BW Defender

H_2S, CO, O_2 , LEL

2, 3 and 4 Gas Detectors

User Manual

Limited Warranty & Limitation of Liability

BW Technologies 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. Parts, product repairs and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a BW Technologies authorized reseller, and does not apply to fuses, disposable batteries or to any product which, in BW Technologies' opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation or handling. BW Technologies warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. BW Technologies does not warrant that software will be error free or operate without interruption.

BW Technologies authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of BW Technologies. Warranty support is available if product is purchased through a BW Technologies authorized sales outlet or Buyer has paid the applicable international price. BW Technologies reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

BW Technologies' warranty obligation is limited, at BW Technologies' option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a BW Technologies authorized service center within the warranty period.

To obtain warranty service, contact your nearest BW Technologies authorized service center or send the product, with a description of the difficulty, postage and insurance prepaid (FOB Destination), to the nearest BW Technologies authorized service center. BW Technologies assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If BW Technologies determines that the failure was caused by misuse, alteration, accident or abnormal condition of operation or handling, BW Technologies will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

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Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

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12/01

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

BW Defender2 Gas Detector

Order Number	Description
DEFEND-4	BW Defender2 (4 Gas) Detector (H_2S, CO, O_2, %LEL)
DEFEND-4-DL1	BW Defender2 (4 Gas) c/w Black Box Datalogger
DEFEND-4-DL2	BW Defender2 (4 Gas) c/w User Downloadable Datalogger
DEFEND-3H	BW Defender2 (3 Gas) Detector (H_2S, O_2, %LEL)
DEFEND-3H-DL1	BW Defender2 (3 Gas) c/w Black Box Datalogger
DEFEND-3H-DL2	BW Defender2 (3 Gas) c/w User Downloadable Datalogger
DEFEND-2	BW Defender2 (2 Gas) Detector (O_2, %LEL)
DEFEND-2-DL1	BW Defender2 (2 Gas) c/w Black Box Datalogger
DEFEND-2-DL2	BW Defender2 (2 Gas) c/w User Downloadable Datalogger
Add Suffix -UK	For delivery with a U.K. Charger
Add Suffix -EU	For delivery with a European Charger

BW Defender2 Multi-Gas Detector
4-gas, 3-gas and 2 gas instruments

BW Defender2 with Black Box Datalogger

Provides full time continuous datalogging while the detector is operating. Wrap around memory ensures the most recent data is always saved. Data cannot be accessed by the user. Data is retrievable by an authorized BW factory service center in the event of an incident or occurrence.

BW Defender2 with User Downloadable Datalogger

Provides full time continuous datalogging while the instrument is operating. Data is saved on a convenient MultiMediaCard and can be removed and downloaded by the user. Data is imported into standard office software (Microsoft® Excel, Access etc.)

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BW Defender2

Introduction

⚠Warning

To ensure your personal safety, read "Safety Information" before you use the detector.

The BW Defender2 gas detector ("the detector") warns of hazardous gas at levels above factory set alarm setpoints. This product is a gas detector.

The detector is a personal safety device. It is your responsibility to respond properly to the alarm.

Table 1 lists the gases monitored.

Table 1. Gases Monitored

Gas	Unit of Measure
carbon monoxide (CO)	parts per million (ppm)
hydrogen sulfide (H_2S)	parts per million (ppm)
oxygen (O_2)	percent by volume (%)
combustible gases (LEL)	percent of lower explosive limit (% LEL of Methane)

Contacting BW Technologies

To contact BW Technologies, call:

USA and Canada: 1-800-663-4164
BW America: 1-888-749-8878
Europe and U.K.: +44 (0) 1869-233004
Anywhere in the world: +1-403-248-9226

Address correspondence to:

BW Technologies
2840 – 2 Ave. S.E.
Calgary AB
Canada T2A 7X9

Email: info@bwtnet.com
Or visit us on the World Wide Web: **www.gasmonitors.com**

ISO 9001

Safety Information - Read First

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

A **Warning** identifies conditions and actions that pose hazard(s) to the user; a **Caution** identifies conditions and actions that may damage the detector.

International symbols used on the detector and in this manual are explained in Table 2.

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

Note

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

⚠Warning

To avoid possible personal injury:

- ⇒ **Substitution of components may impair Intrinsic Safety.**
- ⇒ **Do not use the detector if it is damaged. Before you use the detector, inspect the case. Look for cracks or missing plastic.**
- ⇒ **If the detector is damaged or something is missing, contact BW Technologies immediately (see p. 2).**
- ⇒ **Make sure the battery is locked in place before you operate the detector.**
- ⇒ **Use only a sensor specifically designed for your detector. (See the section, "Replacement Parts and Accessories.")**
- ⇒ **Periodically test the sensor's response to gas by exposing the detector to a targeted gas concentration that exceeds the High Alarm setpoint. Manually verify that the audible and visual alarms are activated.**
- ⇒ **Prior to each day's usage sensitivity must be tested on a known concentration of the target combustible gas (methane, etc.) equivalent to 25-50% of full-scale concentration (accuracy must be within 0 to +20% of actual). Accuracy may be corrected by recalibrating the instrument.**
- ⇒ **Calibrate the detector before first-time use, and then at least once every 90 days.**
- ⇒ **Do not turn off the detector during a work shift. Turning off the detector resets the LTEL (Long Term Exposure Limit), STEL (Short Term Exposure Limit) and maximum gas exposure values to 0. (See the section, "Alarms.")**
- ⇒ **It is recommended that the accuracy of the detector be checked with known concentration calibration gas before each day's use and immediately after any known exposure to contaminants.**

⚠Warnings (cont.)

- ⇒ **The LEL sensor is factory calibrated to methane. If monitoring a different combustible gas, calibrate the sensor using the appropriate gas.**
- ⇒ **High off-scale % LEL readings may indicate an explosive concentration.**
- ⇒ **Protect the LEL sensor from exposure to lead compounds, silicones, and chlorinated hydrocarbons. Although certain organic vapors (such as, leaded gasoline and halogenated hydrocarbons) may temporarily inhibit sensor performance, in most cases, the sensor will recover after calibration.**
- ⇒ **Any rapid up-scaling reading followed by a declining or erratic reading may indicate a gas concentration beyond upper scale limit, which may be hazardous.**
- ⇒ **Use only Black & Decker VersaPak™ batteries, properly charged and installed in the detector case. (See the section, "Replacement Parts and Accessories.")**
- ⇒ **Only charge batteries using a VersaPak™ charger (such as the D4-VP130 and V-CHARG1). Do not use any other charger. Failure to observe this precaution could lead to fire or explosion.**
- ⇒ **Do not change or charge batteries in a hazardous location. Doing so will impair the Intrinsic Safety of the unit, and may lead to fire or explosion.**
- ⇒ **Read and observe all instructions and precautions in the literature provided with the charger. Failure to do so may result in fire, electric shock, or other forms of personal injury or property damage.**

Caution

To avoid possible damage to the detector:

⇒ **Extended exposure of the detector to certain concentrations of combustible gases and air may stress a detector element, which can seriously affect its performance. If an alarm occurs due to high concentration of combustible gases, recalibration should be performed, or if needed the sensor replaced.**

⇒ **Do not test the combustible sensors response with a butane cigarette lighter; doing so will damage the sensor.**

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

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

⇒ **Do not immerse the detector in liquids.**

⇒ **The detector Warranty will be voided if customer personnel or third parties damage the detector during repair attempts. Non-BW Technologies repair/service attempts void this Warranty.**

Table 2. International Symbols

Symbol	Meaning
	Cenelec (LCIE) EEx ia d IIC
CE	Conforms to European Union directives.

Getting Started

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

- Black & Decker VersaPak™ Batteries (2 cells)
- VersaPak™ battery charger
- O_2 sensor
- LEL sensor
- H_2S/CO sensor (dual sensor) 4-gas detector only
- Dummy Sensor (2-gas units only)
- H_2S sensor (3-gas units only)
- Calibration hose

To order replacement parts, see the section "Replacement Parts and Accessories."

The detector comes with sensors installed. The "Maintenance" section describes how to install the batteries.

