

MBeacon User's Guide



Honeywell

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1 WARNINGS

Read Before Operating

This manual must be carefully read by all individuals who have or will have the responsibility of using, maintaining, or servicing this product. The product will perform as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions.

Warning:

Use only the Lithium battery provided by RAE Systems. This instrument has not been tested in an explosive gas/air atmosphere having an oxygen concentration greater than 21%. Substitution of components may impair suitability for intrinsic safety. Replace batteries only in non-hazardous locations.

STATIC HAZARD: Clean only with a damp cloth.

For safety reasons this equipment must be operated and serviced by qualified personnel only. Read and understand instruction manual completely before operating or servicing. Any rapid up-scale reading followed by a declining or erratic reading may indicate a gas concentration beyond upper scale limit, which may be hazardous.

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Marking

The MBeacon is certified according to the IECEx scheme, ATEX and CSA for US and Canada as protected by intrinsic safety.

The product is marked with the following information:




RAE SYSTEMS

3775 N. 1st. St., San Jose

CA 95134, USA

FMC-400

Serial No/barcode: XXX-XXXX-000

<p>IECEX TSA 10.0016X Ex ia IIC T4 Ex ia I</p>	<p> 0575  IM1/II 1G Ex ia IIC T4 Ex ia I DNV 10 ATEX 83388X</p>	<p> Class I, Gr. A,B,C,D T4 Intrinsically Safe</p>
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-40° C ≤ Tamb ≤ 50° C

Warnings:

- Use only RAE 500-0111-000 for internal battery. Do not replace internal battery in hazardous locations.
- Ui: 3.6V; Ci: 78µF; Li/Ri: 3.5µH/ohm
- Understand User's Manual before operating or servicing.
- Substitution of components may impair intrinsic safety.
- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Applied Standards

IECEX	ATEX	North America
IEC 60079-0:2004	EN 60079-0:2006	CAN/CSA-C22.2 No. 0-M91
IEC 60079-11:2006	EN 60079-11:2007	CAN/CSA-C22.2 No. 157-92
		C22.2 No. 142-M1987
		UL 913
		UL916

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1.1 Operation Area and Conditions

1.1.1 Hazardous Areas classified by Zones

MBeacon is intended to be used in hazardous areas classified zone 0, zone 1 or zone 2, within the temperature range of -40° C to +50° C, where gases of explosion groups IIA, IIB or IIC and T4 may be present.

1.1.2 Hazardous Areas classified by Divisions

MBeacon is intended to be used in hazardous areas classified for Class I Div. 1 or 2, within the temperature range of -40° C to +50° C, where gases of explosion groups A, B, C or D and temperature class T4 may be present.

1.2 Instruction For Safe Use

Strictly follow the instructions for safe use. Application of the MBeacon requires full understanding and strict observation of the instructions.

1.3 Use In Hazardous Areas

Equipment which is intended for use in explosive atmospheres and which has been assessed and certified according to international regulations may be used only under specified conditions. The components may not be modified in any way.

The appropriate regulations for service and repair must be properly observed during such activities.

2 Standard Kit

MBeacon with antenna
Maintenance tool
User's Guide

2.1 Key features

- Battery-powered beacon device has a one-year battery run time.
- Field-replaceable battery does not require a “hot work” permit.
- Does not require network cabling or any type of infrastructure installation.
- Factory configured for plug and play.
- Cl I/Div I, Zone I hazardous location approvals
- FCC and R&TTE wireless communication approvals
- IP-65 ingress protection rating for outdoor use

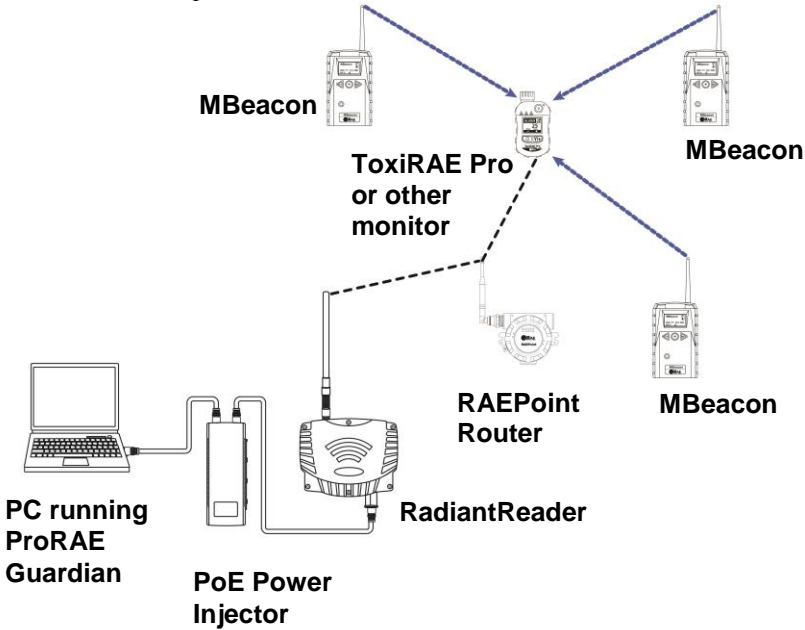
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3 General Information

The MBeacon is a component within the ConneXt PRO wireless gas-monitoring system that regularly transmits its SSID, which is used by the system to provide location information on wireless gas monitors.

