Breathing Air Quality

Respirable, breathable air must be supplied and is the responsibility of the user or employer. Supplied breathing air must AT MINIMUM meet the requirements for Type 1 gaseous air described in the ANSI/Compressed Gas Association Commodity Specification G-7.1 for Grade D or higher quality as specified by Federal regulations 42 CFR, Part 84.141(b) and 29CFR1910.134(i).

The requirements for Grade D breathable air include:

Oxygen 19.5-23.5%
Hydrocarbons (condensed)
in mg/m3 of gas...5 mg/m3 max.
Carbon monoxide ....10 ppm max.
Carbon dioxide ....1,000 ppm max.
Odor ....*
No toxic contaminants at levels that make air unsafe to breathe.

*Specific measurement of odor in gaseous air is impractical. Air may normally have a slight odor. The presence of a pronounced odor should render the air unsatisfactory.

Contact the Compressed Gas Association (1725 Jefferson Davis Highway, Arlington, VA 22202) or www.cganet.com for complete details on Commodity Specification G-7.1.

Air Source

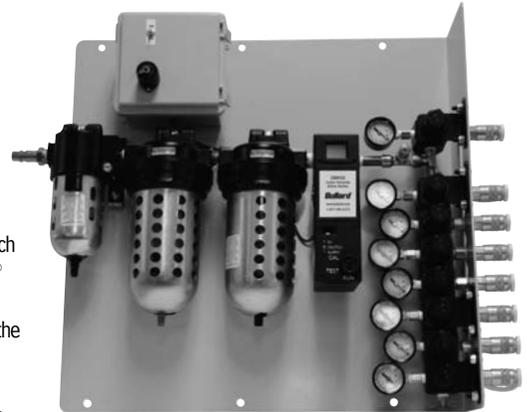Locate the source of supplied air, whether it is a breathing air compressor or an ambient air pump, such as a Bullard Free-Air® pump, in a clean air environment. Locate the air source far enough from your work site or hazardous exhaust emissions to ensure the air remains contaminant-free.

Always use an inlet filter on your air source. Use suitable after-cooler/dryers with filters, and carbon monoxide monitors and alarms, like the Bullard COM5 OR COM10 CO monitor, as necessary to assure clean, breathable air at all times.

The air should be regularly sampled to be sure that it meets Grade D requirements.

Filtration Efficiency

1st Stage	Particulate/Bulk Liquid Separation	Auto drain, filter change indicator	
		Removes 95% bulk particulates and liquids larger than 5 microns	
2nd Stage	Oil Coalescing and Ultra Fine Particulate	Auto drain, filter change indicator	
		Removes oils and particulate to 99.9% larger than 0.01 micron	
3rd Stage	Activated Charcoal	Manual drain, filter change indicator	
		Removes organic vapors, odors and tastes. Less than 0.03 pp/wt remaining oil content	

CAB Clean Air Box Specifications and Parts Information

	CAB15PM Series	CAB30PM Series	CAB50PM Series	CAB100PM Series
Dimensions	19" x 13" x 7"	22" x 14" x 7"	24" x 18" x 9"	27" x 20" x 10"
Weight	17 lbs	18 lbs	36 lbs	41 lbs
Inlet Fitting Size	1/2"	1/2"	1/2"	1/2"
Outlets (1/4")	1	2	4	8
Maximum Air Flow	15scfm at 110 psi	30scfm at 110 psi	50scfm at 110 psi	100scfm at 110 psi
(cfm/bar)	425 lpm at 7.5 bar	850 lpm at 7.5 bar	1415 lpm at 7.5 bar	4248 lpm at 7.5 bar
Remote Alarm Jack	N	Y	Y	Y
Maximum Inlet Pressure	150 psi	150 psi	150 psi	150 psi
Relief Valve	125 psi	125 psi	125 psi	125 psi
Monitoring	Inline Continuous CO Monitoring	Inline Continuous CO Monitoring	Inline Continuous CO Monitoring	Inline Continuous CO Monitoring
Power	12V DC or	12V DC or	12V DC or	12V DC or

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Respirator Capacity

The Bullard Clean Air Box is supplied with up to 8 quick-disconnect fittings. The actual number of respirators that may be connected to the CAB is dependent on the inlet pressure to the Bullard air filtration system and the air flow and pressure requirements of the respirator being worn. Air supply pressure ranges and approved hose lengths for a respirator can be found in the manufacturer's User Instructions for the respirator.