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

- Figure 1 and Table 3 describe the detector's components.
- Figure 2 and Table 4 describe the detector's display elements.
- Table 5 describes the detector's pushbuttons.

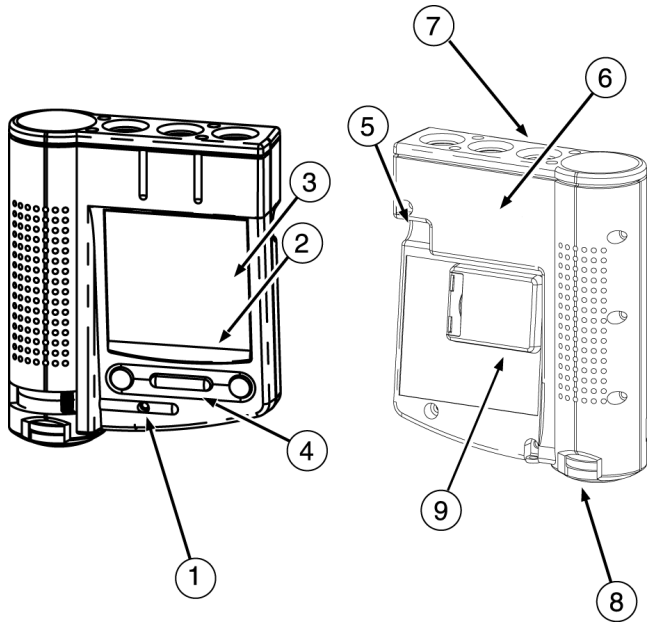


Figure 1. BW Defender2 Detector

Table 3. BW Defender2 Detector

Item	Function
①	Audible Alarm
②	Visual Alarm
③	Display
④	Pushbuttons
⑤	Accessory Output Jack
⑦	Sensors
⑧	Battery
⑨	Datalogger (optional)

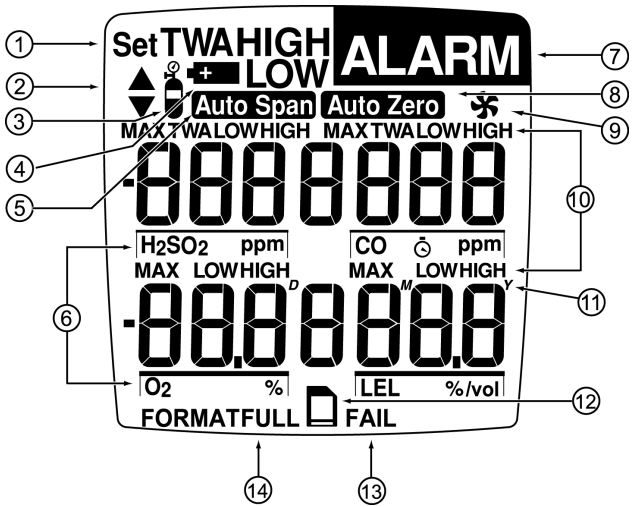


Figure 2. Display Elements

Note

Pushbutton reactivates the backlight for 10 seconds when light is insufficient.

Table 4. Display Elements

Item	Function
①	Set Value
②	Increment or Decrement Value
③	Gas Cylinder
④	Battery
⑤	Automatically Span the Sensor
⑥	Gas Identifier Bars
⑦	Alarm Setpoint or Alarm
⑧	Automatically Zero the Sensor
⑨	Not Used
⑩	Multi-Gas Alarm Condition or View TWA and Maximum Gas Exposure
⑪	Real Time Calendar (Date, Month, Year)
⑫	Optional Datalogger Card Indicator
⑬	Optional Datalogger FAIL Indicator
⑭	Other Symbols – future use

Table 5. Pushbuttons

Pushbutton	Description
ⓘ	• To turn on the detector, press ⓘ. • To initiate the Confidence Beep, press while pressing ⓘ at startup. • To turn off the detector, press ⓘ and hold for 5 seconds.
▼	• To decrement the displayed value, press ▼. • To view the TWA and maximum gas exposures, press ▼ and simultaneously.
▲	• To increment the displayed value, press ▲. • To enter the user options menu, press ▲ and ▼ simultaneously.
	• To manually reset maximum (peak) hold, press and hold for 5 seconds. • To initiate calibration and setting alarm setpoints, press and ⓘ simultaneously. • To acknowledge latched alarms press .

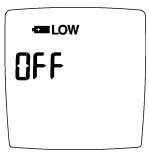
Activating the Detector

⇒ To activate the detector, press ⓘ in a normal atmosphere (20.9% oxygen).

Self-Test

The detector performs the actions in steps 1-10. Manually check that all actions occur.

1. *If the battery is low,* **LOW flashes***, the display reads* **OFF***. Replace the battery and restart the detector.*

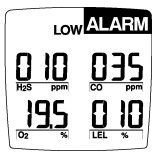


2. The display shows all elements.
3. The detector beeps and flashes.
4. The detector briefly turns on the backlight.

User Downloadable model only (5 and 6)

5. The detector tests data card. Display advises if card is present and ready for use (page 11).
6. The display shows the time, day and date.
7. *The display shows the LTEL (TWA), Low and High Alarm setpoints.*

Note: The alarm setpoints on a shipped detector may vary by region. See Resetting Gas Alarm Setpoints.



8. Calibration status is shown
9. The display reads **tESt** (test) as the detector tests the sensors.
10. The oxygen sensor is calibrated automatically.

If the detector fails steps 1-10, see the section, "If the Detector Does Not Work."

MultiMediaCard icon is displayed continuously on Black Box Dataloggers and when card is present in User Downloadable Dataloggers.

Datalogger Operation

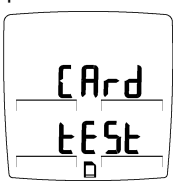
Datalogger operation is automatic and requires no settings.

Black Box Datalogger

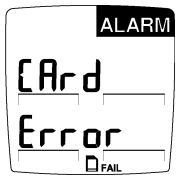
The “Fail”, “Alarm” and card icons will blink if the card malfunctions or is removed.

User Downloadable Datalogger Test

The detector tests the data card. The display advises if the card is present and ready for use.



If the card is missing or malfunctioning, the detector beeps and flashes quickly. The display advises **– Error –** and the detector continues the self-test and proceeds to normal operation.
The detector does not require the data card to be present or functioning to operate.

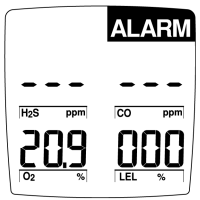


Removing the card will cause a “Card Out” message and a brief alarm. Inserting the card will cause a “Card In” message and a beep.

Add or change the data card on User Downloadable units at any time. The detector supports card insertion and removal while instrument is active.

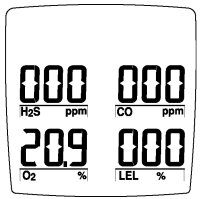
Sensor Test

If a sensor fails the self-test, the audible alarm emits a slow modulating tone and the visual alarm flashes slowly. Sensor fail display advises failed sensor:



Self-Test Pass

If the detector passes the self-test, the detector begins normal operation. The display shows the ambient gas readings:



The detector starts recording the maximum gas exposure and calculating the TWA (time-weighted average).

Self-Test Fail

If the detector fails the self-test, see the section, “If the Detector Does Not Work.”

Battery Test

The battery is tested on activation and continuously after activation. If the battery is low, **LOW** flashes.

Note

If the Confidence Beep is on, the audible alarm beeps if the battery has sufficient power and stops if the battery power is low. (See the section, "Confidence Beep.")

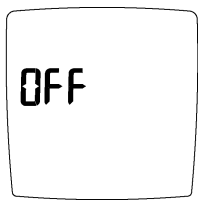
Backlight

The backlight illuminates in all alarm conditions and when the ambient light is insufficient (for short periods). Reactivate the backlight by pressing any button.

Deactivating the Detector

⇒ To turn off the detector, press ⓘ and hold for 5 seconds.

The audible alarm beeps four times, the visual alarm flashes four times and then the display shows:



The display turns off and the detector stops normal operation.