The ConneXt PRO system is a permanently installed solution that allows for remote monitoring, two-way communication (on select equipment), and quick visual compliance verification.

The ConneXtPRO consists of wireless gas monitors (and their associated docking stations), beacon devices, and a real-time software monitoring application. By providing remote, real-time gas concentration status and location information to key stakeholders, ConneXt PRO supports a safer, more efficient plant.



Simple network configuration

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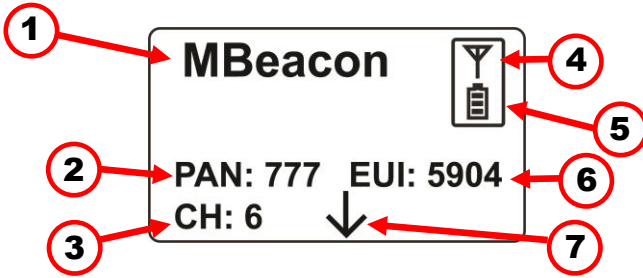
4 Physical Description



1	LCD (with backlighting)
2	Battery cover (on bottom)
3	Y/+, MODE, and N/- keys
4	Antenna

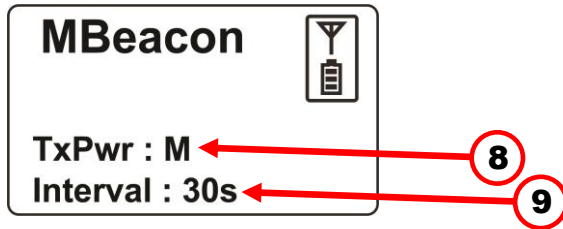
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4.1 LCD Display (Monitoring)



1	Instrument name
2	Pan ID
3	Channel
4	Radio connectivity indicator
5	Battery strength indicator (percentage)
6	EUI (Extended Unique Identifier)
7	Prompt for next screen (press [MODE] key)

When you press [MODE], a second screen is shown:



8	Transmission power (low, medium, high)
9	Polling interval

Press [MODE] to return to the main screen.

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5 Specifications

RF Certifications	FCC Part15 CE R&TTE Directive 1995/5/EC Contact RAE Systems for contry-specific wireless aprovals
Display	Customized LCD (1 x 1.75") with backlight
LED Indicators	Normally disabled, flashing when battery is low
Frequency Band	802.15.4 Sub1GHz 10 channels
RF Output power	Up to 0dBm EIRP
Receiver Sensitivity	Minimum -110dBm
Wireless Operating Range	Up to 100 meters, to wireless portable devices, line of sight
Antenna	Single, attached external 3dBi
User Interface	Three keys (Y/+, MODE, N/-)
Power Supply	D-size Lithium primary battery, +3.6V
Operation Time	Internal Battery: 1 year, typical
Operating Temperature	-40° to +50° C (-40° to 122° F)
Storage Temperature	-40° to +85° C (-40° to 185° F)
Humidity	10% to 90% relative humidity, non-condensing
Dimensions	26.5cm x 9.5cm x 5.5cm (10.5" L x 3.7" W x 2.1" H)
Weight	0.6 kg (1.3 lbs)
Package	IP-65
Mounting	Optional stainless-steel bracket mount or magnetic mount; wall mount for external battery

FCC Part 15 Statement

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.

6 Operation

The MBeacon continuously transmits its MBeacon package. The end instrument receives it and gets a RSSI from the MBeacon. RSSI is then reported to ProRAE Guardian, which calculates the instrument's location using RSSI from three MBeacons. The MBeacon does not receive signals.

6.1 Network Planning and Preparation

Complete RF network planning before installing the MBeacon.

Complete the following tasks before installing the MBeacon in the wireless network.

- **Network site planning:** Complete site planning to understand how a wireless network can be built and supported for your application.
- **RF site assessment:** Perform an RF site assessment when designing a large wireless network. The site assessment should at a minimum include the following tasks:
 1. **Site assessment:** Conduct the site assessment when the plant is operating, so that maximum possible interference can be measured and addressed.
 2. **RF spectrum analysis:** Conduct RF spectrum analysis on the 900Mhz band to detect any potential RF interference. Strong interference sources should be addressed (removed, avoided or minimized) before the installation.
 3. **Arrange mesh:** Arrange point-to-point 2-node mesh in various locations to measure the RF propagation ability in the site. Received Signal Strength Indicator (RSSI) can serve as an indicator of the RF environment.
 4. **MBeacon placement:** Determine placement using Honeywell Analytic's Location Accuracy Estimator tool. Please contact Honeywell Analytics for further information about the use of Location Accuracy Estimator in RF system planning.