Air Monitoring

The air flows through the CO monitor and a small amount (~0.5 lpm) is diverted through a preset internal regulator and flow restrictor, delivering a continuous flow of sample air to the sensor chamber. The monitor will analyze the air and display the CO concentration in parts-per-million (ppm). The Green LED located on the face of the monitor will illuminate during normal operation when the CO level is below the CO alarm point (10 ppm US and 5 ppm International). If the CO level rises above the alarm set point, the Red (alarm) LED on the face of the monitor will illuminate and an audible alarm will sound.

Function Modes

The knob on the front of the COM10 or COM5 monitor sets the functions for the CO monitor and can be switched to RUN, TEST and CAL.

RUN mode is the operation/detection mode. The monitor must be in the RUN mode to monitor the supplied breathing air. Supplied air must be turned on and flowing to the instrument while in this mode. When the supplied air is off or interrupted while the monitor is in the RUN mode, the low flow alarm will sound and LF will be displayed on the monitor until the supplied air is turned on.

TEST mode allows for bump testing of the sensor or for silencing of the low flow alarm when supplied air is shut off. To perform a bump test, place the monitor in the TEST mode and flow the calibration gas into the center of the knob. The reading on the monitor should be 10 +/- 1 if applying CO gas. The reading on the monitor should be zero or 1 if applying the zero gas. In the test mode, the supplied air will not be monitored and there is no need to turn the supplied air off when entering this mode. Unit must be zeroed after bump test is performed.

CAL mode is the calibration and zero calibration mode. When the monitor is switched to the CAL mode, the supplied air will not be flowing to the sensor and there is no need to shut off the supplied air. When in the CAL mode, (AC) AutoCal® will be displayed. Pressing the On/Off button while in this mode will change the display to (AO) AutoZero. For calibration and zeroing instruction, see the Calibration section.

F1 (fault) is indicated on the display when the cam valve is not positioned securely in one of these three modes.

Error Codes

rC indicates that the system requires a recalibration.

lb indicates a low battery.

Monitor Specs

Operating Temperature...-4ºF to 120ºF (-20ºC to 48.89ºC)
Humidity Range ....0 – 100%
Sample Flow Rate ....0.85 cfh
Display ....2 digit LCD
Sensor Type...Electrochemical; Carbon Monoxide
Range..0 – 99 ppm
Calibration...................................Manual CO and Zero - Auto Cal®; No manual adjustments
Alarm Setting..10 ppm (5 ppm International)

CAB Clean Air Box Set Up and Operation

⚠ WARNING

Always operate the CAB Clean Air Box in the upright position. Failure to comply may result in one or all of the following:

Auto drains will not function properly. This may result in the contamination of the CO monitor and cause water to be passed through the air supply hose and into the worker's respirator.

Auto drains may become clogged. See user instructions for information on cleaning or replacing auto drains.

Filters may accumulate moisture and/or contaminants. See user instructions for information on replacing filter.

Set Up and Operation

Power Supply Requirements

The Bullard CAB Panel Mount filtration systems are not supplied with an AC power cord. The panel must be wired for either 110 or 220VAC, 50/60 Hz, single phase operation. Proper wiring should be performed by a qualified electrician in accordance with local and national electrical codes and is the responsibility of the user.
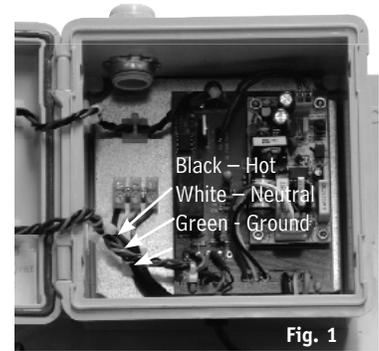

Black – Hot
White – Neutral
Green - Ground

Fig. 1

See below for proper wiring information (Figure 1).