Note

If ⓘ is held down for less than 5 seconds, the detector will not shut down.

Confidence Beep

The Confidence Beep tells you the Detector is ON and the battery has sufficient power respond to a hazardous level of gas and emit an alarm. Instead of beeping when the battery's power is low, the audible alarm beeps to advise you the battery has sufficient power. The Confidence Beep stops when the battery power is low.

You can only activate the Confidence Beep at startup.

To turn on the Confidence Beep:

1. If the detector is on, deactivate the detector.
2. Press ⓘ and simultaneously.

After the self-test completes, the detector continuously beeps once every 5 seconds.

⇒ To turn off the Confidence Beep, turn off, and then restart the detector.

User Option Menu

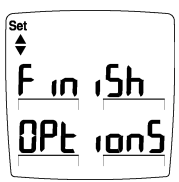
User options are:

1. Finish options and exit User Options Menu.
2. Set latching alarm function
3. *User Downloadable Datalogger model only:* Adjust real-time clock and calendar.
4. Enable or disable operation of one or more sensors**.**
5. Enable or disable Pass Code Protection.

To access the User Options press ▲ and ▼ simultaneously until the display reads:

To choose the desired options press ▼ or ▲. Press to select the option.

To exit the options menu and return to normal operation at any time, press when the display shows **Finish Options**.

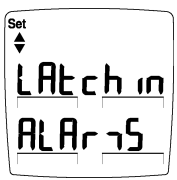


For options 4 and 5, see "User Options" (P. 40).

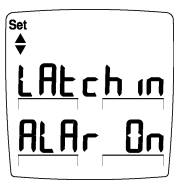
Latched Alarms User Option

The detector is shipped with the latching alarm function disabled. If the gas alarms are set to latch, the audible and visual alarms persist in the event of an alarm condition until the alarm is acknowledged by pressing .

To enable (or disable) the latching alarm function press when the display advises Latching Alarms.



The display will advise latching alarm function is ON.



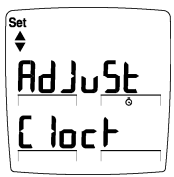
Repeat above sequence to disable latched alarms. The display will advise the latching function is OFF.

Change the Date and Time

Time and date adjustments apply only to the User Downloadable Datalogger detectors.

1. Set the time and date to your local time.

To set the real-time clock calendar, press when the display advises to Adjust Clock.



Display reads in order:
- Day of the week, *Monday =1*
- Hours (h),
- Minutes,
- Date(D),
- Month(M),
- Year(Y).

Use ▼ and ▲ to adjust time and date. Press after each new setting.

Alarms

Table 6 describes the detector alarms and shows how the display looks for each alarm.

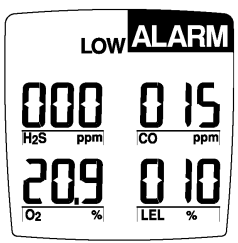
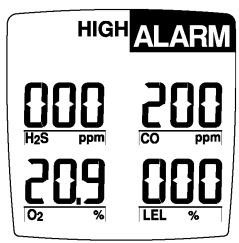
Table 7 describes the computed gas exposure for the Time Weight Average for TWA (LTEL).

LTEL (Long Term Exposure Limit) **= TWA**

During an alarm condition, the detector activates the backlight and the display shows the current ambient gas reading. Gas alarms are latching.

The High Alarm overrides a TWA alarm and a TWA Alarm overrides a Low Alarm.

Table 6. Alarms

Alarms	Display	Alarms	Display
Instant Low Alarm: • Slow modulating tone and flash. • **ALARM** and target gas bar flash.		**Instant High Alarm:** • Fast modulating tone and flash. • **ALARM** and target gas bar flash.	

Latching Alarm User Option: *If the Latched Alarm function is turned ON, the audible and visual alarms continue to sound and flash until the Low or High Alarm condition is acknowledged. Press to deactivate the audible and visual alarms when the current ambient gas reading falls below the low alarm level. The alarms cannot be deactivated if an alarm condition is still present. A TWA alarm condition will not reset.*

Table 6. Alarms (cont.)

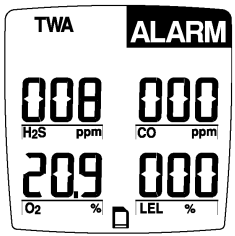
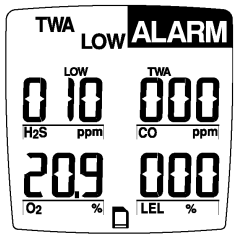
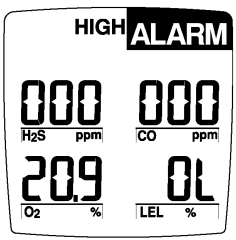
Alarms	Display	Alarms	Display
TWA (LTEL) Alarm: • Fast modulating tone and flash. • **ALARM** and target gas bar flash.		**Multi-Gas Alarm:** • Alternating Low and High Alarm tone and flash. • **ALARM** and target gas bars flash. *Note: icon displayed advises the data card is present.*	
Over Range Alarm: **(Over Level Exposure)** • Fast modulating tone and flash. • **ALARM** and target gas bar flash.			

Table 6. Alarms (cont.)

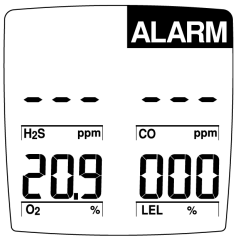
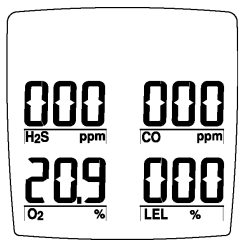
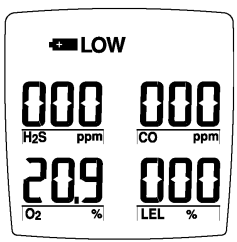
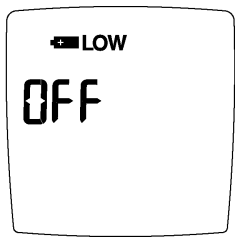
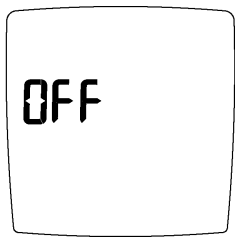
Alarms	Display	Alarms	Display
Sensor Alarm: • Slow modulating tone and flash. • **ALARM** and gas bar(s) flash.		**Confidence Beep**: • 1 beep every 5 seconds.	
Low Battery Alarm: (Confidence Beep disabled) • 1 beep and 1 flash every 5 seconds. • **LOW** flashes.			

Table 6. Alarms (cont.)

Alarms	Display	Alarms	Display
Automatic Shutdown Alarm: • 8 beeps and flashes. • **LOW** displays periodically.		**Normal Shutdown**: • 4 beeps and flashes.	

Gas Exposures Computed

⚠ Warning

To avoid possible personal injury, do not turn off the detector during a work shift. The detector automatically resets the TWA (LTEL), and maximum gas exposures at start-up. If you restart the detector during a work shift, these values will not reflect the entire work shift.

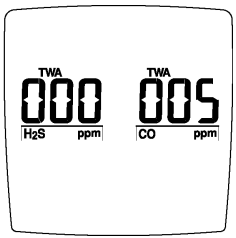
Table 7. Computed Gas Exposures

Gas Exposure	Description
TWA (LTEL) (CO and H_2S only)	Long Term Exposure Limit is a Time-Weighted Average alarm based on an 8-hour workday. Accumulated value.
Maximum* (Peak)	For each gas level further from the acceptable range, the detector resets the maximum gas exposure to the new level.
* Maximum gas exposure describes both very high and very low levels of oxygen.	

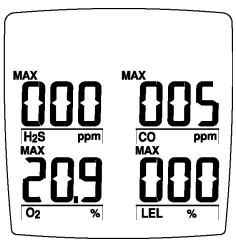
Viewing Gas Exposures

⇒ Press ▼ and simultaneously.

The display first shows the TWA gas exposure:



The display then shows the maximum gas exposure:



Press and hold for 5 seconds to reset the maximum exposures.

