PENTAIR

GOYEN EMP6, BBD6 & BBD6S

PARTICULATE EMISSION MONITORS

PENTAIR CLEAN AIR SYSTEMS | INSTALLATION AND OPERATION MANUAL

EMP6, BBD6 & BBD6S
PARTICULATE EMISSION MONITORS

Installation and Operation Manual

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Rev01 – April 2014

WARNING

Use of controls or adjustments or procedures other than those specified in this manual may result in product failure, or poor product performance. You are cautioned that any changes or modifications to the product not expressly approved in this manual could void your product warranty.

IMPORTANT NOTE

The EMP6/BBD6/BBD6S and all associated products and this manual are subject to continuous development. Contact Pentair Environmental Systems for the latest technical information.

HEALTH AND SAFETY INFORMATION

Read this before operating or installing the equipment.

Equipment Operation

Use of this instrument in a manner not specified by Goyen may be hazardous.

Electrical Power Supply

Before working on the electrical connections, all of the electrical power lines to the equipment must be isolated. All the electrical cables and signal cables must be connected exactly as indicated in these operating instructions. If in doubt, contact Pentair Environmental Systems.

Face and Eye Protection

Suitable face and eye protection must be worn when working on hot vessels and ducts!

Special safety measures must be taken when working on a high-pressure duct.

Protective Clothing

Protective clothing must always be worn when working in the vicinity of hot vessels or ducts.

Signs and Symbols Used on Equipment and Documentation

Caution: Risk of electric shock.

Caution: Attention to possibility of risk of damage to the product, process or surroundings. Refer to instruction manual.

Protective Conductor Terminal. Must be connected to mains earth (ground).

Storage

The instrument should be stored in its packaging, in a dry, sheltered area.

Unpacking

Check all packages for external signs of damage. Check the contents against the packing note.

Return of Damaged Goods

IMPORTANT

If any item has been damaged in transit, this should be reported to the carrier and to the supplier immediately. Damage caused in transit is the responsibility of the carrier, not the supplier.

DO NOT RETURN a damaged instrument to the sender, as the carrier will not then consider a claim. Save the packing with the damaged article for inspection by the carrier.

Return of Goods for Repair

If there are any problems encountered with the instrument during the installation, commissioning or during the course of operation, please consult the troubleshooting guide.

If you need to return goods for repair, please contact our Customer Service Department. They will be able to advise you on the correct returns procedure.

Any item returned to Pentair Environmental Systems should be adequately packaged to prevent damage during transit.

You must include a written report of the problem together with your own name and contact information, address, telephone number, email address, etc.

Lifting Instructions

Where items are too heavy to be lifted manually, use suitably rated lifting equipment.

Refer to the Technical Specification for weights. All lifting should be done as stated in local regulations.

DESIGN AND MANUFACTURING STANDARDS

Certifications

If applied, these symbols indicate compliance with the EMC Directive and the Low Voltage Directive (LVD), and with Australian/New Zealand C-tick standards for EMC emissions and safety.

The EMP6 system is MACT compliant. The EMP6/BBD6/BBD6S systems are RoHS compliant, ATEX certified with MCERTS approval pending.

Dimensions

All measurements are given in millimetres and inches, unless otherwise stated.

QUICK REFERENCE

OPERATOR CONTROLS (EMP6/BBD6/BBD6S)