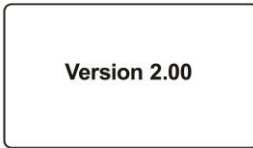
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6.2 Turning The MBeacon On

Hold down the [MODE] key and release it when the MBeacon screen lights up. The display indicates that it is now on:



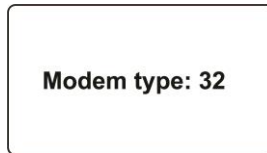
The MBeacon performs a self-test. The display briefly shows the firmware version:



Next, it shows the firmware's build date and time:



This is followed by the Modem Type:

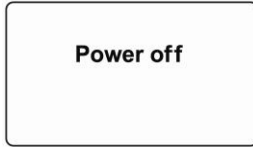


Then the MBeacon begins to transmit its SSID according to its settings.

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6.3 Turning The MBeacon Off

Hold down the [MODE] key through the “5...4...3... 2... 1... Power Off” sequence. When you see “Power off,” release the [MODE] key.



The MBeacon is off when the display is blank.

6.4 Battery Charge Indicator

The MBeacon's internal battery is designed to provide power for up to a year. When the battery gets low, the MBeacon sends a notification to the real-time monitoring system, informing of its low-power status. It is recommended that the battery be changed immediately, to minimize disruption.

Battery power is indicated by the battery icon. The battery should be replaced before it is completely discharged. See page 31 for the replacement procedure.

When the battery is completely depleted, the LCD displays “Power off.” and the LED and buzzer alarm activate once per second. The MBeacon shuts down after you press any key, or shuts down automatically if you do not press a key for 60 seconds.

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7 Button Functions

The three buttons provide fast access to functions in the MBeacon.

- Press [MODE] to toggle between the two main screens.
- Press [Y/+] or [N/-] to “wake” the display.

7.1 Backlight

Whenever you press the [Y/+] , [MODE], or [N/-] key, the backlight turns on for 15 seconds and then shuts off.

8 Programming The MBeacon

Programming Mode is accessed by first providing the correct password.

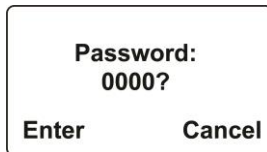
Press and hold [MODE] and [N/-] until you see this screen:



Input the 4-digit password:

- Increase the number from 0 through 9 by pressing [Y/+] .
- Decrease the number from 9 through 0 by pressing [N/-] .
- Step from digit to digit using [MODE] .

Once all the four digits have been entered, press [MODE] again to see the following screen appear. Press [Y/+] to enter the password.



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If you make a mistake, you can cycle through the digits by pressing [MODE] and then using [Y/+] and [N/-] to change the number in each position.

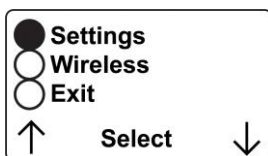
Note: The default password is 0000.

If your password is incorrect, you see this screen:



After a few seconds, the MBeacon exits to its main screen.

When you have successfully entered Programming Mode, you see this screen:



Note: If you do not make a selection in 60 seconds, the MBeacon automatically exits to the main screen.

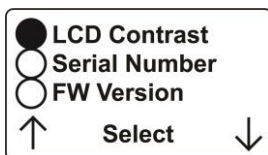
Press [Y/+] or [N/-] to scroll to “Settings,” “Wireless,” or “Exit.” Then press [MODE] to select your choice.

Settings provides information about your instrument. Some screens are read-only (you cannot edit them), but other screens allow you to change settings.

Wireless consists of parameters you can set/change that affect wireless functionality, network configuration, etc.

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Settings include some read-only information (Serial Number and Firmware Version) and some settings that you can change.



Press [Y/+] to scroll up or [N/-] to scroll down.

Note: The next screen contains additional options:



Note: The scrolling “wraps,” so once you reach the first or last item, it starts scrolling through the items again.

Six choices (including Exit) are available:

- LCD Contrast
- Serial Number (read-only)
- Firmware Version (read-only)
- Factory Reset
- Edit Password
- Exit

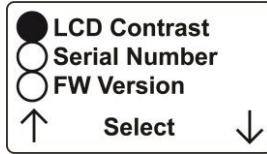
To make a selection, scroll until the circle to the left of your choice is black, and then press [MODE].

Note: If you do not make a selection in 60 seconds, it automatically exits to the main screen.

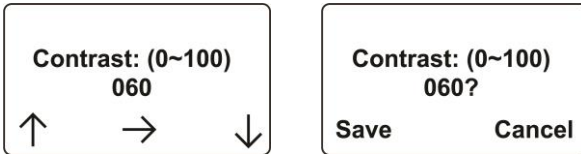
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8.1.1 LCD Contrast

The display's contrast is adjustable via this menu. To access it, press [MODE] when its name is highlighted (dark circle):



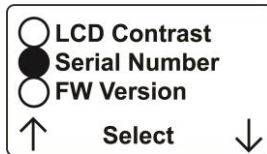
The contrast value is shown in the display. Step through the digits from left to right by pressing [MODE]. Change a digit's value by pressing [Y/+] to increase and [N/-] to decrease. After the third digit, you see a flashing “?”