Gas Alarm Setpoints

The detector's gas alarm setpoints trigger the gas alarms, which are described in Table 8.

Table 8. Gas Alarm Setpoints

Alarm	Condition
Low Alarm	*CO, H_2S, and LEL:* Ambient gas level above Low Alarm setpoint. (for O_2 see below)
TWA Alarm (CO and H_2S only)	TWA above Low Alarm setpoint.
High Alarm	*CO, H_2S, and LEL:* Ambient gas level above High Alarm setpoint. (for O_2 see below)
Multi-Gas Alarm	Two or more gas alarm conditions.

Oxygen Alarm Setpoints: *User selectable for Low and High Alarms in the 0-30.0% range. Set both below, or both above, or one above and one below 20.9%, as desired*

Resetting Gas Alarm Setpoints

Note: Standard factory alarm setpoints may vary by region.

Table 9. Factory Set Alarm Setpoints

Gas	Low	High
CO	35 ppm (parts per million)	200 ppm
H_2S	10 ppm	15 ppm
O_2	19.5%	23.5%
Combustible Gases	10% LEL	20% LEL

To change the factory-set alarm setpoints, refer to the section “Calibration and Setting Alarm Setpoints.”

You can disable an alarm by setting the alarm setpoint to 0. Setting the Low Alarm setpoint to 0 turns off the Low and TWA Alarms.

The detector allows you to set the O_2 alarm setpoints for Low Alarm above or below 20.9% and to set High Alarm above or below 20.9% as desired.

Stopping a Gas Alarm

The Low and High Alarms stop when the ambient gas level returns to the acceptable range.

Note

If alarms are set to latch, press to reset the audible and visual alarms.

The detector computes the TWA value based on an 8-hour workday. Only deactivating the detector can stop the TWA Alarm.

Sensor Alarm

The detector tests for a missing or defective sensor during the activation self-test. See the section, "If the Detector Does Not Work."

Low Battery Alarm

The detector tests the battery on activation and continuously thereafter. If the battery voltage is low, the detector activates the Low Battery Alarm.

The Low Battery Alarm continues until you replace the battery or the battery power is almost depleted. If the battery voltage drops too low, the detector executes an Automatic Shutdown.

Automatic Shutdown Alarm

If the battery voltage is in immediate danger of dropping below the minimum operating voltage, the audible alarm beeps 8 times and the visual alarm flashes 8 times. After 3 seconds, the display blanks out and the detector stops normal operation. The display shows **LOW** periodically until the battery power is depleted.

Replace the battery. (See the section, "Replacing the Battery.")

Note

If the Confidence Beep is on, the audible alarm does not beep during a Low Battery alarm. (See the section, "Confidence Beep.")

Typically, the Low Battery Alarm continues for 30 minutes before Automatic Shutdown.

Calibration and Setting Alarm Setpoints

Guidelines

Caution

The detector must be calibrated using the following gas concentrations: H_2S = 25 ppm, CO = 100 ppm, Methane = 2.5 % (50 % LEL), and balance air.

If you do not calibrate all of the sensors, use the gas concentration listed above for the target sensor being calibrated.

When calibrating the detector, adhere to the following guidelines.

- CG-Q58 Calibration Gas (four-gas mix) is available from BW Technologies. (See the section "Replacement Parts and Accessories.")
- Calibration accuracy is never better than the calibration gas accuracy. BW Technologies recommends a premium-grade calibration gas. Gases with NIST (National Institute of Standards and Technology) traceable accuracy will improve the validity of the calibration. Do not use a gas cylinder beyond its expiration date.
- Calibrate a new sensor before use. Allow the sensor to stabilize before starting calibration (used: 60 seconds; new: 5 minutes).
- Calibrate the detector once every one to three months, depending on use and sensor exposure to poisons and contaminants.
- Calibrate the detector if the ambient gas display varies at start-up.
- It is best to calibrate the sensor before changing alarm setpoints.
- Calibrate only in a clean atmosphere, which is free of background gas.
- To disable an alarm, set its alarm setpoint to 0.
- The LEL sensor is factory calibrated to methane. If monitoring a different combustible gas, calibrate the sensor using the appropriate gas.
- The O_2 sensor is automatically calibrated on activation. Activate detector in a normal 20.9% O_2 atmosphere.
- If you require a certified calibration, contact BW Technologies using one of the numbers on page 2.

Diagnostics Protection:

The detector test the ambient air (auto zero) and the test gas applied (auto span) to ensure it meets expected values.

In auto zero if any background target gas is present, the sensor(s) affected will read **no** and exit the auto zero function retaining the previous set value(s).

In auto span if any target gas is not present or does not meet expected values the sensor(s) will advise you and exit calibration mode retaining the previous set value(s).

Applying Gas to the Sensors

The calibration hose, which is shipped with the detector, simplifies sensor testing and calibration. Table 10 and Figure 3 show how to use it when applying gas to the sensors.

Table 10. Applying Gas to the Sensors

Item	Description
①	Detector Back
②	Calibration Hose
③	Regulator and Gas Cylinder

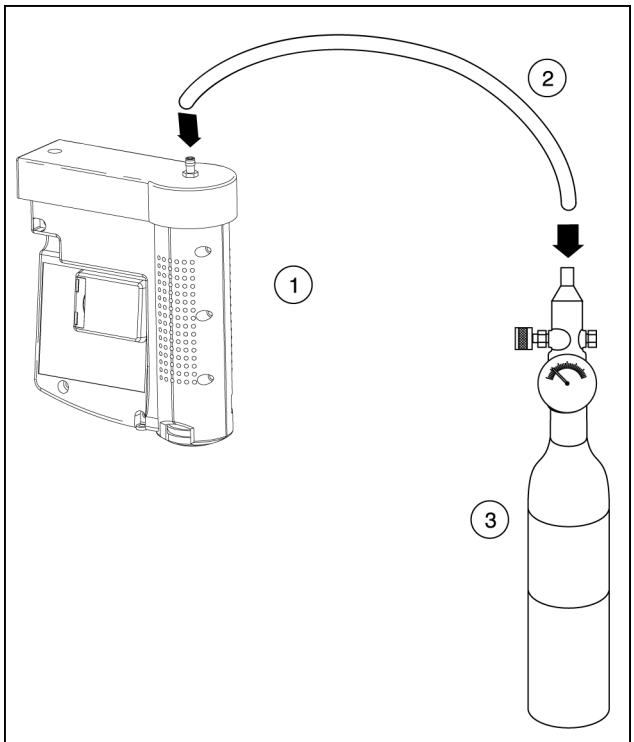


Figure 3. Applying Gas to the Sensors

Calibration Procedure

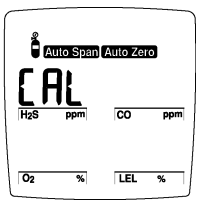
To calibrate the detector and set its alarm setpoints, perform the following procedure.

Start Calibration

To quit at any point after auto zero, press . The detector retains any saved values, and the audible alarm beeps four times before the detector returns to normal operation.

1. Press ⓘ and simultaneously.

The display shows:

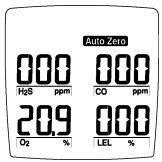
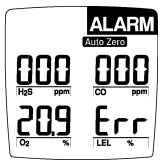


The audible alarm beeps once.

Auto Zero and Oxygen Sensor Calibration

The display flashes “auto zero” while the detector automatically zeroes the H_2S, CO and LEL sensors and calibrates the oxygen sensor.

The audible alarm then beeps twice.

Auto Zero	Sensor Fail
	

Note

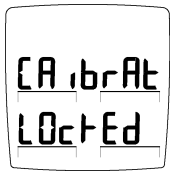
Do not apply the calibration gas until the display shows a flashing gas cylinder; otherwise, the auto zero step will fail.