Figure 1: Control Panel

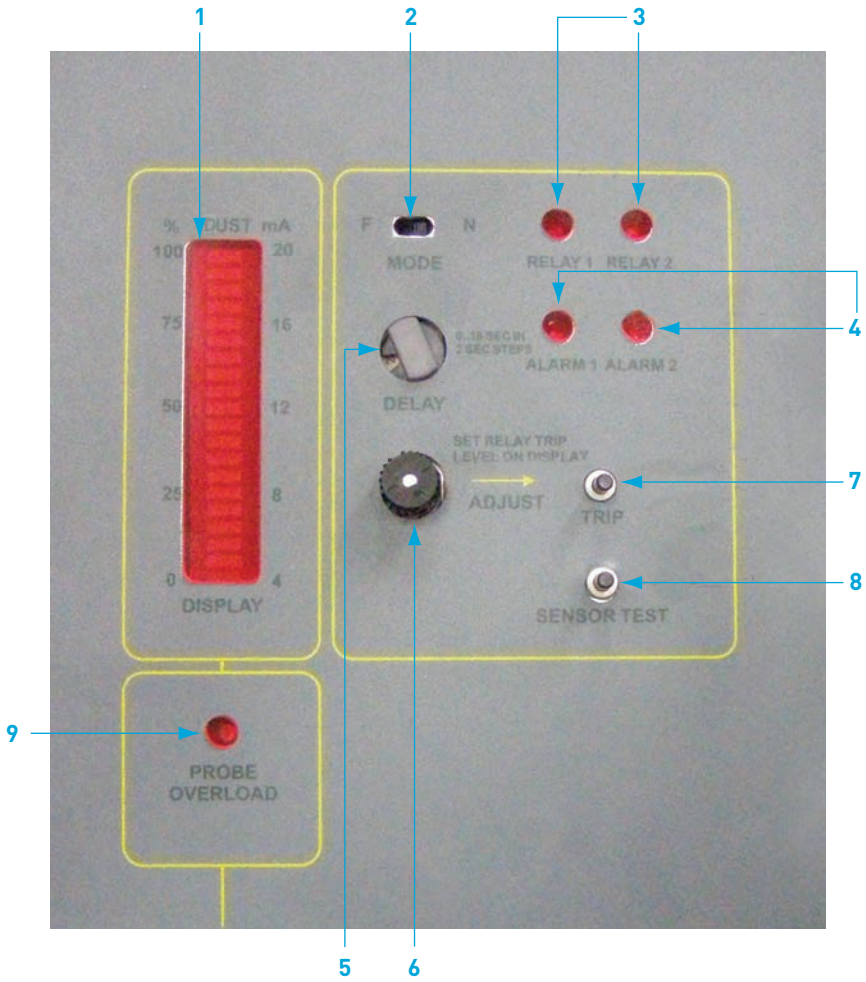
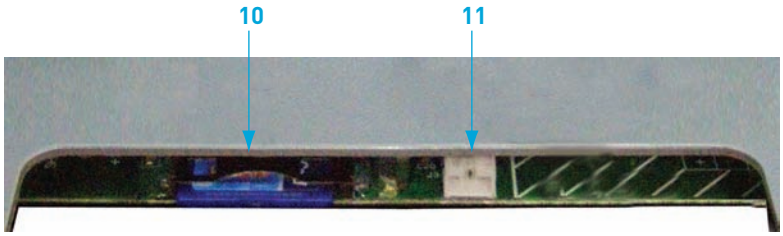


Figure 2: SD Card and Programming Port



Key to Figures 1 and 2

1.	LED Bar Graph Display – 20-level LED display that indicates dust level.
2.	Mode – 'N' normal operation, 'F' failsafe operation: In normal mode, the Alarm relay outputs are energised during an alarm condition. In failsafe mode, the Alarm relay outputs are de-energised during an alarm condition.
3.	Relay 1 and Relay 2 LEDs – Indicate whether the Alarm relays are energised.
4.	Alarm 1 and Alarm 2 LEDs – Indicate that the dust level has exceeded the user-specified level.
5.	Delay – When an Alarm condition occurs, the corresponding relay will go to the Alarm state after a time delay determined by this switch. A delay of 0 to 18 seconds may be selected.
6.	Adjust – Used to set the Alarm trip levels.
7.	Trip – Used to set the Alarm trip levels.
8.	Sensor Test – Initiates an Active Head self-test.
9.	Probe Overload LED – Continuously on (solid) when a communication fault has occurred (refer troubleshooting guide). Flashing (intermittent) in self-test mode (normal operation).
10.	SD Card (EMP6 only) – Stores logged data (accessed by removing front panel).
11.	Programming Port (EMP6 only) – Using the serial cable supplied, connect to this port to program the controller (accessed by removing front panel).