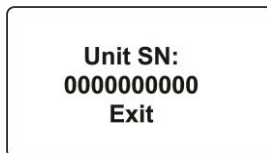
- Save your changes by pressing [Y/+].
- Exit without saving changes by pressing [N/-].
- Step back to the first digit by pressing [MODE].

8.1.2 Serial Number

This shows the Serial Number of the MBeacon. To view it, press [MODE] when “Serial Number” is highlighted (dark circle):



The serial number is shown in the display:

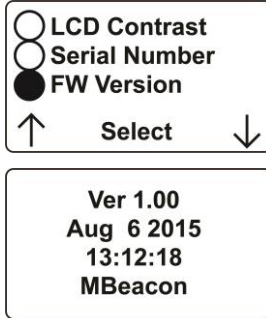


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Press [MODE] to return to the Settings menu. If you do not make a selection in 60 seconds, the unit automatically exits to the menu.

8.1.3 Firmware Version

This shows the firmware version incorporated in the instrument. It is read-only. You cannot make changes to the information. To view it, press [MODE] when its name is highlighted (dark circle):



Press [MODE] to return to the Settings menu. If you do not make a selection in 60 seconds, it automatically exits to the menu.

8.1.4 Factory Reset

You can perform a factory reset to the instrument's original settings. To access it, press [MODE] when its name is highlighted (dark circle):



You are asked whether you want to perform the factory reset:



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To perform the reset, press [Y/+]. To exit without performing the reset, press [N/-].

While the MBeacon is being reset to its original factory settings, the screen shows that the activity is taking place:



When the reset is complete, this screen appears:



Then the unit returns to the Settings menu.

Note: If you perform a factory reset, all of your settings are removed and cannot be retrieved.

8.1.5 Edit Password

You can change the password by selecting “Edit Password.”



At this screen, input your new password over the old one (or the default):

- Increase the number from 0 through 9 by pressing [Y/+].
- Decrease the number from 9 through 0 by pressing [N/-].
- Step from digit to digit using [MODE].

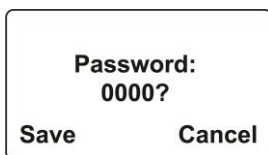
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Note: If you make a mistake, you can cycle through the digits by pressing [MODE] and then using [Y/+] and [N/-] to change the number in each position.

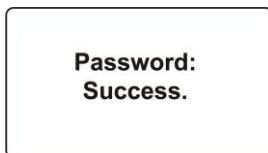


Once all the four digits have been entered, press [MODE] again to see the following screen appear.

- Save your changes by pressing [Y/+].
- Exit without saving changes by pressing [N/-].
- Step back to the first digit by pressing [MODE].



Saving the password takes a moment, and a screen indicates that it has been successfully saved:



8.1.6 Exit

Scroll until "Exit" is selected.

Press [MODE] to return to the Programming Menu.

Note: If you do not make a selection in 60 seconds, it automatically exits to the menu.

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8.2 Wireless

Wireless consists of editable parameters and actions to configure, form, and test a closed-loop wireless network.



Under Programming Menu, select “Wireless.”

Press [Y/+] to scroll up or [N/-] to scroll down through wireless sub-menus.

Note: When you reach the last item and continue scrolling, a second screen appears:



The scrolling “wraps,” so once you reach the first or last item of either screen, it starts scrolling through the items in the other screen again.

Five choices (including Exit) are available:

- PANID Setup
- Channel Setup
- Transmit Power Setup
- Interval Setup
- Exit

To make a selection, scroll until the circle to the left of your choice is black, and then press [MODE].

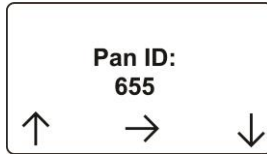
Note: If you do not make a selection in 60 seconds, it automatically exits to the main Programming Menu.

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8.2.1 PAN ID Setup

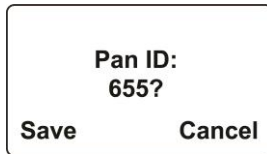
All units on a network must be programmed with the same PAN ID (Personal Network Identifier) to ensure communication compatibility.

When you see this screen, press [MODE] to view the current PAN ID or to change it:



Important! The allowed range for PAN ID numbers is 001 through 999.

The screen shows the PAN ID, with the cursor blinking on the first digit. Step through the digits from left to right by pressing [MODE]. Change a digit's value by pressing [Y/+] to increase and [N/-] to decrease. After the third digit, you see a flashing “?”



- Save your changes by pressing [Y/+].
- Exit without saving changes by pressing [N/-].
- Step back to the first digit by pressing [MODE].

Note: If you do not press a key within 60 seconds, the screen reverts to the programming Menu screen showing Settings, Modem, and Exit.

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8.2.2 Channel Setup

All units in a network must operate on a single channel. The available channels vary by the internal wireless modem's frequency, and channel ranges are set by RAE Systems to correspond with the wireless modem frequency. The frequency is set at the factory according to country/region.