If a sensor fails, the display advises error (**Err**) *and skips the span for the failed sensor(s). Other sensors span normally. Press to exit. Then restart calibration in an atmosphere that is clear of the targeted gases. If the auto zero fails a second time, restart the detector to test the sensors.*

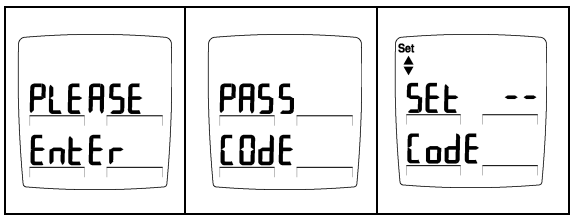
Pass Code Protect: *The detector will ask for the pass code before proceeding to Auto Span and Alarm Setpoints.*

Pass Code Protect Activated

Before setting span the display will advise Calibration is locked.



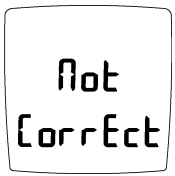
Then display requests the Pass Code.



The Set up/down arrow icon lights to prompt entry of the three-digit pass code. Enter the correct pass code using ▲ and ▼ keys. Press key to accept the displayed pass code.

If the correct code is entered the detector automatically proceeds to auto span.

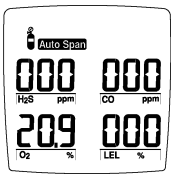
If the pass code is not entered within 8 seconds or the wrong pass code is entered, the detector advises the code is **not correct.**



The detector beeps four times and automatically returns to normal operation.

Auto Span

The display shows a flashing gas cylinder and beeps twice, prompting you to apply a calibration gas to the sensor or skip the span (sensitivity adjustment):



Use a calibration gas containing the gas concentrations listed in the Guidelines.

Apply gas to the sensor at a flow rate of 250 to 500 ml/min.

2. Or, press now to skip the span.

When the detector senses approximately one-half of the expected gas concentration (30 seconds), the audible alarm beeps once. The detector then begins spanning the sensor (2 minutes).

The audible alarm beeps three times at the end of the span.

Note

The detector will not span a sensor if:

- *You do not apply gas to the sensor.*
- *The sensor fails to detect at least one-half of the expected gas concentration in the first 30 seconds.*
- *The gas concentration drops below one-half of the expected gas level during the 2-minute span.*

If you apply gas to a sensor and the detector fails to span the sensor, repeat the calibration process using a new gas cylinder. If the sensor fails the span a second time, replace the sensor. (See the section, "Replacing a Sensor")

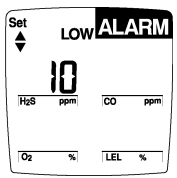
Alarm Setpoints

Alarms may be set anywhere within the detection range for the sensor (See specifications), or set to zero for OFF.

Setting the Low Alarm Setpoint

Next set the Low and High Alarm setpoints for each sensor in turn, starting with H_2S.

The display shows the Low Alarm setpoint for H_2S:



The Set up/down arrow icon lights, prompting you to input a new Low Alarm setpoint. To accept the displayed value, press .

3. To change the Low Alarm setpoint for this sensor, press ▲ or ▼ until the display shows the new value. Press to save the displayed value.

Note

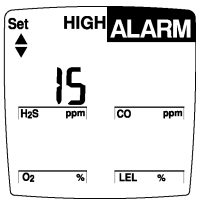
If you do not press any pushbuttons within 10 seconds, the detector automatically retains the Low Alarm setpoint.

If you change the displayed value but pause for 10 seconds before pressing , the detector rejects the new value. The display shows error **(Err)** *and the audible alarm beeps six times. The saved Low Alarm setpoint is displayed.*

The detector allows you to set both (Low and/or High) O_2 alarm setpoints below or above 20.9%, or one below and one above 20.9%.

Setting the High Alarm Setpoint

The display shows the High Alarm setpoint for H_2S:



The Set up/down arrows lights, prompting you to input a new High Alarm setpoint.

4. To change the High Alarm setpoint for this sensor, press ▲ or ▼ until the display shows the new value.

5. Press to save the displayed value.

Note

If you do not press any pushbuttons within 10 seconds, the detector automatically retains the High Alarm setpoint.

If you change a High Alarm setpoint but pause for 10 seconds before pressing , the detector rejects the new value. The display shows ***no*** *and the audible alarm beeps six times. The display then shows the unchanged High Alarm setpoint.*

Setting the Remaining Alarm Setpoints

The display shows the Low Alarm setpoint for the next sensor. The Set up/down arrows lights, prompting you to input a new Low Alarm setpoint.

6. Repeat steps 3 through 6 to set alarm setpoints for CO, LEL and O_2.

After all alarm setpoints are set, the audible alarm beeps four times and the detector returns to normal operation.

Verification (optional)

Test the detector using a gas cylinder other than the one used in the calibration steps. The gas concentration should not exceed the sensor's detection range. Confirm that the display shows the expected concentration.

Instrument Maintenance

User Options

Maintenance

To keep the detector in good operating condition, perform the following basic maintenance as required:

- Calibrate, test, and inspect the detector at regular intervals.
- Keep an Operations Log of all maintenance, calibrations, and alarm events.
- Clean the exterior with a soft damp cloth. Do not use solvents, soaps, or polishes.
- Do not immerse the detector in liquids.

Replacing the Battery

⚠ Warning

To avoid personal injury:

⇒ **Replace the battery as soon as the detector emits a Low Battery Alarm.**

⇒ **Use only Black & Decker VersaPak™ batteries, properly installed in the detector case.**

⇒ **Only charge batteries using a VersaPak™ charger (such as the D4-VP130 or V-CHARG1). Do not use any other charger. Failure to observe this precaution could lead to fire or explosion.**

⇒ **Do not change or charge batteries in a hazardous location. Doing so will impair the intrinsic safety of the unit, and may lead to fire or explosion.**

⇒ **Before you use the detector for the first time, fully charge the batteries, following the instructions provided with the charger.**

Table 11 and Figure 4 illustrate how to replace the battery. If the detector is on, shut down the detector before replacing the battery. Push the release button. The battery pulls out and snaps in.

Table 11. Replacing the Battery

Item	Description
①	Detector Front
②	Release Button
③	Battery

To preserve battery life, turn the detector off when you are not using it.

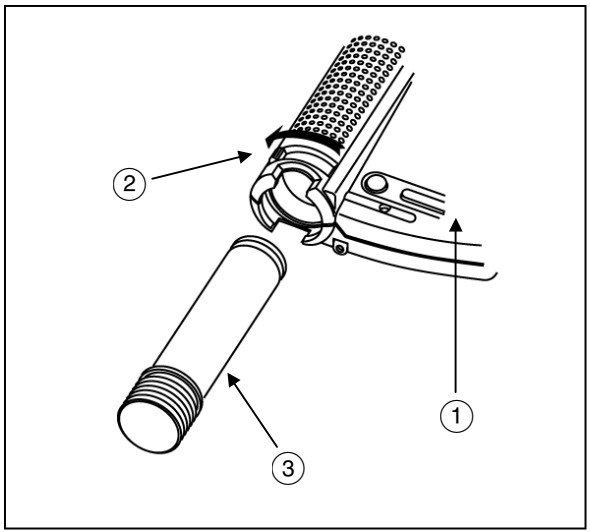


Figure 4 . Replacing the Battery

Replacing a Sensor or Sensor Filter

⚠ Warning

To avoid personal injury, use only sensors specifically designed for the detector. See the section, "Replacement Parts and Accessories."

Each sensor has a high degree of resistance to common vapors and gases. A sensor will most likely clear itself if you remove the detector to a clean environment and wait 10 to 30 minutes.

Do not expose a sensor to the vapors of inorganic solvents (such as, paint fumes) or organic solvents.

The section “If the Detector Does Not Work” describes problems caused by a sensor in need of calibration or replacement.

Sensor Filter

The sensors are equipped with a replaceable filter. Check if the Sensor Screens are dirty. Clean the filters using clean warm water. Dry before replacing. If they are still clogged replace the filters

You can also, use a soft brush and warm clean water to clean the built-in sensor screens on the oxygen and Twin Tox sensors.

Table 12 and Figure 5 illustrate how to replace a sensor or sensor filter. If the detector is on, shut down the detector. Use a Phillips head screwdriver to loosen and tighten any screws.

Do not use excessive force when removing or inserting the sensor, or the sensor may be damaged. Gently rocking the sensor back and forth may help free a tightly held sensor. Insert new sensor in the compartment.