SETTING THE ALARM LEVELS

Alarm 1

- Press and hold the TRIP button (7). The ALARM1 LED (4) will flash to indicate the trip level for Alarm 1 is being set.
- The DISPLAY (1) will show the current trip level.
- Rotate the ADJUST rotary switch (6); the trip level will show on the LED DISPLAY.
- Release the TRIP button (7).

Alarm 2

- To set Alarm 2, press the TRIP button (7), and then press and hold within one second of releasing the button.
- Set the ALARM2 (4) trip level using the same procedure.

INTRODUCTION

The EMP6/BBD6 is a family of Triboelectric Emission Monitors.

PRODUCT DESCRIPTION

The EMP6/BBD6/BBD6S active head (P2-45200) utilises AC-coupled Triboelectric technology. As particles travel through the process they develop a charge, and as these particles pass or impact the sensing element (probe) a very small current is induced. This current is conducted down the sensing element to the Active Head where it's amplified, filtered, rectified, and further filtered and converted to digital form looking only at the AC component. This gives a linear representation of the concentration or mass flow rate of the particles in the gas stream, depending on the chosen scale of calibration.

The reason for measuring the AC component is that, compared to the DC component, the electronics are more sensitive. The AC signal is substantially less affected by influences such as amplifier noise and process parameters, which include the build-up of process dust on the sensing element.

The EMP6/BBD6/BBD6S Active Head totally filters out any 50 Hz or 60 Hz frequencies related to mains supply. The digital signal is then sent via a data cable to the control unit for further processing and display. This signal can be read via the LED bar graph display on the front panel of the EMP6/BBD6/BBD6S, or for the EMP6 only on the SD card or via the 4 to 20 mA/0 to 10 V output.

By performing a calibration process, the output signal may be adjusted so that it indicates in any required units, e.g. mg/s or mg/m^3.

An installation consists of:

- a control unit (the EMP6/BBD6/BBD6S control box);
- a separate cylindrical Active Head (monitor); and
- a probe (a sensing rod, wire or other element screwed to the Active Head).

The Active Head is typically mounted through the wall of a duct carrying the moving particles so that the probe is exposed to the particles.

The Active Head features a robust machined alloy housing with purge-air facility for hostile environments, easy mounting, easily replaceable probe, low-noise electronics and a wide-range sensitivity switch.

PARTS LIST:

The family of EMP6/BBD6/BBD6S product range:

EMP6-3100	EMP6 control unit only. Requires 18 to 32 V DC regulated +/–10%.
EMP6-3200	Includes the EMP6 control unit and Active Head. Requires 18 to 32 V DC regulated +/–10%.
EMP6-4100	EMP6 control unit only. Requires 100 to 240 V AC +/–10% 50/60 Hz.
EMP6-4200	Includes the EMP6 control unit and Active Head. Requires 100 to 240 V AC +/–10% 50/60 Hz.
BBD6-4100	BBD6 control unit only. Requires 100 to 240 V AC +/–10% 50/60 Hz.
BBD6S-4100	Higher-resolution BBD6 control unit only. Requires 100 to 240 V AC +/–10% 50/60 Hz.
BBD6-4200	Includes the BBD6 control unit and Active Head. Requires 100 to 240 V AC +/–10% 50/60 Hz.
BBD6S-4200	Includes the BBD6S control unit and active head. Requires 100 to 240 V AC +/–10% 50/60Hz.
P2-45200	Active head; power is supplied by the EMP6 or BBD6 or BBD6S control box.