Prior to hooking up the incoming air supply lines, purge all moisture by running the air before connecting the CAB.

Attach to incoming air source; do not exceed 150 psi.

Fig. 2

Insure the AC Power Supply is operational.

Flip switch on Control Box to ON position. (Figure 2)

Insure the knob on the CO Monitor is rotated to the TEST position. This will prevent the Low Flow alarm from sounding during start up if no air is flowing. (Figure 2)

Push the ON button located behind the front cover of the CO Monitor. (Figure 3)

Wait for the 60 second countdown shown on the CO Monitor display screen.

Calibrate the CO Monitor if necessary. See Calibration Instructions.

Connect the remote alarm assembly (optional) to the remote alarm jack located on the control box.
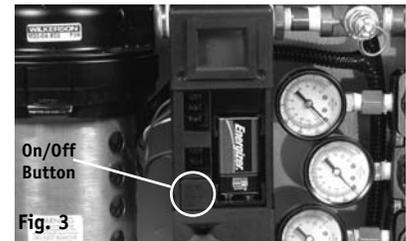

On/Off Button

Fig. 3

Warning Signals...Normal Operation - Green Light
....High CO - Red Light
....High CO - Audible alarm (90db)
....Low Battery - Amber Light (Blinking)
....Low Battery - Audible alarm (chirp)
....Low Flow Alarm - Audible alarm (90db)
Warranty.. Two years on sensor and monitor
Shielding   Internal RFI/EMI coating

NOTE
The knob must be in RUN position for active monitoring of CO in the air supply.

Attach respirators and adjust regulator to appropriate pressure per respirator manufacturer's recommendation. For units with independent regulators, adjust each regulator as appropriate for each outlet being used.

Calibration and Zero-Point Process

Zero-Point Adjustment

NOTE:
It is recommended that the Clean Air box be under pressure with no air going through the outlet fitting when perfroming zero point adjustment or calibration.

NOTE:
If monitor has been relocated to a different working area and ambient temperatures change, allow the unit to stabilize for 15-20 minutes prior to Zero Point adjustment and calibration.

Zero Adjustment Procedure

Remove the front cover of the CO Monitor.

Push the ON button. The unit will beep and begin a 60 second countdown.

Rotate the knob located on the front of the CO Monitor to the CAL position.

"AC" will appear on the display.

Press and hold the On/Off button until it beeps.

"AO" will now appear on the display.

Attach the regulator to the zero gas cylinder.

Insert the calibration connector fitting into the center of the knob on the front of the monitor.

Open the cylinder valve fully. The flow rate is preset, so there is no need to adjust it.

The red LED will continue to blink for approximately 90 seconds during which the zero adjustment process will take place.

Watch for the green LED to begin blinking. This indicates a successful zero.

With the Zero air still flowing, turn the knob to TEST. The reading should be Co 0 or Co 1. If any other reading is displayed, repeat the Zero Point Adjustment.

Close the regulator on zero gas cylinder completely. Remove the calibration connector fitting from the center of the knob.

With the incoming air flowing, turn the knob to RUN.

NOTE
Knob must be in RUN position for active monitoring of CO in the air supply.

Calibration Instructions

The COM5 and COM10 are Auto-Cal instruments. All calibration adjustments are made automatically.

Monitor calibration should be performed monthly or whenever the reading may be questionable. A calibration schedule should be maintained for future reference. To obtain an accurate calibration, we recommend the use of Bullard calibration kits.

Calibration Procedure

If necessary, remove the front cover of the CO monitor and push the ON button.

Rotate the knob located on the front of the monitor to the CAL position.

"AC" will appear on the display.

Attach the regulator to the calibration gas cylinder (10 ppm CO required).

Insert the calibration connector fitting into the center of the knob.

Open the cylinder valve fully. The flow rate is preset, and there is no need to adjust it.

The Red LED on the front of the monitor will continue to blink for approximately 90 seconds during which the calibration process will take place.

Watch for the green LED to blink. This indicates a successful calibration.