These are the modem frequencies and channel ranges:

869 MHz:

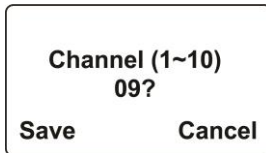
Channel 0 (channel cannot be changed)

900 MHz:

Channels 1 through 10

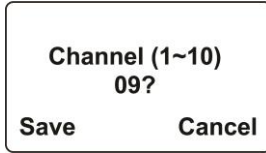


Press [MODE] to view or change the channel. The range of available channels is shown in parentheses. The screen also shows the channel number, with the cursor blinking on the first digit:



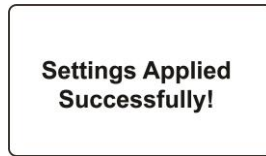
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Step from digit to digit from left to right by pressing [MODE]. Change a digit's value by pressing [Y/+] to increase and [N/-] to decrease. When you press [MODE] you see a flashing “?” after the second digit:



- Save your changes by pressing [Y/+].
- Exit without saving changes by pressing [N/-].
- Step back to the first digit by pressing [MODE].

If you have saved the channel number successfully, you see these screens in sequence:



Important! Remember that the range of allowed channels for instruments on a MBeacon's network depends on the wireless modem frequency. Therefore, you may not be able to change the channel to a number outside of its assigned set of numbers. If you select an incompatible channel number, you will see this screen, and then the MBeacon returns to the Wireless menu.



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8.2.3 TxPower Setup

Transmission Power is the amount of power used to send beacon signals to instruments. Optimum signal strength and battery use are best balanced during installation.

Note: Using more Transmission Power than necessary reduces battery life.

Important! It is highly recommended that this setting not be changed without first consulting the system's integrator.

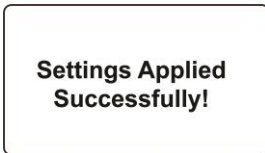


There are three settings: Low, Medium, and High. The default value is Medium.

Press [Y/+] to scroll up or [N/-] to scroll down to the setting of your choice.

1. Press [MODE] to save the change.

The settings are applied.



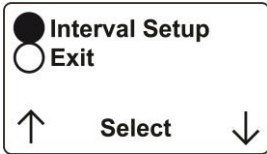
The screen shows the three choices again.

Press [N/-] to advance to the next screen, Interval Setup.

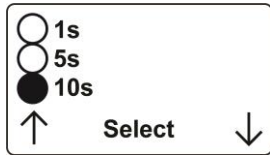
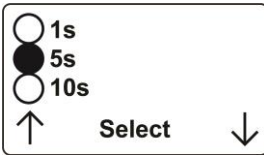
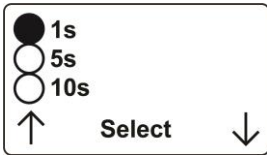
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8.2.4 Interval Setup

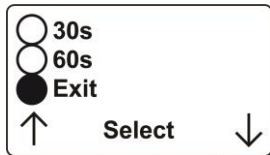
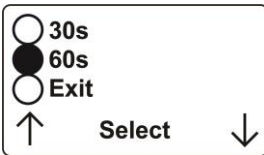
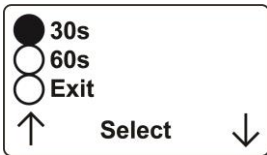
Set the time interval at which the MBeacon sends out a signal. This can range from once per second to once per minute. The transmission frequency is user-adjustable, but a rate of at least once every 30 seconds is recommended. **Note:** Shorter intervals reduce battery life.



Press [MODE] to see the options for the polling interval:



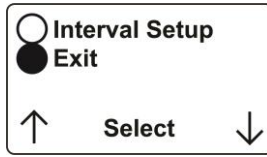
Press [MODE] to select one of these. Otherwise, press [N/-] to advance for more options:



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8.2.5 Exit

To exit Wireless and return to the main Programming Menu, scroll until “Exit” is shown:



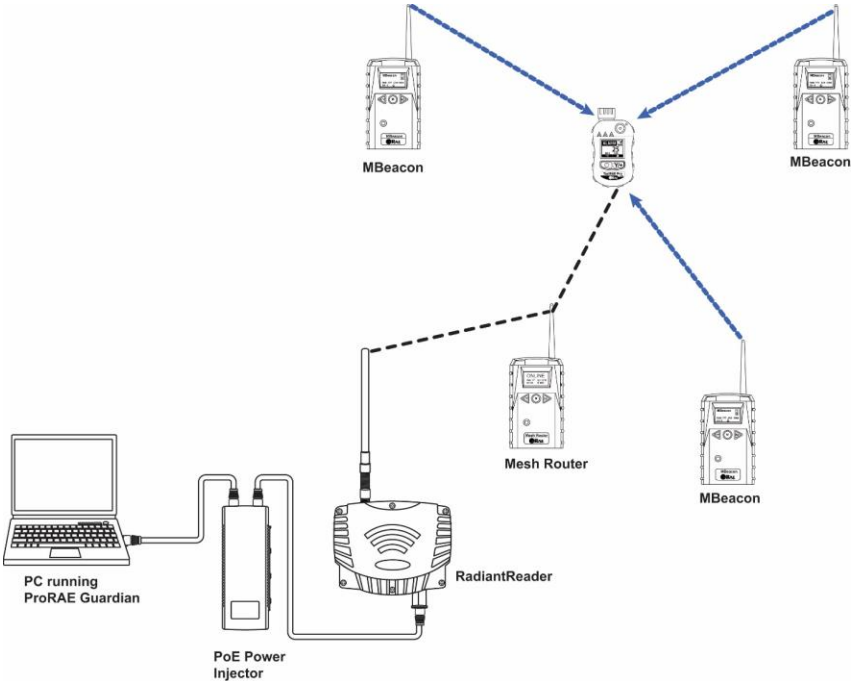
With “Exit” selected, press [MODE]. The MBeacon now returns to the Programming Menu screen.