FEATURES

Table 1: List of features for the EMP6/BBD6

FEATURE	EMP6	BBD6	BBD6S
Mains power option (factory configuration)	✔	✔	✔
DC power option (factory configuration)	✔		
Two adjustable alarm levels	✔	✔	✔
Two relay outputs to indicate alarm, with change-over contacts	✔	✔	✔
Adjustable relay activation delay	✔	✔	✔
Relay failsafe/normal modes	✔	✔	✔
20-LED dust level display	✔	✔	✔
Active Head self-test	✔	✔*2	✔*1
Active Head self-test external activation input	✔		
Active Head self-test relay output	✔	✔	✔
External alarm relay activation input	✔		
4 to 20 mA dust level output	✔		
0 to 10 V dust level output	✔		
Dust level logging	✔		

Notes:

*1 Calibration on the BBD6S can only be read off the bar graph display, visual resolution of 0.2 mg/m^3. This resolution is indicative only and not meant to meet legislation.

*2 Calibration on the BBD6 can only be read off the bar graph display, visual resolution of 1 mg/m^3. This resolution is indicative only and not meant to meet legislation.

INSTALLATION

PLANNING YOUR INSTALLATION

Temperature Considerations

CAUTION

Active Head probe-insertion temperature should be less than 200°C (390°F).

The equipment (Active Head and EMP6/BBD6/BBD6S control box) ambient temperature (including temperature rise due to ducting) must not exceed 60°C (140°F).

If in doubt, contact Pentair Environmental Systems to ensure that your proposed installation is suitable.

Mounting Positions

Choose a mounting position for the Active Head which satisfies these criteria:

In a straight section of metal duct, at least 5 diameters after or 2 diameters before any bend or screen, about 2 diameters before any isokinetic sampling point, at right angles, even further from dampers, fans, away from high vibration, ambient temperature or direct radiation, with probe axis perpendicular to the gas flow.

Grounding of the Duct Material

If possible, replace any insulating material (particularly plastic) which comes into contact with the gas flow, with grounded metal.

Ensure that every part of the duct and all metal exposed to the gas flow (e.g. inspection covers, fan and damper blades, isokinetic probes) are grounded.

Should there be any ungrounded metal or insulating material in contact with the gas stream, ensure that it is electrically screened from the probe (e.g. by an intermediate, grounded, welded mesh screen).

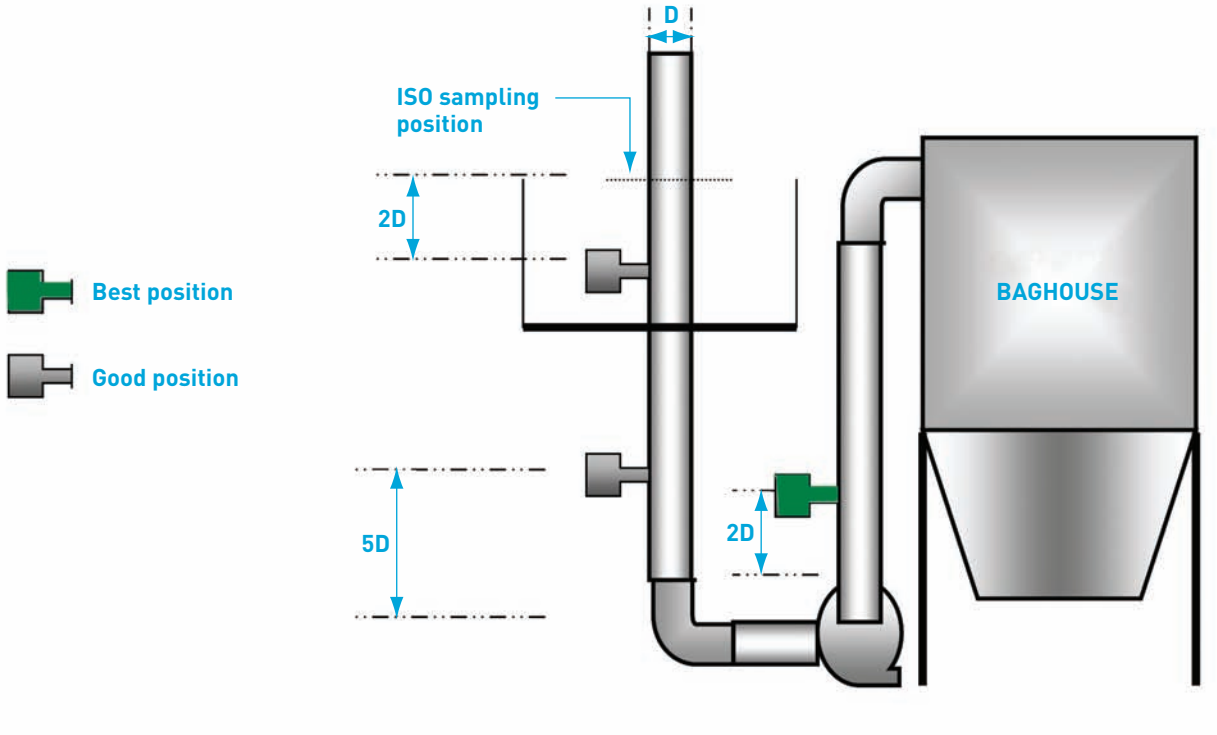
If in doubt, consult Pentair Environmental Systems.