With the 10ppm gas still flowing, turn the knob to TEST. The reading should be Co 10+/-1. If any other reading is displayed in the test mode, repeat both the Zero Point adjustment and CO calibration.

Close the regulator on CO gas cylinder completely and remove the calibration connector fitting from the center of the knob.

With the zero air flowing, rotate the knob to the RUN position.

NOTE:
Typical calibration takes approximately 90 seconds. If unit will not calibrate within 3 minutes, repeat the calibration steps with compressed air turned off. If the problem persists, contact the Bullard Customer Service Department at 1-877-BULLARD (285-5273).

NOTE:
Knob must be in RUN position for active monitoring of CO in the air supply.

Shut Down

Make sure all personnel have left the work area.

Shut off the incoming air to the Clean Air Box.

Release air pressure from the box by pulling the relief valve ring out.

Turn the CO Monitor off by pressing and holding the ON/OFF button for three seconds.

You will hear three short beeps to let you know the CO monitor is OFF.

Turn the control box switch to the OFF position.

Disconnect the airline hoses.

Install dust caps to prevent entry of debris into the outlet fittings.

System Maintenance

CAUTION
Always depressurize the system before performing service.

Filter Housing/Bowls

Periodic cleaning of the polycarbonate bowls may become necessary. Remove the auto drains. Clean the bowls with a mild soapy solution. Re-install into the filter housing.

Auto Drains

The automatic drains are designed to remove bulk liquid contaminants. The drains (1st and 2nd stages only) will automatically drain the liquids after the level has reached 1/3 of the bowl capacity. For periodic cleaning, use mild soap and water.

Filter Change

The filtration system consists of a filter change indicator, which will gradually change from green to orange when filter life is spent.

NOTE
Air must be flowing through the Clean Air Box before the filter change indicators will function.

Drain Lines

Make sure the auto drain tubes are placed in the holes at the bottom of the box to allow liquids to drain outside of the box

Calibration

Monitor calibration should be performed monthly or whenever the reading may be questionable. A calibration schedule should be maintained for future reference. To obtain an accurate calibration, we recommend the use of Bullard calibration kits.

Part Number:

CABCK   Calibration kit for CO monitor, 10 ppm CO, zero air, regulator and case - 34 liter size

CABCK17L   Calibration kit for CO monitor, 10ppm CO, zero air and regulator - 17 liter size

CABRS   New CO sensor

NOTE

To assure sensor accuracy, calibration of the monitor is required. If you cannot obtain an accurate calibration, sensor replacement may be necessary. Contact Bullard Customer Service Department for ordering information.

Battery Replacement

CO Monitor Battery Replacement: A 9-volt battery is installed under the front panel cover to provide power to the CO monitor. This monitor may also run solely on DC power if the clean air box is not attached to an AC power supply.

To replace the 9-volt battery, remove the panel cover from the front of the CO monitor. Lift it off from either the left or right side. If a 9-volt battery is being used to power the monitor and the battery power becomes too low, the monitor will indicate low battery (LB) on the display to indicate it is time to change the battery. (Figure 4)

Fig. 4

> ⚠ **WARNING**
>
> Removing the front of the housing by prying at the top will result in damage to the housing. This damage is not covered under warranty.

Sensor Replacement

NOTE

Important: Before installing a replacement sensor, verify that you have the correct sensor. The CABRS is the replacement sensor for all COM10 or COM5 monitors with serial numbers with a suffix "A", and serial numbers with NO suffix. The CABRS2 is the replacement sensor for all COM10 or COM5 monitors with serial numbers with a suffix "B". Also, the monitors that require the CABRS2 will have an extra board to which the sensor mounts (Figure 5).

Fig. 5
CABRS
CABRS2

The sensor is easily accessible by removing the front of the housing from the COM5 or COM10 monitor.

To gain access to the sensor, remove the four screws on the front of the CO monitor only. After removing the four screws, gently pry the front of the housing off from the <u>bottom</u> of the housing. (Figure 6)

Battery Cover
Screws
Fig. 6   Pry here

Gently pull out the old sensor.

Remove the shorting clip cover from the new sensor.

Fig. 7

Failure to remove shorting clip (not shown) will result in inability to calibrate.