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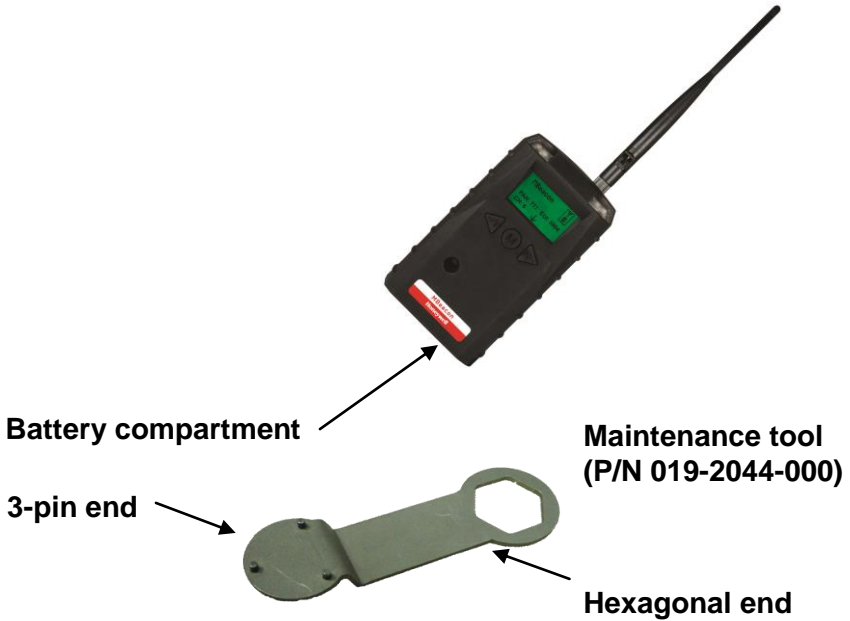
9 Installation

Installing MBeacons in a system requires compatible wireless gas monitors, an access point such as a RadiantReader and a PC running ProRAE Guardian.

Simplified system. This shows a system in which there are three MBeacons and a single wireless monitor (a ToxiRAE Pro). The MBeacons send a signal to ToxiRAE Pro, which relays the RSSI signal and relative signal strength and each MBeacon's ID to ProRAE Guardian. A map in ProRAE Guardian includes data that corresponds to each MBeacon's location. The Location Engine in ProRAE Guardian uses the received signal strength and location of each MBeacon relative to the monitor to triangulate its location.



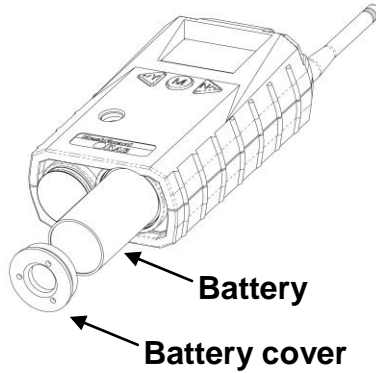
10 Internal Battery Replacement



1. Use the 3-pin end of the tool to unscrew and open the battery cover by turning it counterclockwise.
2. Remove the battery.
3. Insert the new battery with its positive (“+”) pole towards inside of the unit.
4. Replace the battery cover by turning it clockwise with the 3-pin end of the tool.

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Note: Only Change battery in a safe location and use the battery RAE Systems provided. After changing the battery, wait at least 60 seconds before turning the MBeacon on.



Warning

Only change internal battery in non-hazardous locations and use the battery RAE Systems provides (P/N: 500-0111-000), EVE ER34615 or XENO XL-205F).

10.1 Proper Battery Disposal



The Waste Electrical and Electronic Equipment (WEEE) directive (2002/96/EC) is intended to promote recycling of electrical and electronic equipment and their components at end of life. This symbol (crossed-out wheeled bin) indicates separate collection of waste electrical and electronic equipment in the EU countries. This product may contain one or more Nickel-metal hydride (NiMH), Lithium-ion, or Alkaline batteries. Specific battery information is given in

this user guide. Batteries must be recycled or disposed of properly.