Note: 2-gas Detector is equipped with a dummy twin-tox sensor.

Table 12. Replacing a Sensor or Sensor Filter

Item	Description
①	Cover Screws
②	Sensor Cover
③	Sensor replaceable screens
④	Sensors (LEL and O_2)
⑤	Sensor – Twin Tox (H_2S, CO)

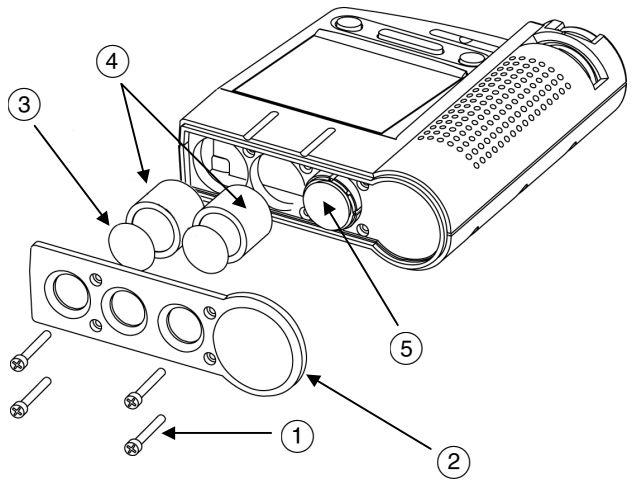


Figure 5. Replacing a Sensor or Sensor Filter

User Options

Upgrade a 2 or 3 Gas Unit

A 2-gas (O_2, LEL) or 3-gas (O_2, LEL, H_2S) detector can be upgraded in the field to a 3 or 4-gas unit. Install the desired H_2S or Twin Tox (CO/H_2S) sensor. Then, in the User Option's Sensor Menu, enable the newly installed sensor(s).

Sensor Enable or Disable

⚠ Warning

Disabling an installed sensor configures the detector to a one, two, or three gas unit. No protection is now provided for the gas targeted by that sensor(s).

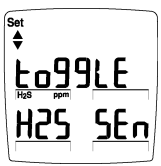
Disabling a sensor should be performed with extreme caution. In the event a sensor fails, Sensor Disable can be used to turn off the sensor fail alarm. The sensor should be replaced and enabled as soon as possible.

To disable a Sensor enter the User Options Menu (page 14).

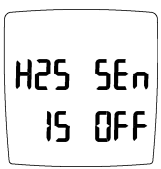
Disabling/Enabling a Sensor

Select the sensor H_2S, CO, LEL, or O_2 to be enabled or disabled. The detector will function normally with remaining enabled sensors. The sensor may be enabled again at any time.

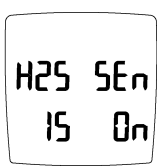
To disable (or enable) the H_2S sensor reading, press when the display advises:



The display then advises the H_2S Sensor is OFF.



To enable H_2S sensor repeat above sequence. The display advises H_2S Sensor is ON.



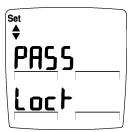
Repeat the sequence for CO, LEL (combustible) and O_2.

Pass Code Protection

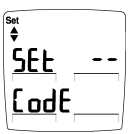
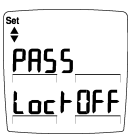
The detector is shipped with the Pass Code protection OFF. Pass Code protection prevents user access to the calibration and adjust alarm setpoints functions.

User Options Menu (page 14): To activate the Pass Code Protect, press when the screen displays PASS Lock.

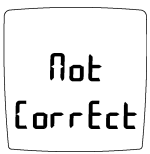
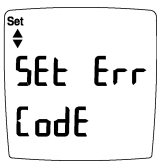
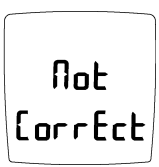
The screen advises Pass Code Lock protection is ON (activated) and beeps 3 times.



If the detector is pass code protected, the display advises the unit is locked and requests Pass Code. Enter correct code and press to confirm entry. Display advises Pass Lock is OFF. *Note: Factory Code is provided separately.*

Pass Lock ON	Set Code	Pass Lock OFF
		

The correct three digit factory Pass Code must be entered in 8 seconds or the display advises that the code is not correct or error and returns to the options menu.

No code entered or *Incorrect code entered and confirmed* • Beeps and flashes • Returns to previous screen	
Code entered, but not confirmed. • Display shows both LCD's • Beeps and flashes	 

If the Detector Does Not Work

The detector's electronics are protected from variations in humidity and corrosive atmospheres. If you encounter a problem, try the solutions listed in Table 13.

If you still are unable to correct the problem, contact BW Technologies using one of the numbers on page 2.

Table 13. Troubleshooting Tips

Problem	Possible Cause	Solution
Detector does not turn on.	No battery.	→ Install battery.
	Depleted battery.	→ Replace battery.
	Damaged or defective detector.	→ Contact BW. (See page 2.)
Detector enters alarm immediately when turned on.	Sensor needs to stabilize.	→ Used sensor: wait 60 seconds New sensor: wait 5 minutes
	Low Battery alarm.	→ Replace battery.
	Sensor Alarm.	→ Replace sensor.
	Damaged or defective detector.	→ Contact BW. (See page 2.)

Table 13. Troubleshooting Tips (cont.)

Problem	Possible Cause	Solution
Activation self-test fails during one of the first five steps.	General fault.	→ Contact BW. (See page 2.)
Detector does not display normal ambient gas reading after activation self-test.	Sensor not stabilized.	→ Used sensor: wait 60 seconds New sensor: wait 5 minutes
	Detector requires calibration.	→ Calibrate detector.
	Target gas is present.	→ Detector is operating properly. Use caution in suspect areas.
Detector does not respond to pushbuttons.	Battery is depleted.	→ Replace battery.
	Detector is performing operations that do not require user input.	→ Pushbutton operation restored automatically when the operation ends.
Detector does not accurately measure gas.	Detector requires calibration.	→ Calibrate sensor.
	Detector is colder/hotter than ambient gas.	→ Allow detector to acquire ambient temperature before use.
	Sensor screen is blocked.	→ Clean sensor screen.

Table 13. Troubleshooting Tips (cont.)

Problem	Possible Cause	Solution
Detector does not enter alarm.	Alarm setpoint(s) are set incorrectly.	→ Reset alarm setpoints.
	Alarm setpoint(s) set to zero.	→ Reset alarm setpoints.
	Detector is in calibration mode.	→ Complete the calibration procedure.
Detector intermittently enters alarm without apparent reason.	Ambient gas levels are near alarm setpoint or the sensor is exposed to a puff of the target gas.	→ Detector is operating normally. Use caution in suspect areas. Check maximum gas exposure reading.
	Alarms set incorrectly.	→ Reset alarm setpoints.
	Missing or faulty sensor.	→ Replace sensor.
Detector automatically shuts off.	Automatic Shutdown feature activated due to weak battery.	→ Replace battery.
Unit will not auto zero or calibrate. O_2 sensor reading is erratic.	O_2 sensor replacement may not be compatible.	→ Change O_2 sensor.

Replacement Parts and Accessories

⚠Warning

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

To order parts or accessories listed in Table 14, contact BW Technologies. (See page 2.)

Table 13. Replacement Parts and Accessories

Model No.	Description	Qty
D4-VP130-(UK) D4-VP130-(EU) V-CHARG1	230 VAC Charger U.K. 230 VAC Charger Europe 230 VAC Charger Australia 12 volt Vehicle Charger	1
  D4-VP100 GA-VP110	VersaPak™ battery, Rechargeable: NiCad (Europe, U.K., Australia) NiMH (worldwide)	1
D4-2-CC	Boot carrying case	1
MMC16	MultiMediaCard 16 MB	1
MMC32	MultiMediaCard 32 MB	1
DOOR1-K10	Single Use Card Lock doors	10
D4-RHM04	Replacement H_2S/CO sensor	1
SR-X10	O_2 (2 Year) Replacement Sensor	1
D4-RW90	Replacement LEL sensor	1
PS-RH01	Replacement H_2S sensor	1
CG-Q58	Calibration Quad Gas, 58 L	1
CG-Q34	Calibration Quad Gas, 34 L	1
REG-0.5	Regulator (0.5 L/min)	1

Specifications

Operating temperature: -20 °C to +50 °C

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

Alarm setpoints: May vary by region and are user settable.