Align pins and gently push the new sensor into the sockets (Figure 7).

Replace the front cover of the monitor when sensor replacement is complete. Ensure LED lights are aligned with housing before securing front cover with screws.
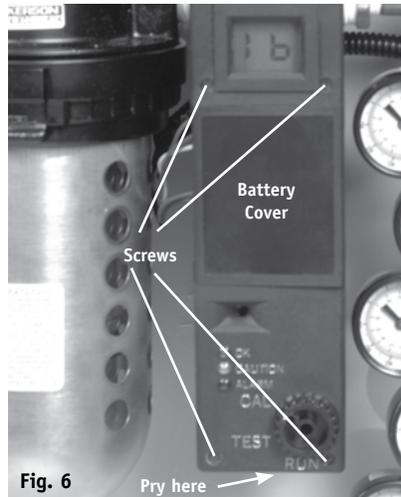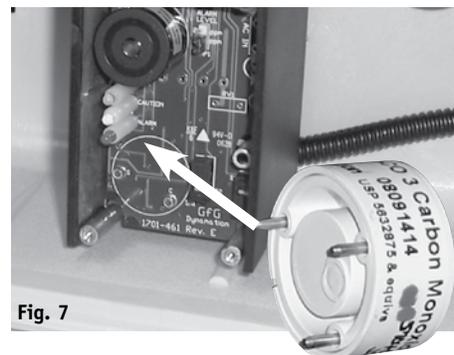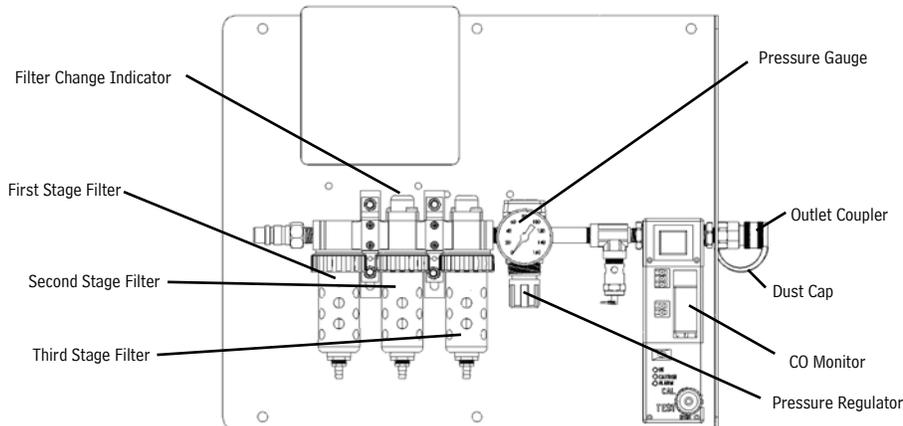
After replacing the sensor, allow the instrument to warm up for at least 30 minutes. The new sensor must be zeroed and calibrated before first use. See Zero Point Adjustment and Calibration Instructions.
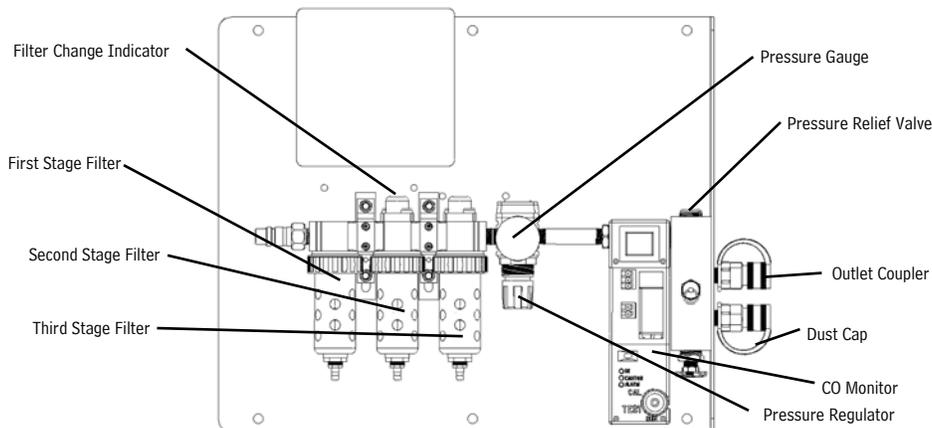
Replacement Parts Breakdown