Particle Moisture

The Active Head should be mounted as far from the moisture source as possible, so that water droplets have evaporated and the dust surface has dried.

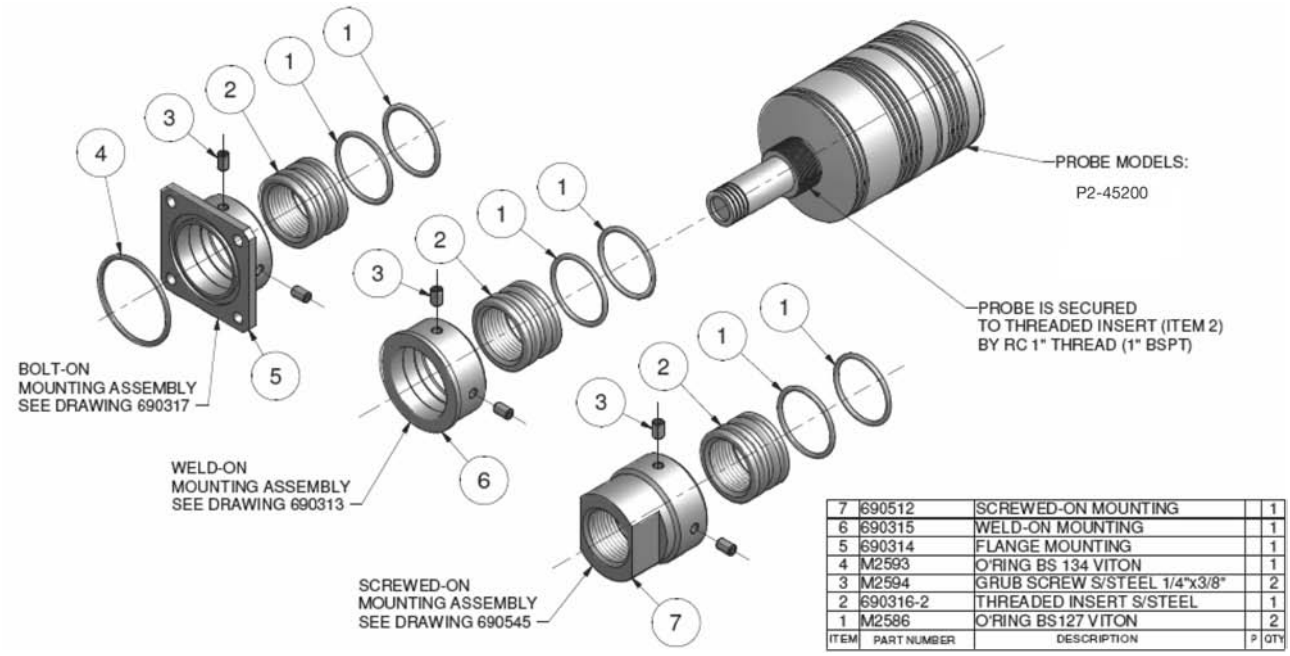
If the humidity is above 80% or unstable, water droplets may appear momentarily and be detected, increasing errors.