At the end of its life, this product must undergo separate collection and recycling from general or household waste. Please use the return and collection system available in your country for the disposal of this product.

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11 Troubleshooting

Failure Symptom	Cause	Solution
Cannot turn on	Battery charge too low	Replace battery
	Battery has been changed	Wait at least 60 seconds to turn on MBeacon
	New battery needs to be discharged before use	Check RAE Systems web site for information on batteries

Note: If other problems occur, consult your system's integrator.

Ordering Replacement Parts: If you need replacement parts, a list is available online: <http://www.raesystems.com>

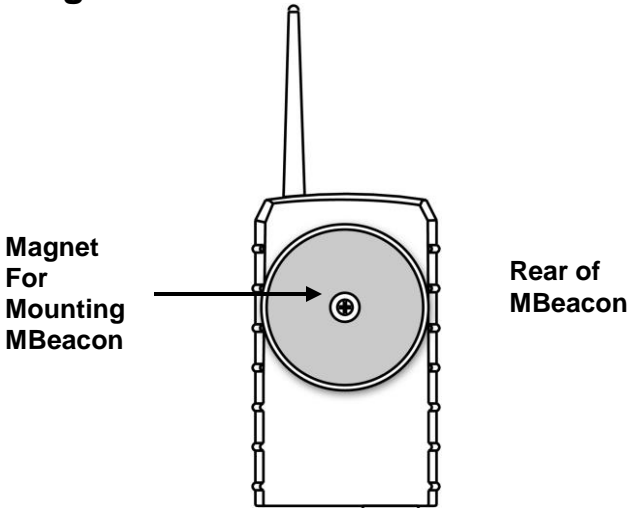
12 MBeacon Alarm Signal Summary

Alarm Mode	When	LCD	Buzzer & LED
Battery Low	< 3.15V	("empty" battery icon)	1 beep per minute
Battery Exhausted	< 2.93V	 A rectangular box containing the text "Power off".	1 beep per second

13 MBeacon Installation

Two methods for mounting MBeacon make it easy to install. The first method uses a magnet that screw onto the rear of the MBeacon, making ideal for moving from one location to another. The second method uses a specially designed stainless-steel enclosure that is permanently mounted. It protects the MBeacon from damage in industrial settings.

13.1 Magnet-Mount Installation



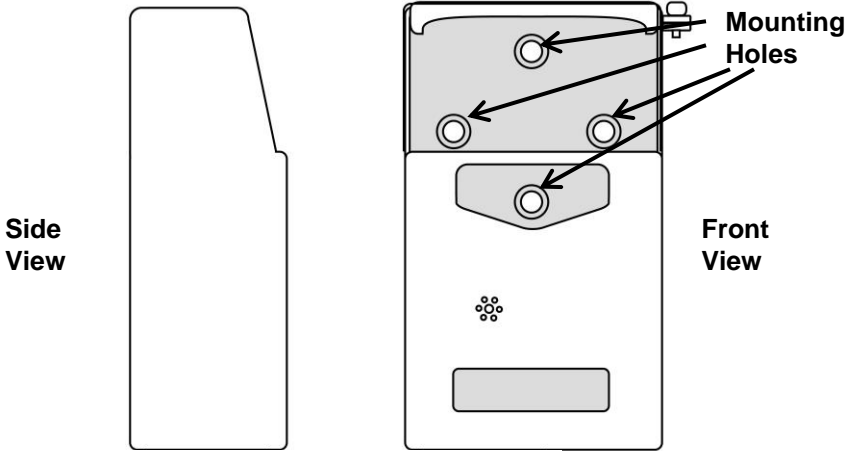
This magnet is powerful enough to support the MBeacon when it is placed against a flat steel or iron surface.

Important! Keep the magnet away from computer hard drives. The strong magnet can corrupt or erase data on these.

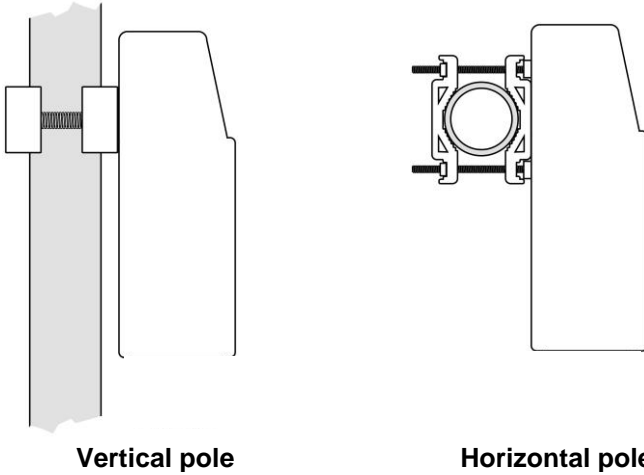
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13.2 Fixed Installation

Four reinforced holes in the rear of the enclosure allow for a screw to pass through to the mounting brackets.



