Rig Rat III Controller

Wireless Gas Detection Communication Center

User Manual

"INNOVATORS IN GAS DETECTION"

BW Technologies

Limited Warranty & Limitation of Liability

BW Technologies Ltd. (BW) warrants this product to be free from defects in material and workmanship under normal use and service for a period of two years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. BW's warranty obligation is limited, at BW's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a BW authorized service center within the warranty period. In no event shall BW's liability hereunder exceed the purchase price actually paid by the buyer for the Product.

This warranty does not include:

a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;

b) any product which in BW's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;

c) any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product; or

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of BW;

b) the buyer promptly notifying BW of any defect and, if required, promptly making the product available for correction. No goods shall be returned to BW until receipt by the buyer of shipping instructions from BW; and

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CAUTION: FOR SAFETY REASONS, THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND THE USER MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

The Rig Rat III Controller

Order Number	Description
RR-3C04	Wireless gas detection communication center

Rig Rat III Controller

Introduction

⚠ Warning

To ensure your personal safety, read “Safety Information” before you use the controller.

The Rig Rat III Controller (“the controller”) is a wireless communication center for the Rig Rat III gas detection system. The controller is a monitoring device and does not control the Rig Rat III Detector. The controller warns when hazardous gas levels exceed the user-selectable alarm setpoints of the detectors. A complete system can contain one controller and up to four detectors.

The controller is an area safety device. It is your responsibility to respond properly to the alarm.

Contacting BW Technologies

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ISO 9001

Safety Information - Read First

Use the controller only as specified in this manual, otherwise the protection provided by the instrument may be impaired.

International symbols used on the controller and in this manual are explained in Table 1.

Read the **Warnings** and **Cautions** on the following pages before using the controller.

Note

This instrument contains batteries. Do not mix with the solid waste stream. Spent batteries should be disposed of by a qualified recycler or hazardous materials handler.

⚠ Cautions

⇒ **Do not use the controller if it or any system components are damaged. Inspect the system on a regular basis and keep a log.**

⇒ **If the controller is damaged or something is missing, contact BW Technologies immediately.**

⇒ **When installing cables, ensure they are protected from possible damage. Secure the cable(s) in place and fasten any excess. Do not exceed a 65-degree bend allowance when installing the cables.**

⇒ **Ensure that all plug-in connectors are clean and fully seated when installing them.**

⇒ **Confirm that the weatherproof ring on the connector(s) is fully screwed down.**

⇒ **Confirm that all ports not in use are fully screwed down and have cover caps installed.**

⇒ **Ensure that the latch on the external hinged door is fully engaged and that the handle has been turned the full 180 degrees to complete the weather seal.**

⇒ **Do not expose the unit to electrical shock and/or severe mechanical shock.**

⇒ **Use only parts specifically designed for the Rig Rat III Controller system. See the section Replacement Parts and Accessories.**

⇒ **Do not allow liquids to condense and/or use high power sprays on the instruments.**

⇒ **Do not attach system components that do not meet specified criteria (such as alarms, relays, cabling, etc.).**

⚠ Cautions (cont.)

⇒ **Electromagnetic interference (EMI) signals may cause incorrect operation of the controller.**

⇒ **Do not attempt to disassemble, adjust, or service the units unless instructions are contained in the manual for that procedure and/or that part is listed as a replacement part. Use only BW parts.**

⇒ **The controller warranty will be void if the unit is disassembled, adjusted, or serviced by non-BW Technologies personnel.**

Table 1. International Symbols

Symbol	Meaning
C SA US	Approved to both U.S. and Canadian Standards by the Canadian Standards Association

Getting Started

The items listed below are included with your controller. If the controller is damaged or something is missing, contact the place of purchase immediately.

The controller comes complete with the following:

- Security key
- Power key
- Slot-regular screwdriver
- User manual

Note

An antenna and antenna cable are needed in order to operate the controller. To order the antenna, antenna cable, or any replacement part, see the ***Replacement Parts and Accessories*** *section.*

To become familiar with the features and functions of the controller, study the following figures and tables:

- Figure 1 and Table 2 describe the controller's main external components.
- Figure 2 and Table 3 describe the controller's main internal components.
- Figure 3 and Table 4 describe the controller's Liquid Crystal Display (LCD).
- Table 5 describes the controller's switches and keys.