Figure 3: Recommended mounting positions



ACTIVE HEAD INSTALLATION

Figure 4: Duct installation products



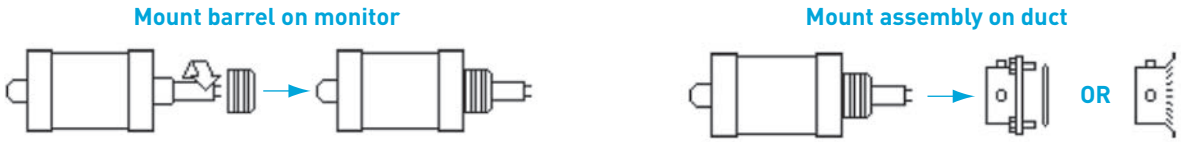
ITEM	PART NUMBER	DESCRIPTION	P	QTY
7	690512	SCREWED-ON MOUNTING		1
6	690315	WELD-ON MOUNTING		1
5	690314	FLANGE MOUNTING		1
4	M2593	O'RING BS 134 VITON		1
3	M2594	GRUB SCREW S/STEEL 1/4"x3/8"		2
2	690316-2	THREADED INSERT S/STEEL		1
1	M2586	O'RING BS127 VITON		2

Installation

Cut a 30 mm hole in the duct, and either:

- Weld on a plain 1-inch BSPT female bush (firmly hand-tighten the monitor in the bush);
- Weld on the Weld-on Mount Kit P2-60202-SS; or
- Weld on a flange to suit Bolt-on Mount Kit P2-60203-SS.

Figure 5: Mount Kit Installation Examples



If a mount kit is to be used, it will include a metal barrel with a 1-inch BSP thread inside to suit the monitor, and two Viton O-rings outside to seal into the adapter. Screw the monitor firmly into the barrel with the chamfer outwards (see Figure 5).

Either bolt the bolt-on adapter P2-60203-SS to the duct (using the supplied Viton O-ring to seal), or weld the weld-on adapter P2-60202-SS to the duct. Then press the monitor/barrel assembly into the adapter, apply thread sealant to the grub screws and tighten them.

Note: Refer to the *Reference* section for detailed drawings (page 21).

EMP6/BBD6 INSTALLATION

Wiring may only be undertaken by a qualified and licensed practitioner.

The Front Panel must remain fitted at all times while the unit is connected to a power source.

CAUTION

Incorrect wiring could destroy the EMP6/BBD6/BBD6S and devices connected to it. Always double-check connections.

In some industrial plants where the earthing is poor or large electrical currents or large magnetic fields are present, or near arc welding, different earth locations may exhibit different potentials, causing instrumentation cabling to carry large currents, burn out and cause a fire.

Non-isolated instrumentation can suffer internal damage from earth-potential differences greater than 3.5 V RMS or 5 V peak. Avoid any possibility of these circumstances, and ensure that arc welding is performed ONLY where the instrument is NOT connected to the work piece.

When a cable is not connected to anything, it can carry high induced voltages which, while not necessarily dangerous to humans, are nonetheless dangerous to electronic devices. When such a cable is plugged or wired into the first device, the accumulated energy is discharged into the device. To avoid damage, it is good practice to momentarily discharge any accumulated charge on the cable screen to ground, e.g. by shorting the two with a multimeter lead.

The human body can accumulate a high electrostatic charge while walking or standing next to high-voltage electrical equipment. Therefore, avoid any electrical contact with the pins on the network header, either directly or indirectly via a screwdriver blade. If there is a possibility that electrostatic discharge might occur to the terminals, all care should be taken to ensure no discharge occurs.