Detection range:
CO: 0 - 500 ppm in 1 ppm increments
H_2S: 0 - 100 ppm in 1 ppm increments
O_2: 0 - 30 % in 0.1% increments
LEL: 0 - 100 % LEL of methane in 1% LEL increments

Sensor type:
H_2S/CO: Twin plug-in electrochemical cell (4-gas)
O_2: Plug-in electrochemical cell
LEL: Plug-in catalytic bead
H_2S: Pug-in electrochemical cell (3-gas)

Detection techniques:
H_2S and CO: Low, TWA (LTEL), and High Alarms
O_2 and LEL: Low and High Alarms

Alarm Conditions: Low Alarm, TWA (LTEL) Alarm, High Alarm, Multi-Gas Alarm, Sensor Alarm, Low Battery Alarm, Confidence Beep, Automatic Shutdown Alarm and Calibration Due Alarm

Audible alarm: 95 dB at 1 ft (0.3 m) variable pulsed beeper

Visual alarm: Red light-emitting diode (LED)

Display: Alphanumeric liquid crystal display (LCD)

Backlight: Automatically activates whenever there is insufficient light to view the display and during alarm conditions

Self-test: Initiated at activation

Calibration: Automatic Zero and Automatic Span
Oxygen Sensor: On Activation (auto)

User Enable/Disable Options:
Confidence Beep, Latching Alarms, Password Protect, Sensor Disable

Batteries: Two Black & Decker VersaPak™ batteries

Battery Charger: Black & Decker VersaPak™ VP130 charger

Battery operating time: NiCd: 7-8 hours
NiMH: 10-12 hours

First-time charge: NiCd: 6 hours for 2 batteries
NiMH: 9 hours for 2 batteries

Normal Charge: NiCd: 3-4 hours for 2 batteries
NiMH: 9 hours for 2 batteries

Intrinsic safety:

Cenelec (LCIE) EEx ia d IIC T4

Conforms to European Union Directives CE

General Specifications for Datalogger Units

Media Type: MMC (MultiMediaCard)

Size: 16 MB (standard); 16, 32 and 64 MB cards available

Storage: 250,000 lines of data (16 MB)
2.2 months (based on a normal work week)

Memory Type: Wrap-around memory ensures most recent data is always saved

Sample Rate: One reading every 5 seconds (standard)

Data recorded: All sensor readings, all alarm conditions, calibrations, event flags, battery status, sensor status, confidence activation, and product status along with the time and date for each reading and unit serial number.

MMC Card Test: Automatically on activation

BW Defender2 with Black Box Datalogger

Operation: Requires no user intervention

Continuous: Full time continuous datalogging while the detector is operating

Access: Data cannot be accessed or manipulated by the user

Data Retrieval: Authorized factory representative if required

Advise Indicators: Icon advises datalogger operating status

Card Alarm: MMC Card fail or missing

BW Defender2 with User Downloadable Datalogger

Operation: Requires no user intervention (automatic)

Indicators: Icon advises Datalogger is operating normally, MMC card missing / malfunction advise and Card In/Out advise

Compatible with: Desktop PC Computer or Laptop

Operating System: Windows 95 or higher

Download via: USB, parallel port, floppy disk or PC card adapter

Software required: Spreadsheet or database compatible with comma-separated-value (CSV) text files (Excel, Access, Quattro, etc.)

Card Alarm: Card Fail or Missing

Support:

BW E.D.M (Excel Datalog Manager): E.D.M. is an Excel software add-in that enhances the abilities of Microsoft Excel when handling BW Defender2 User Downloadable Datalogger data files.

Appendix A

Excel Datalog Manager (E.D.M.)

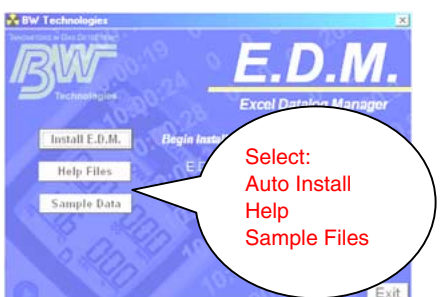
The Support CD for the User Downloadable Datalogger Detectors contains:

- BW Technologies Excel Datalog Manager (E.D.M.) software plug-in.
- Installation and Use Instructions
- Datalogger example data files and spreadsheets.

IMPORTANT

E.D.M. *Review and use the CD Help and Sample files for installing and using the E.D.M. program.*

Excel: *All functions and features of Microsoft Excel are available, including automatic graphing. Use Excel Help to sort, format, & archive data easily and automatically.*



Excel Datalog Manager (E.D.M.) Software plug-in

Data import is fully automated and allows Excel to load files larger than 65,535 lines. The E.D.M. program will automatically create additional worksheets for larger files.

System Requirements

Recommended E.D.M. system: *750 MHz Pentium (or equivalent), 100 MB hard disk space, Microsoft Windows 2000, Microsoft Excel 2000*

Minimum E.D.M. system requirements*: 300 MHz Pentium (or equivalent), 30 MB free hard disk space, Windows 95, Microsoft Excel 95*

Sample data files

Sample data are available on CD. Sample data files help you become familiar with the software.

Files with the .CSV extension are samples of actual data files downloaded from BW Defender2 Datalogger. CSV files may be imported into Excel using the E.D.M. wizard or loaded directly into Excel or a compatible database, spreadsheet or word processor.

Installing Excel Datalog Manager (E.D.M.):

- Place the BW Defender2 Datalogger E.D.M. Support CD in the middle of the CD-ROM tray and close.
- **AutoPlay:** From the main window Click on the "Install E.D.M". Button, the installation wizard will guide you.
- **AutoPlay not Activated:** In "My Computer" find the E.D.M. icon on your CD drive.
  Double Click the E.D.M. icon to select the drive.
  Then, double Click the folder "EDM v###" to open.
  Next double click the "Setup" file
  Now the installation wizard will guide you.

After setup is complete and you have restarted your computer, you will find a new item listed in your start menu called **BW Technologies**, which contains:

- EDM Help – (Use instructions & Help information)
- Excel Datalog Manager (Starts the Excel Datalog Manager software)

MMC Card Reader Installation

To retrieve recorded data, a MultiMediaCard reader has to be configured and installed to your computer. The Adapter provides the physical connection between the MultiMediaCard and your computer. Follow manufacturer's instructions.

Ensure your Card Reader is compatible with your computer. Several Card Readers that support Windows are available from BW Technologies.

Types of MultiMediaCard Readers

MultiMediaCard readers are available in four types:

- Floppy Disk adapters;
- Universal Serial Bus (USB) or
- PCMCIA (PC card) adapters.

Start Excel Datalog Manager

Double click on the E.D.M. icon on the desktop to start the Excel Datalog Manager Wizard. This provides a simple method of transferring data from the datalogger system to Microsoft® Excel.

Import Your Data File.

After starting the E.D.M. wizard follow the easy steps

1. Start: The first screen asks you to click '**Next**' to begin the data file import.

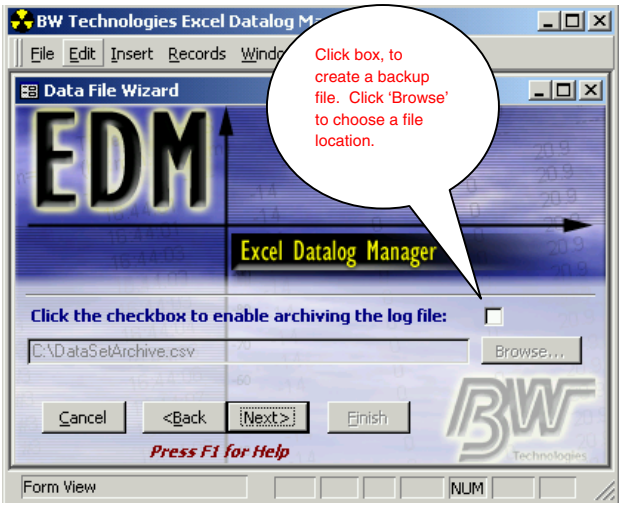
2. File Location: Click **'Browse'** to locate your data file. Once located, highlight the file and Click **'Open'**, then ***'Next'*** *to move to the next option.*

Data files may be imported from the hard disk, or directly from the MultiMediaCard containing the data. The import process does not modify or erase the original data.