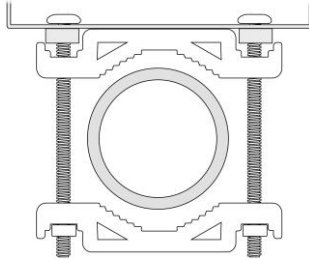
The enclosure can be mounted to a vertical or horizontal pole.



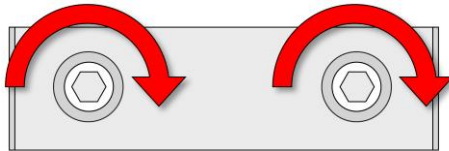
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Slip the screws through the two holes that are side by side in order to mount the enclosure to a vertical pole. Otherwise slip the screws through the two vertically aligned holes to attach the enclosure to a horizontal pole.

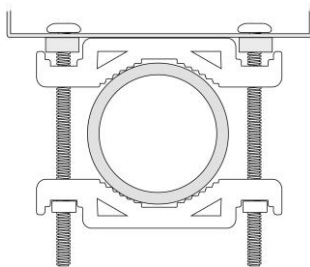
Loosely assemble the clamp parts around the pole. Note that the screws have nuts that fit into the clamp parts. The clamp parts are designed to hole the nut so that you do not need to use a wrench. Hand-tighten the parts until snug.



Tighten the hex screws from the front of the enclosure:



Once the clamp parts and the enclosure are securely held against the pole, stop tightening.

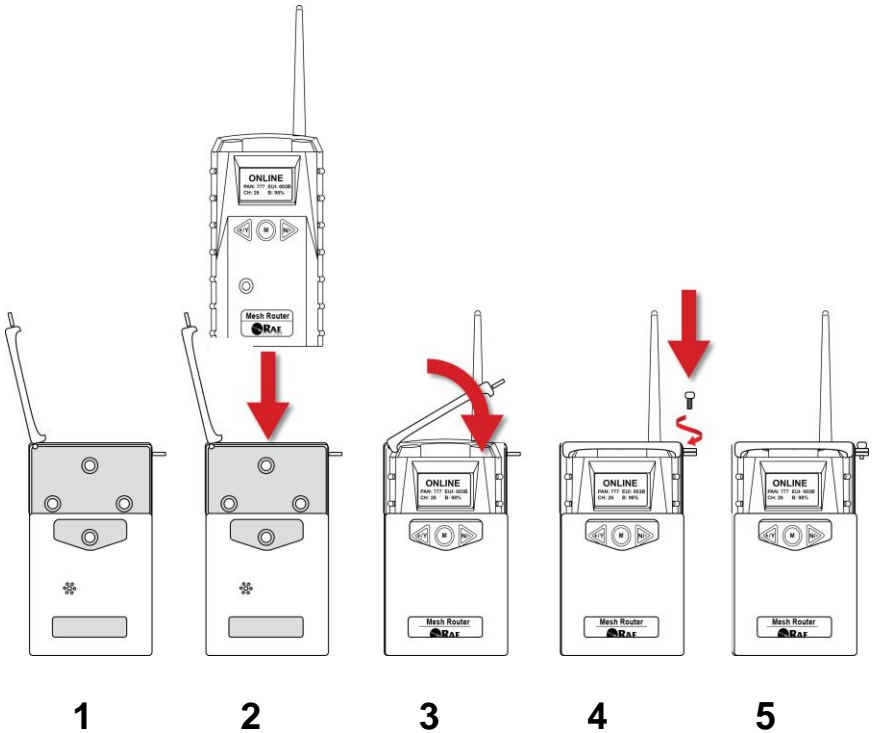


Note: The pole must be between 25mm (1") and 63mm (2.5") in diameter.

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Next, place the MBeacon into the enclosure:

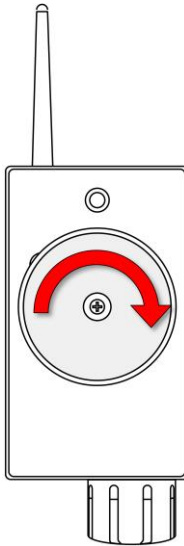
1. Lift up the hinged cover of the enclosure.
2. Slide the MBeacon into the enclosure from the top.
3. Close the cover of the enclosure.
4. Insert the hex screw into the cover's locking portion, and tighten it.
5. The MBeacon is now ready to use.



13.3 Magnetic Mount Alternative Installation

The magnet-mount disc can be attached to the steel enclosure instead of the clamps. This approach provides the protection of the enclosure with the ease of installation afforded by the magnetic mounting.

1. Insert screw through magnetic disc.
2. Place the magnetic disc over the bottom hole on the rear of the enclosure.
3. Tighten the screw until the disc is snug.



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Year Of Manufacture

To identify the year of manufacture, refer to the serial number of the instrument.

The letter in the serial number indicates the year of manufacture. For example, “M” indicates the manufacturing year is 2010.

Letter	Year
J	2008
K	2009
M	2010
N	2011
P	2012
Q	2013
R	2014
S	2015
T	2016
U	2017
V	2018
W	2019

14 Technical Support

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