CAB15PM (15 cfm)

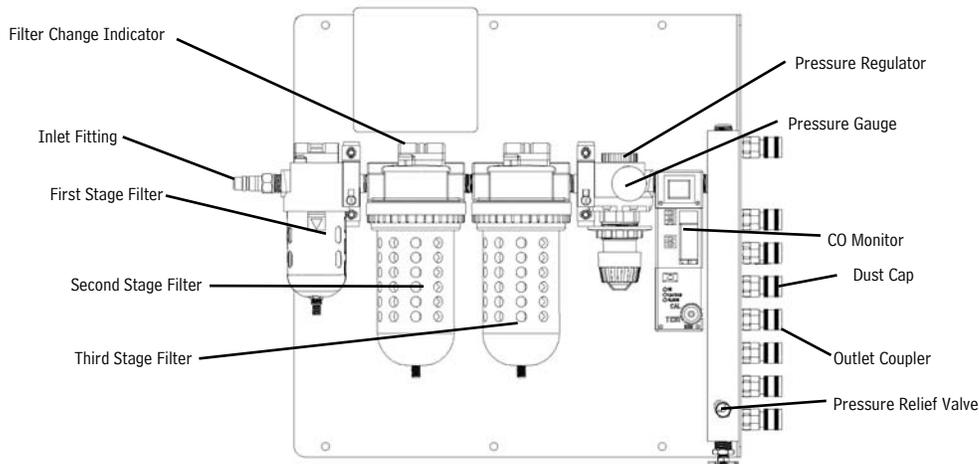| Description	Part Number	Description	Part Number
CO Monitor	COM5 or COM10	Snap-Tite Coupling	CABQDSN
Filter Change Indicator	CAB30FCI	Hansen Stainless Coupler	CABQDSS
Pressure Regulator with Gauge	CABREG1	Dust Cap, Universal	CABQDCAP
Relief Valve, 125 psi	41PRV	A Filter Element - First Stage	CAB30FEA
Hansen Coupling	CABQDHA	B Filter Element - Second Stage	CAB30FEB
Schrader Coupling	CABQDSC	C Filter Element - Third Stage	CAB30FEC
Cejn Coupling	CABQDCE	CO Sensor	CABRS

CAB30PM (30 cfm)

Description	Part Number	Description	Part Number
CO Monitor	COM5 or COM10	Cejn Coupling	CABQDCE
Filter Change Indicator	CAB30FCI	Snap-Tite Coupling	CABQDSN
Pressure Regulator with Gauge	CABREG1	Hansen Stainless Coupler	CABQDSS
Independent Regulator	CABREG4	Dust Cap, Universal	CABQDCAP
Pressure Gauge for Independent Regulator	S19685	A Filter Element - First Stage	CAB30FEA
Relief Valve, 125 psi	41PRV	B Filter Element - Second Stage	CAB30FEB
Hansen Coupling	CABQDHA	C Filter Element - Third Stage	CAB30FEC
Schrader Coupling	CABQDSC	CO Sensor	CABRS

Replacement Filter Information
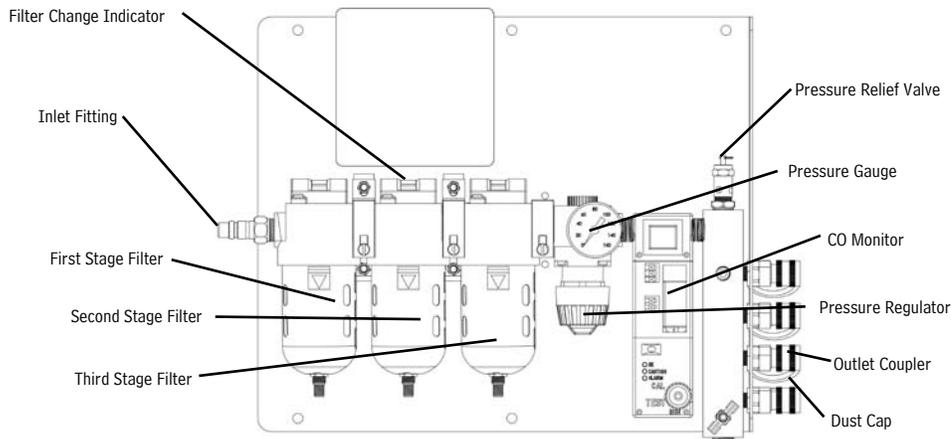
CAB50PM (50 cfm)