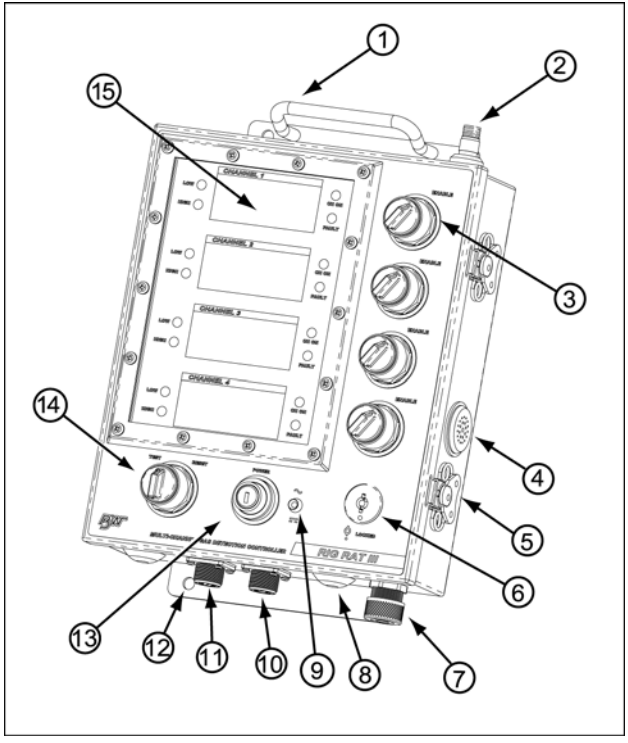


Figure 1. The Rig Rat III Controller

Table 2. The Rig Rat III Controller

Item	Function
A	Carrying handle
B	TNC antenna connector
C	Channel enable/disable switch
D	Audible alarm
E	External tension latch
F	Security key
G	Power entry
H	Low, High, Fault alarm relays
I	External/Internal power indicator LED
J	Relay option port
K	Alarm bar accessory port
L	Mounting bracket
M	Power switch
N	Test/reset
O	LCD display panel

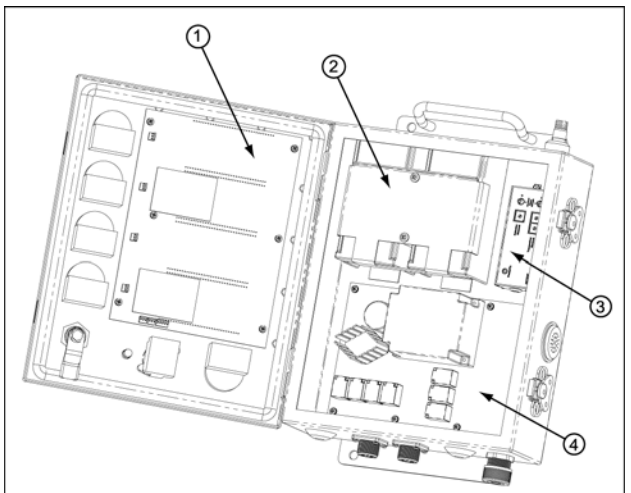


Figure 2. Internal Components

Table 3. Internal Components

Item	Function
A	Main board
B	Batteries
C	Transceiver
D	Power board

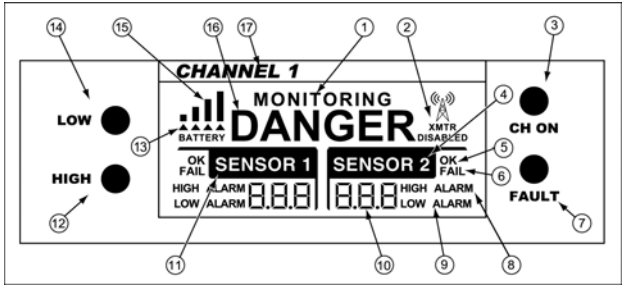


Figure 3. Display Elements

Table 4. Display Elements

Item	Function
A	Sensor(s) monitoring gas
B	XMTR disabled icon
C	Channel on LED
D	Sensor 2 identifier icon bar
E	Sensor OK
F	Sensor FAIL
G	Fault alarm LED
H	High alarm condition
I	Low alarm condition
J	Numeric value (ppm or %)
K	Sensor 1 identifier icon bar
L	High alarm LED
M	Battery level indicator
N	Low alarm LED
O	Battery level bar icon
P	Flashing danger alarm
Q	Channel label