3. Archive Back-up of Data File:
This option enables you to create a complete backup copy of the original card data. Click the **'Browse'** button to select the location to place the backup data file. *Once finished click **'Next'**.*

> *Back-ups can be loaded into Excel or other compatible programs at any time.*

4. Location Of Final File: Use this step to select the location of the finished Excel data workbook. The data file will be sorted, imported into Excel, formatted, and saved as an Excel workbook file. *Once finished click **'Next'**.*



5. Filter: This step allows the user to filter the original files down to a convenient, manageable size without losing any critical information.
Select all logged data, or select to include only every 2, 3 or etc. entry without losing any critical information.
Once finished click '**Next**'.

Note:

This option does not remove or delete data from the original data file or any archived file; only the final Excel workbook is affected. ALL Records involving alarm conditions, failures, calibrations, battery warnings or other important events will not be filtered and will appear in the final Excel Workbook in their entirety. If the confidence beep is used on the datalogging instrument, this step has no effect; E.D.M. will not filter out records where the confidence beep is active.

6. **Finish:** Click on '**Finish**' to import the data into Excel and open the finished Excel data workbook.

Note

The data file may take several minutes to transfer, read and sort in E.D.M.

Direct Import to Compatible Programs

Information from this point on only applies to users who are not using the E.D.M. plug-in. The following information applies to direct data import into Excel and other compatible programs. To use the datalogger data, insert the data card into a computer adapter and open the data file LOGFILE0.CSV using spreadsheet or database software. Word processors and text editors may also be used, but performance may be poor, since the datalogger file is at least 16 megabytes in size.

Data for user-accessible models is comma-separated-values (CSV) format. The data order is:

- Date, day, time
- H_2S, CO, LEL, O_2
- H_2S TWA, CO TWA
- Status Codes, serial number

Recorded data includes eight single-character unit status codes. The eight characters represent codes for the H_2S, CO, LEL, and O_2 sensors, datalogger, unit battery status, and unit alarm status. A summary of most of the available codes can be seen in table A.

Importing the Data File Into Compatible Desktop Applications

Information from this point forward only applies to users who are not using the Excel Datalog Manager (E.D.M.) plug-in.

The recorded data can be loaded into most spreadsheet, database, word processor, or text editor applications, some examples are:

- Microsoft® Excel 95, 98 and 2000;
- Quattro Pro;
- Lotus 1-2-3;
- Microsoft® Access; and
- Microsoft® Word

Determining Application Compatibility

To determine if the application selected is compatible:

- Insert MMC card in to the Card Reader; then
- Open desired application.
- Use the applications “File/Open” menu options to locate and open the data file.

If the recorded data file is compatible with the application, it will open. If not the application will report an error in opening the file.

Important

Some applications have an internal file size limits, and may not load the entire file. Check the applications specifications prior to use.

Table A: DATALOGGER STATUS CODES

Codes	Explanation
General Codes	
—	Normal operation
G	Backlight is on
Sensor Codes	
L	Low Alarm
H	High Alarm
T	TWA Alarm
U	Dual alarm (Low and TWA alarms)
V	Dual alarm (High and TWA alarms)
O	Sensor is over-ranged
C	Calibrating
F	Sensor Failure
1	Alarm setpoint 1
2	Alarm setpoint 2

Codes	Explanation
Battery Status Codes	
—	Battery OK
B	Low battery alarm
K	Confidence beep is active
Alarm Status Codes	
L	Low Alarm
H	High Alarm
T	TWA Alarm
M	Multi-Gas alarm
C	Calibration
S	Automatic Shutdown
F	Self-test Fail
R	Real-time Clock failure

When datalogger information is imported into most spreadsheet software, it will appear similar to the example below; line numbers are included here for clarity.

Note:

Some compatible software packages have an internal file size limit of and may not load the entire file. Check your software limits.

Line	Date	Day	Time	H2S	CO	LEL	O2	H2S	CO	Status	Serial
1	7/2/00	#3	18:20:04	10	35	10	19.5	--	--	1111----	0521871
2	7/2/00	#3	18:20:09	15	200	20	23.5	--	--	2222----	0521871
3	7/2/00	#3	18:20:37	0	0	0	20.9	0	0	--------	0521871
4	7/2/00	#3	18:20:41	0	0	5	20.9	0	0	--------	0521871
5	7/2/00	#3	18:20:44	12	21	7	20.9	0	0	L------L	0521871
6	7/2/00	#3	18:20:47	16	30	9	20.9	0	0	H------H	0521871
7	7/2/00	#3	18:20:50	20	37	10	20.9	0	0	HLL----M	0521871
8	7/2/00	#3	18:20:52	0	0	0	20.9	0	0	------B-	0521871
9	7/2/00	#3	18:20:57	0	0	0	20.9	0	0	------BS	0521871

In this example:

Line 1 shows the alarm 1 setpoints (code '1') for all 4 sensors.

Line 2 shows the alarm 2 setpoints (code '2') for all 4 sensors. Alarm points are only recorded when the unit is turned on, indicating the unit has just been activated.

Lines 3 and 4 show normal operation – no gas readings or alarms.

Line 5 shows an H_2S low alarm. CO and LEL gases are present below alarm levels. The unit is in low alarm.

Line 6 shows the H_2S sensor in high alarm. The unit is sounding high alarm.

Line 7 shows the H_2S in high alarm, and CO and LEL in low alarm. The unit is sounding multi-alarm.

Line 9 shows the unit emitting a low-battery alarm. There are no gas alarms.

Line 10 shows the unit automatically shutting down because of a low battery. The battery is low, and the unit is sounding an automatic shutdown alarm.

MultiMediaCard Compatibility

A standard 16MB MMC Flash Memory card is supplied with the BW Defender2 Datalogger. When purchasing additional MultiMediaCards, BW Technologies recommends Sandisk® MMC Flash Memory cards that contain between 8MB and 64MB storage capacity.

MultiMediaCard(s) compatible with the “MMC” specification will always have the exact word “MultiMediaCard” or “MMC” written on the disk. Cards that do not contain these exact words are not a MultiMediaCard.

The “MMC” card is ***not*** the same as the following:

- MultiMedia card;
- Multi media card;
- SmartMedia

Hitachi and Infineon manufacture compatible MMC cards. MMC cards are available through retailers in North America and Europe. They are also available through mail order and Internet vendors.

Troubleshooting

A new MMC Card is automatically formatted when it is installed in the detector. When installing any new or blank MMC card into the BW Defender2 Datalogger, the detector LCD will display “CARD IS BLANK”, then the Datalogger will proceed to auto-format the MMC card.

Recovering Data Files

If the MMC card is reformatted or erased accidentally by your computer application, the recorded data file can be recovered.

FIRST: First ensure the card is installed properly in the card reader. If the recorded data file is not visible ensure that:

- The card reader is visible in the **MY Computer** window.
- If not, verify that the card reader, is installed correctly, and that the connections are secure.
- In the “Removable Disk” drive window, ensure ***All Files*** is selected in the File Types field.

“Reformat and Recover Deleted Files”

Simply place the MMC card back into the detector. The Detector will reformat. The file should now be available.

If the Recorded Data File (Logfile.csv), is still not visible:

- Format MMC card in Windows.
- Remove MMC card from the card reader.
- Insert MMC card back into the BW Defender2 Datalogger.
- Allow Datalogger to reformat the MMC card.
- Remove MMC card from Datalogger.
- Insert MMC card back into card reader.
- Select ***My Computer*** icon.
- Select drive letter that corresponds to the card reader.
- The Recorded Data File (Logfile.csv), will now be visible.