Description	Part Number	Description	Part Number
CO Monitor	COM5 or COM10	Cejn Coupling	CABQDCE
Filter Change Indicator	CAB50FCI	Snap-Tite Coupling	CABQDSN
Pressure Gauge	S19686	Hansen Stainless Coupler	CABQDSS
Pressure Regulator	CABREG2	Dust Cap, Universal	CABQDCAP
Independent Regulator	CABREG4	A Filter Element - First Stage	CAB50FEA
Pressure Gauge for Independent Regulator	S19685	B Filter Element - Second Stage	CAB50FEB
Relief Valve, 125 psi	41PRV	C Filter Element - Third Stage	CAB50FEC
Hansen Coupling	CABQDHA	CO Sensor	CABRS
Schrader Coupling	CABQDSC		

CAB100PM (100 cfm)

Description	Part Number	Description	Part Number
CO Monitor	COM5 or COM10	Cejn Coupling	CABQDCE
Filter Change Indicator	CAB100FCI	Snap-Tite Coupling	CABQDSN
Pressure Gauge	S19686	Hansen Stainless Coupler	CABQDSS
Pressure Regulator	CABREG3	Dust Cap, Universal	CABQDCAP
Independent Regulator	CABREG4	A Filter Element - First Stage	CAB100FEA
Pressure Gauge for Independent Regulator	S19685	B Filter Element - Second Stage	CAB100FEB
Relief Valve, 125 psi	41PRV	C Filter Element - Third Stage	CAB100FEC
Hansen Coupling	CABQDHA	CO Sensor	CABRS
Schrader Coupling	CABQDSC		

Replacement Filter Information

6

One Year Limited Warranty

Bullard warrants to the original purchaser that the Clean Air Box will be free of defects in material and workmanship under normal use and service for a period of one (1) year from the date of purchase. Bullard's obligation under this warranty is limited to repairing or replacing, at its option, articles that are returned within the warranty period and that are, after examination, shown to Bullard's satisfaction to be defective, subject to the following limitations.

a) Clean Air Box must be returned to the Bullard factory with shipping charges prepaid.

b) Clean Air Box must not be altered from its original factory configuration.

c) Clean Air Box must not have been misused, subjected to negligent use, or damaged in transport.

d) The date of purchase is within the one year warranty period. (A copy of the purchaser's original invoice showing the date of purchase is required to validate warranty coverage.)

In no event shall Bullard be responsible for damages for loss of use or other indirect, incidental, consequential or special costs, expenses or damages incurred by the purchaser, notwithstanding that Bullard has been advised of the possibility of such damages.

ANY IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO ONE (1) YEAR FROM THE DATE OF PURCHASE OF THIS PRODUCT.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or allow limitations on how long an implied warranty lasts, so the above limitations or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Return Authorization

The following steps must be completed before Bullard will accept any returned goods. Please read carefully.

Follow the steps outlined below to return goods to Bullard for repair or replacement under warranty or for paid repairs:

1. Contact Bullard Customer Service by telephone or in writing at:

   Bullard
   1898 Safety Way
   Cynthiana, KY 41031-9303
   Toll-Free: 877-BULLARD (285-5273)
   Phone: 859-234-6611

   In your correspondence or conversation with Customer Service, describe the problem as completely as possible. For your convenience, the representative will try to help you correct the problem over the phone.

2. Verify with your representative that the product should be returned to Bullard. Customer Service will provide you with written permission and a return authorization number.