Wire Rating

All connections in the control unit are made using Phoenix Combicon two-piece (pluggable) spring connectors. The Active Head uses a Phoenix Combicon two-piece (pluggable) screw connector.

These connectors are suitable for wire gauges from 0.5 mm^2 to 4.0 mm^2 or 24 to 12 AWG.

The insulation stripping length is 10 mm.

POWER SUPPLY

Refer to Figure 6, connector 12 below.

CAUTION

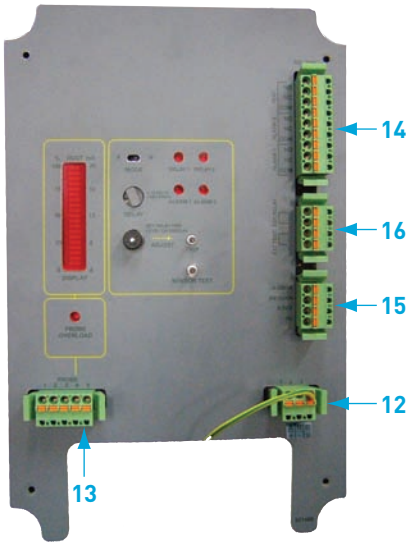
The EMP6/BBD6/BBD6S must be suitable for the available supply voltage. Check that the supply marked on the front panel matches the available supply.

The available supply must be:

Mains AC powered for EMP6-4100, BBD6-4100 & BBD6S-4100:
100 to 240 V AC +/–10% 50/60 Hz.
DC powered for EMP6-3100:
18 to 32 V DC regulated +/–10%.

Please note: All wire colours are subject to local legislation.

Figure 6: EMP6 Display



Note: Refer to pages 10–13 for descriptions of items in Figure 6.

The power connections are as follows:

EMP6-4100/BBD6-4100/BBD6S-4100 (Mains AC powered) 110/240 V AC

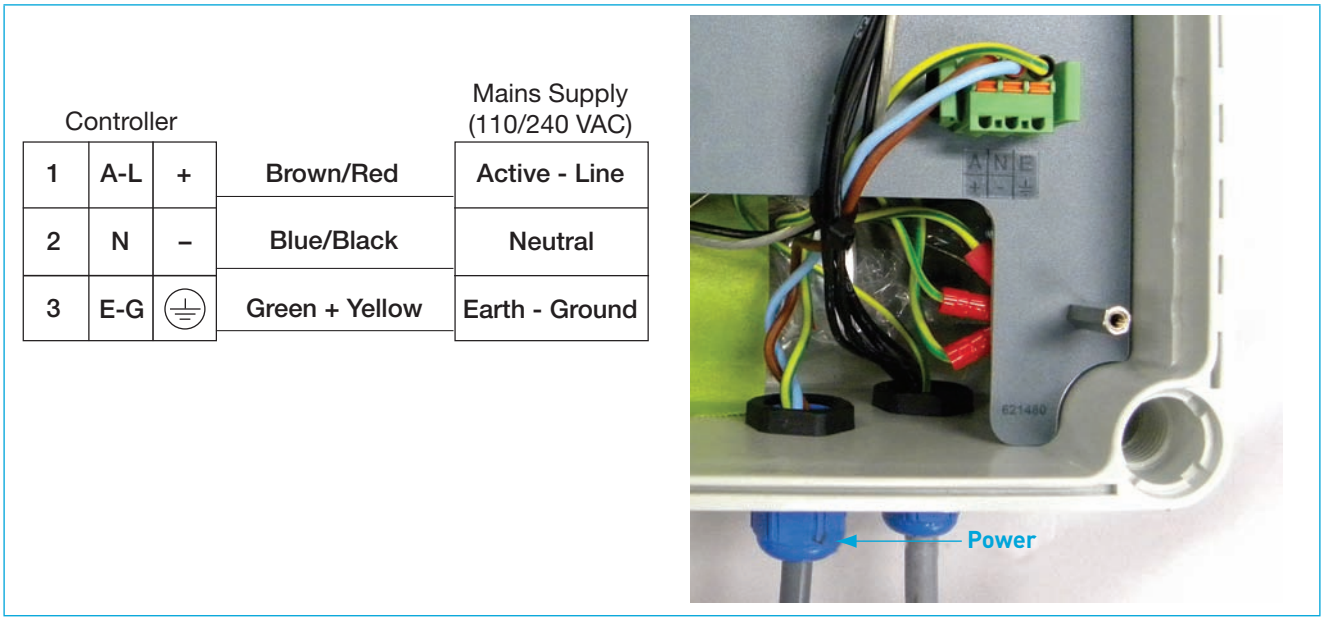
LABEL		WIRE COLOUR	POWER TERMINAL
(A-L/+)	1	Brown/Red	Active/Line
(N/–)	2	Blue/Black	Neutral
(E-G/⏚)	3	Green and Yellow	Earth/Ground