Table 5. Switches and Keys

Switch/Key	Description
POWER	• To turn on the controller, turn the **POWER** switch clockwise. • To turn off the controller, turn the **POWER** switch counterclockwise.
TEST/RESET	• To reset the controller, turn the **TEST/RESET** switch clockwise. • To test the controller, turn the **TEST/RESET** switch counterclockwise. • To acknowledge a latched alarm, turn the **TEST/RESET** switch clockwise.
ENABLE	• To activate a channel, turn the **ENABLE** switch clockwise. • To disable a channel, turn the **ENABLE** switch counterclockwise.
LOCKED	• To lock the controller enclosure, turn the **LOCKED** key counterclockwise.

Installation

Guidelines

⚠ Caution

Qualified personnel should perform the installation according to applicable electrical codes, regulations, and safety standards.

When installing the controller, adhere to the following guidelines:

- This system is rated for General Purpose Area installation only.
- A circuit breaker is included in the building installation as a disconnect device for the equipment. The disconnect device is installed in close proximity to the equipment and is marked as a disconnecting means for the equipment.
- The terminals for all external circuits are used only with equipment that have no live parts that are accessible.

Antenna Location

When finding a location for the antenna, it is important to notice your surroundings. A variety of factors should be kept in mind when selecting a location for the antenna:

- The terrain;
- The line-of-sight to the detector antenna;
- The proximity to any radio frequency interference (RFI).

BW recommends the following when finding a location for the antenna:

- Do not locate the antenna near water.
- Ensure the antenna is as high and clear of surrounding objects as possible.
- There is a clear line-of-sight between the antenna of the controller and the detector. (There are no obstructions between them.)
- The controller's antenna should be placed as far as possible from other antenna systems in order to avoid possible RFI.

⚠ Warning

Use extreme caution when working near telephone and electrical power lines. Always mount antennas at least twice the length of the antenna away from power lines.

Note

Atmospheric conditions may cause signal loss.

Antenna Installation

The controller is equipped with a TNC antenna port. Install the antenna and any extension cables required. For transmission distances see **Specifications** and any applicable accessory manuals.

Antenna cable runs should be kept short (less than 20 ft/ 6 m). If the distance is greater, use a cable such as the LMR 400. See the section **Replacement Parts and Accessories**.

The use of connectors should be minimized.

Controller Location

When selecting a location to install the controller, do not place it where it can be exposed to electrical shock and/or severe mechanical shock.

Controller Installation

The controller should be powered by a minimum 3 conductor AWG 18 wire with a flexible cord suitable for area use depending on the local regulatory requirements.

The controller is equipped with pre-drilled mounting flanges for permanent installation.

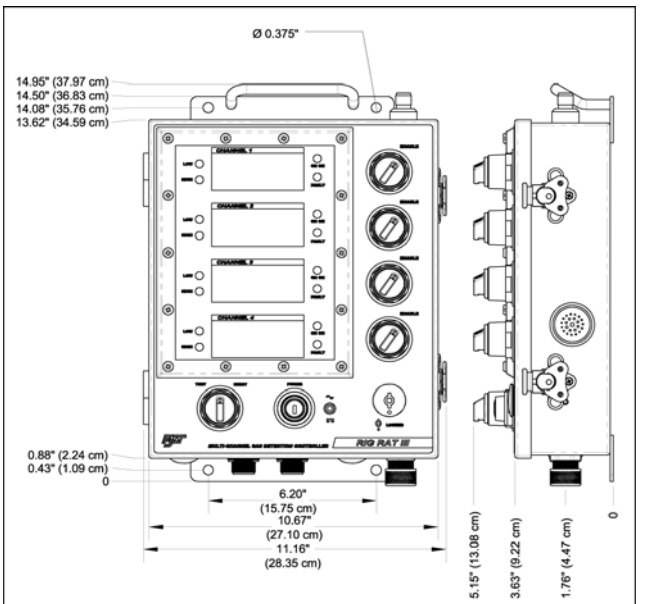


Figure 4. Controller Dimensions

Grounding Instructions

The importance of grounding is fundamental to safety and system operation. Choose the best place to mount the controller and then select the situation that best suits the location and ground accordingly.

The ground from the AC power line should be satisfactory for the system, but if it is not, refer to the applicable situation.

Note

All system components (plug-in accessories and options) are bonded to the main system through their cables.