3. Before returning the product, decontaminate and clean it to remove any hazardous materials which may have settled on the product during use. Laws and/or regulations prohibit the shipment of hazardous or contaminated materials. Products suspected to be contaminated will be professionally discarded at the customer's expense.

4. Ship returned products, including those under warranty, with all transportation charges pre-paid. Bullard cannot accept returned goods on a freight collect basis.

5. Returned products will be inspected upon return to the Bullard facility. Bullard Customer Service will telephone you with a quote for required repair work which is not covered by warranty. If the cost of repairs exceeds stated quote by more than 20%, your representative will call you for authorization to complete repairs.

Warranty Information

Co Montior Troubleshooting Guide

Monitor will not calibrate at 10 ppm.	1. Prior to performing a calibration, allow the temperature of the monitor to stabilize to the environment in which it will be used for several minutes. 2. The Clean Air Box should be under pressure with air flowing to the box with no air going through the outlet couplers (i.e. under static pressure). 3. Perform a zero point adjustment using impurity-free air. 4. If the instrument zeroes, perform a calibration using 10 ppm CO. 5. Verify that the calibration gas is 10 ppm and the gas cylinder is not empty. (Gauges are available.) 6. If the instrument will not calibrate, remove the air supply and repeat both the zero point adjustment and the 10 ppm CO calibration. 7. If the instrument will not calibrate, replace the sensor and repeat both the zero point adjustment and the 10 ppm CO calibration.
Monitor will not successfully complete a zero point adjustment.	• Wait 5 minutes and repeat steps 1-4 above.
Monitor displays a (-0) reading or rC.	• Wait 5 minutes and repeat steps 1-6 above.
Monitor zeroes during the zero point adjustment and the reading elevates after returning to the RUN mode.	A. Allow unit to stabilize in the run mode for 5 minutes. B. Repeat steps 1-6 above. C. If the unit will not calibrate, the supply air may be contaminated. D. Check the supply air for CO level.

Monitor will not turn ON.	• Verify that the ON/OFF button under the front cover of the monitor has been pressed to activate the monitor
	• Check AC power supply
	     1. Confirm the ON/OFF switch on the control box is in the ON position
	     2. Confirm AC power cord is connected to working outlet (Portable)
	     3. Confirm unit is wired correctly (Panel mount)
	• Using Battery back up
	     1. Confirm the AA batteries are good – replace if needed
	• Using 9V battery installed in monitor
	     1. Verify that the battery is good – replace if needed
	• If the power supply is good and the monitor will not power up, return it to the factory for repair or replacement.

Monitor does not display flashing green light after calibration or a partial display appears on the monitor screen.	• With the monitor ON and the unit on battery power only, remove and reinstall the 9 volt battery. • Repeat steps 1-6 above.
Monitor does not turn OFF.	• Monitor must be in the RUN or TEST mode.

Monitor displays an (F1) reading.	• The rotary cam switch is not locked in the CAL, TEST or RUN position.
	• Turn the switch knob slightly until it is in the correct position.
	
	❗ NOTE
	     1. AC appears on the display if attempting to go to CAL mode.
	     2. CO and an alternating number appears on the display if the unit is in the TEST mode.
	     3. A number (PPM content of CO in the compressed air) appears on the display if attempting to go to the RUN mode.

Monitor displays (8.88, 2F or 9E) with flashing lights.	• This can occur when the ON / OFF button is pushed while the monitor is in the fault mode with F1 showing on the display. • Continue to push the ON / OFF button until F1 is shown on the display. • Turn the switch knob slightly to lock the monitor into the CAL, TEST or RUN mode.
Monitor shuts down after 60 second countdown.	• Check power supply. • Verify that the battery is good. • If the power supply is good and the monitor will not power up, return it to the factory for repair or replacement.
Monitor displays "lb".	This indicates a low battery condition and the 9V battery in the CO monitor should be replaced.
Yellow caution LED flashes.	• This is normal for TEST mode and no action is necessary. • If the unit is not in TEST mode, then it may indicate a low battery condition. Replace the 9V battery in the CO monitor.

ISO 9001 certified

6081258007B (1009)