Situation 1: Mount is metallic and at earth ground potential (Figure 5)

1. Investigate the condition of the bond between the mount and the earth ground.

2. System bond can be achieved by mounting the system components using toothed lockwashers (refer to the following figure).

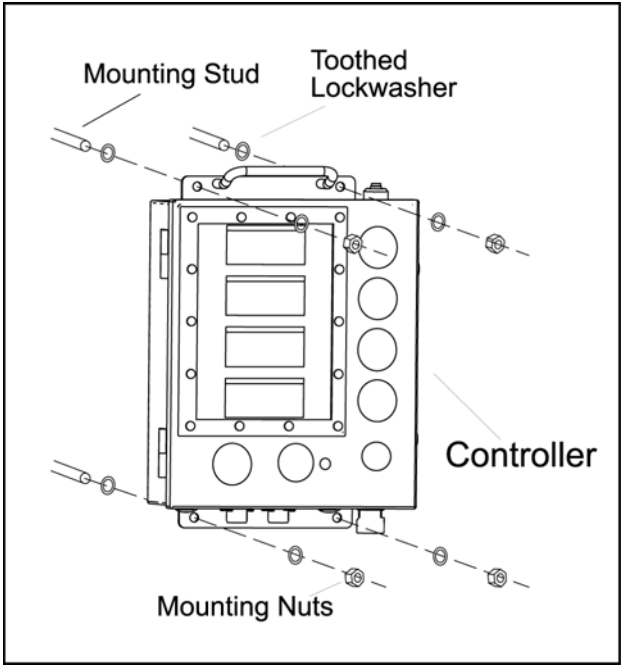


Figure 5. Bonding Controller

Situation 2: Mount is non-metallic (non conducting) (Figure 6)

1. Establish a plant ground location.
2. Using a bonding cable (4-12 gauge insulated wire), tap into the existing plant ground network.
3. Mount the system components in location, fixing the other end of the bonding cable to the mounting bracket.

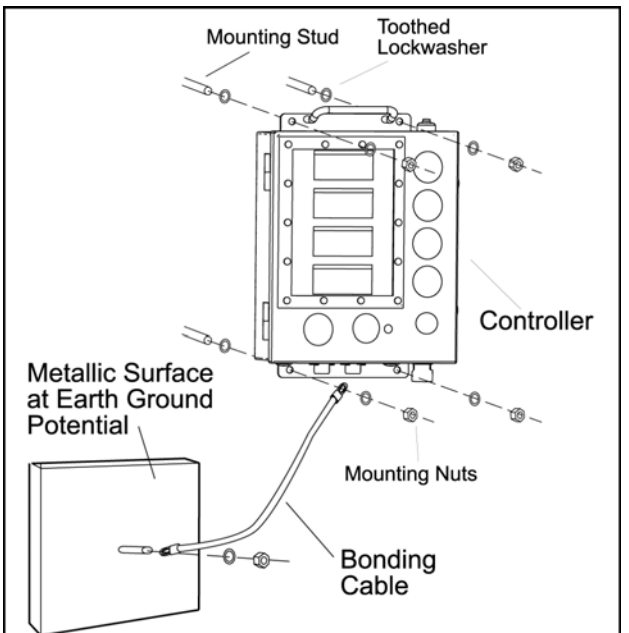


Figure 6. Bonding with Bonding Cable

Situation 3: Mount is metallic, but not grounded to earth ground (non-conducting)

1. Location is not properly grounded and a ground must be supplied.
2. Use toothed lockwashers to mount the controller in location.
3. If a plant ground is not available, mount as in situation 2 or establish an earth ground as in situation 4.

Situation 4: A plant ground rod is not available and earth ground must be provided (Figure 7)

1. Hammer a grounding rod into the ground (usually 2 ft/0.66 m).
2. Secure a bonding cable (4-12 gauge insulated wire) between the controller and the grounding rod.

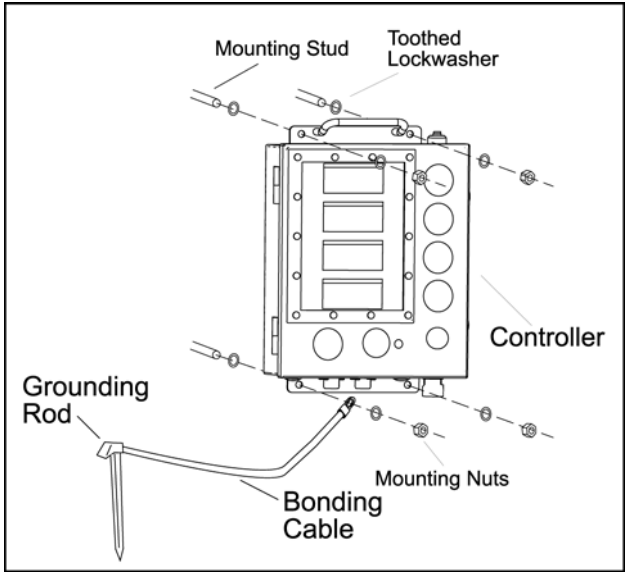


Figure 7. Grounding Rod Installation

Wiring

A supply of AC power is required to operate the controller. Set the power switch to the applicable voltage.

Note

The controller's back up batteries are trickle charged from the main power.

Do not switch neutral wires when connecting devices to the system relays.

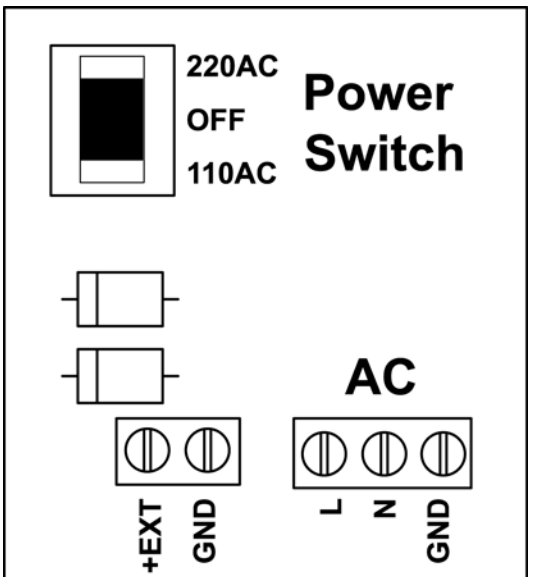


Figure 8. Power Connections

Options and Accessories Installation

See the applicable accessory manual for installation information.

Setting the Transceiver and Detector Channels

Note

The controller will not recognize transceiver and detector channel changes when the system is powered up. Cycle the power on and off after a channel change to confirm the modification.

Digitally coded information is received via a 2.4 GHz radio using Frequency Hopping Spread Spectrum (FHSS) technology. Coding is easily changed on the site to meet changing requirements (e.g., moving controllers, adding detection points, and/or changeover of equipment).

To access the transceiver, open the two external tension latches. (If the controller is locked, you need to unlock it with the security key.)

The controller transceiver operates in the receive mode if the detector channel rotary switch is positioned to channel 0. Confirm that the detector channel is set to 0.

The transceiver channel is selected from 00 to 3F (AB combination) and must be identical to the transceiver channel of all the detectors. Match all detectors transceiver channel codes to the controller's transceiver channel code.

Table 6. Transceiver and Detector Channel Example

	Transceiver Channel	Detector Channel
Controller	00	0
Detector 1	00	1
Detector 2	00	2
Detector 3	00	3
Detector 4	00	4

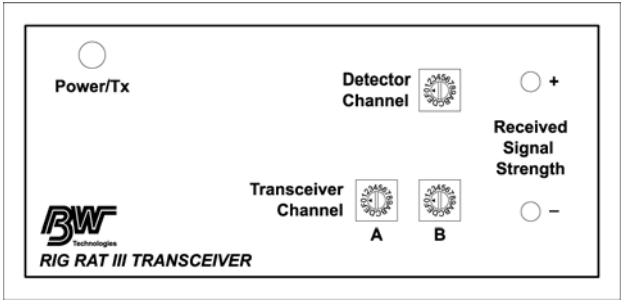


Figure 9. Transceiver

Operation

Activating the Controller

To activate the controller, insert the power key and turn it clockwise.

All the LEDs and LCDs will flash four times and the audible alarm will emit six beeps.

Setting Up the System

Execute the following steps to activate the whole system.

1. Confirm that all applicable detectors are turned on and they are in normal operation.
2. Set all applicable channel enable switches to the enabled position.
3. Push and hold the ◯ **XMTR TEST** button on the detector until **rF tst** is displayed. Refer to the detector's user manual.
4. The detector and controller displays will count down from 999 999 to 000 000.
5. All status information displayed on the detector LCD will be replicated on the corresponding LCD channel of the controller.

Note

The battery displayed on the controller LCD is the battery level of the applicable detector, not the battery level of the controller backup battery.

Normal Operation

During normal operation the **CH ON** LED is green and all enabled LCD channels are displaying identical information from their corresponding Rig Rat III Detectors. For additional LCD description, see the Rig Rat III Detector user manual.

Temporary Disable of Relays and Audible Alarm

This feature disables the relays and the audible alarm for one hour, but the LEDs and LCDs still function normally.

Execute the following to activate this feature:

1. Turn and hold the **TEST/RESET** switch to **RESET** for 5 seconds.
2. The enabled channel's **CH ON** LED will flash, indicating that the controller has disabled any relays and audible alarm.

Note

*To return the controller to normal operation (before an hour is up), turn the **TEST/RESET** switch to **RESET**. The **CH ON** LED will stop flashing to indicate normal operation.*

Backup Battery Power

In the event of a main power failure, the controller will temporarily run from the backup battery.

Note

The controller's backup batteries are trickle charged from the main power.

A controller running off the backup batteries will last from 2-3 hours.

Deactivating the Controller

To turn off the controller, insert the power key and turn counterclockwise.

External Features

External/Internal Power LED

The power indicator LED is green when the controller is operated by a 110 or 220 VAC source.

If the AC power is interrupted, the LED will change from green to red to indicate battery backup (DC) operation.

Test Switch

To test the correct operation of the alarm LEDs, the audible alarm, and the alarm relays, turn the **TEST/RESET** switch to the **TEST** position. All enabled channel LEDs will light, the audible alarm will beep, and the connected alarm accessories will activate.

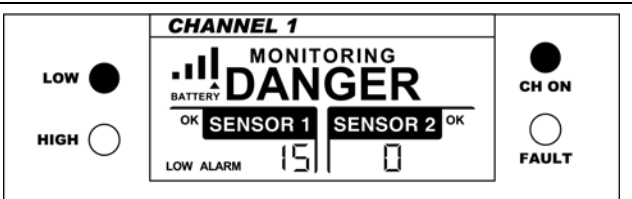
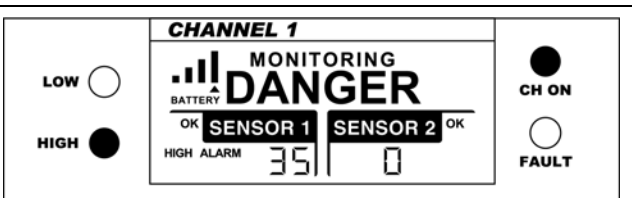
Channel Enable Switch

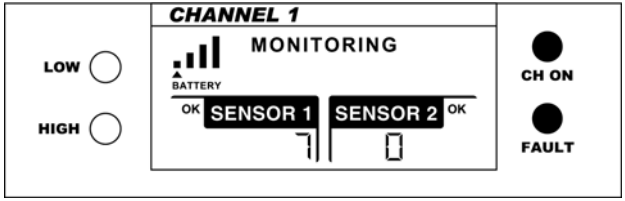
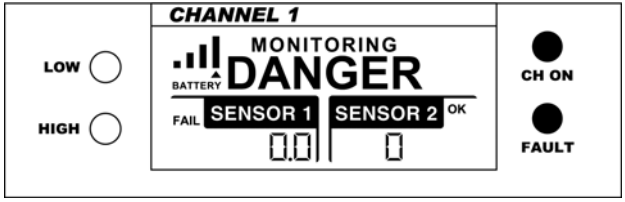
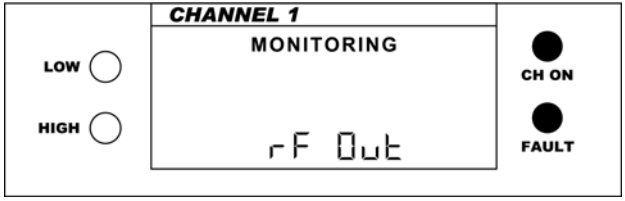
To activate a channel, turn the **ENABLE** switch clockwise.

Alarms

The following table describes the system alarms and shows how the display looks for each alarm. Alarms will reset to normal operation when the alarm condition no longer exists (unless the alarm is latching).

Table 7. Alarms

Alarm	Display
Low Alarm • **LOW** LED lights. • **DANGER** icon lights and flashes. • **LOW ALARM** icon lights advising alarm level and sensor affected. • LCD readout shows numeric value of gas present. • Audible alarm pulses (if enabled).	
High Alarm • **HIGH** LED lights. • **DANGER** icon lights and flashes. • **HIGH ALARM** icon lights advising alarm level and sensor affected. • LCD readout shows numeric value of gas present. • Audible alarm pulses (if enabled).	

Alarm	Display
Low Battery Alarm • **FAULT** LED lights. • Battery arrow is under the shortest bar and the battery icon is flashing.	
Sensor Integrity Alarm • **FAULT** LED lights. • **DANGER** icon lights and flashes. • **FAIL** icon lights to advise of the affected sensor/cable. • Audible alarm pulses (if enabled).	
Loss of Transmission Alarm • **FAULT** LED lights. • **rF Out** flashes. • Audible alarm pulses (if enabled).	

Note

Do not switch neutral wires when connecting devices to system relays.
For all the above listed alarms, common alarm relay and corresponding channel alarm ports will activate if they are connected.

Common Latching Alarm Switches

You can configure an alarm to remain on until the user acknowledges it by latching the alarm. When you latch an alarm you are also latching any accompanying alarm relay. To configure an alarm to be latching, set the applicable switch on the power board to the **ON** position.

To activate the audible alarm during any alarm condition, set the **BEEPER** switch to the **ON** position (see the following figure).

If the alarm is set to latch, it can only be cleared by selecting **RESET** with the **TEST/RESET** switch.

Note

Individual alarm switches (i.e., low, high, and fault alarms) are common amongst all channels.

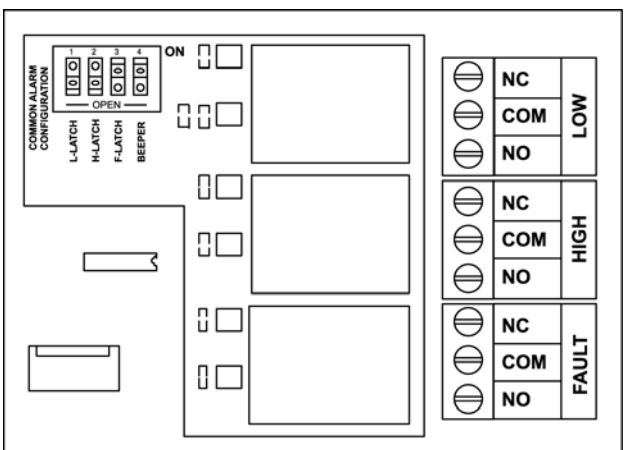


Figure 10. Latching Alarm Switches and Alarm Relays

Storage and Transporting

The controller, when used for continuous monitoring on temporary job sites or as a roving monitor, is easily installed and stored. Battery powered instruments can be used intermittently or stored for long periods of time without recharging as BW batteries have a very low rate of self-discharge.

It is important to be aware of several factors in the storage and transportation of a battery powered equipment.

Prior to Storage or Transporting

Follow these steps before transporting an instrument or placing an instrument in storage:

1. Ensure all instruments are fully charged.
2. Turn off the instrument.
3. Unplug all equipment from the controller and replace port cover caps. Keep a record of all connections.
4. Loosely coil and secure all cables to prevent damage.

Note

Controllers and rechargeable options should be recharged at least once every six months when in storage.

⚠ Caution

Completely discharged batteries should not be left longer than four weeks before recharging. If the battery is fully discharged for a long period of time, cycle charge the unit several times to restore function. Dependent on the conditions, cycle charging may restore up to 75% of a full charge. Ensure all equipment is fully charged before returning to service.

Storage

Store the controller in a warm place as freezing the electrolyte will damage the battery. As the battery discharges, its freezing point rises. The rate of discharge varies with the storage temperature. Higher temperatures result in a faster discharge rate and hence shorter storage times. While in storage the battery's capacity should not be allowed to fall below 50% of the fully charged state.

Note

It will take approximately one year for a battery to discharge to 50% of its fully charged capacity.

Maintenance

The controller is designed to provide years of service with only regular care and minimal maintenance. As regular intervals inspect the instrument and check that it is operating normally.

To clean the controller's exterior, wash it with a mild soap and clean water.

Troubleshooting

If you encounter a problem, follow the solutions listed in the table below. If you still are unable to correct the problem, contact BW Technologies (page 2).

Table 8. Troubleshooting Tips

Problem	Possible Cause	Solution
rF Out	→ Detector is off.	→ Turn on detector.
	→ Detector XMTR is disabled.	→ Enable detector XMTR.
	→ Antenna is not aligned.	→ Move the antenna.
	→ RF signal from detector is too weak.	→ Move or replace the antenna. → Replace the antenna cable with low loss cable (LMR 400). See **Replacement Parts and Accessories**.
	→ Transceiver channel is incorrect.	→ Match the detector's transceiver channel to the controller's transceiver channel.
Signal is intermittent	→ Outside Interference.	→ Ensure all other radio equipment is grounded (i.e., the detectors).

Problem	Possible Cause	Solution
Radio frequency interference (RFI)	→ Poor bonding and grounding.	→ Check grounding and bonding and remove the interference.
Controller will not power up	→ Main power is not connected and backup batteries are low.	→ Connect the main (AC) power and replace/recharge batteries.
Controller displays **Set Up**	→ The controller's Detector Channel rotary switch is not set to 0.	→ Set the Detector Channel rotary switch to 0 (receiving).
Controller displays flashing 	→ Transceiver is not connected properly. → Transceiver fuse is blown.	→ Verify that the transceiver is connected properly. → Replace the transceiver by contacting BW.

Replacement Parts and Accessories

⚠ Warning

To avoid personal injury or damage to the controller, use only the specified replacement parts.

To order parts or accessories listed in the table below, contact **BW Technologies**.

Table 9. Replacement Parts and Accessories

Model No.	Description	Qty
M1524	Security key	1
RR-LAT-1	Security latch, stainless steel	1
E0216K	Replacement port cover cap (5 and 6-pin) with chain, screws, and washer	1
M1487	Power key	2
E2037K	12 V rechargeable battery, sealed lead acid, 3.4 amp hr	1
RR-AN8	Antenna 8 DBI	1
RR-AC10 RR-AC20	LMR 240 cable (for antenna)	/ft. /0.3m
RR-AC50 RR-AC100	LMR 400 cable (for antenna)	/ft. /0.3m
SE-A200	Four channel stainless steel alarm bar	1
CR-H600	Siren alarm (112 dB) w/cable	1
CR-L160	Strobe light (6000 candlepower) w/cable	1
CR-BE10	Horn (85 dB) beeper style w/cable	1
RR-EXT-UC10 RR-EXT-UC25 RR-EXT-UC40 RR-EXT-UC75 RR-EXT-UC100	Cable extension kit (for accessories)	/ft. /0.3m

Specifications

Instrument Dimensions: 14.95 x 11.16 x 5.15 in. (37.97 x 28.35 x 13.08 cm)

Weight: 21.00 lbs (9.53kg)

Enclosure: 14 gauge stainless steel

Operating Temperature: -40 to +50°C (-40 to +122ºF)

Storage Temperature: -40 to +75°C (-40 to +167ºF)

Operating Humidity: 5% to 95% relative humidity (non-condensing)

Battery: Two 12 volt, 3.4 amp hr. rechargeable batteries

Back up Battery Operating Time: 2-3 hours

RF Frequency: 2.4GHz Frequency Hopping Spread Spectrum (FHSS)

RF Transmission Distance: 1.8 miles (3 km)

Alarm Conditions: Low alarm, high alarm, and fault alarm (Fault alarm = loss of transmission alarm, low battery alarm, and sensor integrity alarm)

Audible Alarm: 85 dB at 3 ft (1 m) oscillating

Visual Alarm: Red and yellow light-emitting diodes (LED)

Alarm Relay: Contacts are rated 250 V (max), 10 A (max)

Security: Key lock access to control panel

Power: Key lock access to power

Display: Alphanumeric liquid crystal display (LCD)

User Field Options: System test, system reset, channel enable

Connections: Plug-in, mil-style, amphenol connectors c/w weatherproof covers

Relay option port: One 5-pin female port
Alarm bar accessory port: One 6-pin female port
Antenna: One port c/w TNC connector

Altitude: Up to 3000 m

Pollution Degree: 2

Installation Category: II

Approved: General purpose

Standards: CAN/CSA C22.2 No. 1010

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