Recommended wire gauge: 2.5 mm^2 to 4.0mm^2 (14 to 12 AWG).

The primary earth connection point is the threaded stud on the inside of the front panel. This must be the first point that electrical earth is connected to. Pin 3 on the power connector should be connected to this earth stud.

CAUTION
If the mains connection is hard wired, a disconnect device must be fitted adjacent to the EMP6/BBD6/BBD6S.

Figure 7: AC wiring

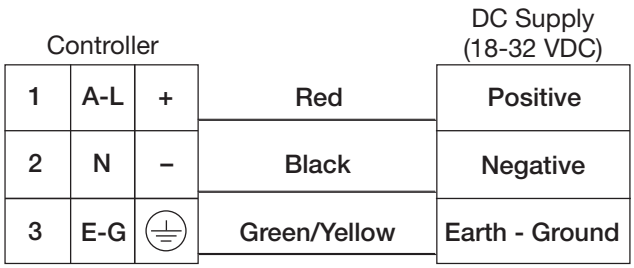


EMP6-3100 (DC powered)

LABEL	WIRE COLOUR	POWER TERMINAL
1	Red	Supply positive
2	Black	Supply negative
3	Green and Yellow	Earth/Ground

Recommended wire gauge: 1 mm^2 (18 AWG).

Figure 8: DC wiring



Active Head Connection

Refer to Figure 6, connector 13 on the image on page 9.

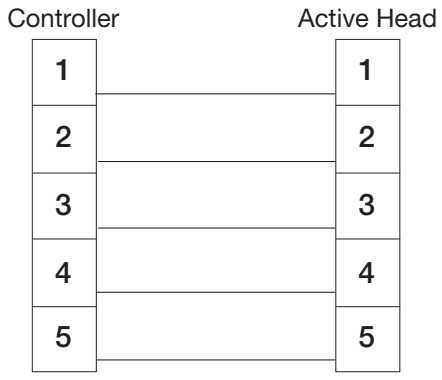
The Active Head ground terminal MUST be connected to a local earth.

Connect the Active Head to the control box using the following table.

LABEL	WIRE COLOUR	TERMINAL
1	White	RS-485 +
2	Green	RS-485 –
3	Drain Wire	Screen
4	Black	0 V supply to Active Head
5	Red	+12 V supply to Active Head

Note: The wire colours on the above table refer to the Belden 9534 cable.

Figure 9: Connection between Active Head and control box



CAUTION

The control box provides power to the Active Head. Do not attempt to connect pins 4 and 5 to a supply voltage.

WARNING

RS485 + and – connections must be connected using the one twisted pair, and the polarity must be correct.

RS485 cabling problems are one of the most common causes of data communication problems and system unreliability. If the connections are wrong, the installation will probably still work; however, there may be a high level of data errors and unreliability.

It is the installer's responsibility to ensure that connections are correct.

Relay Outputs

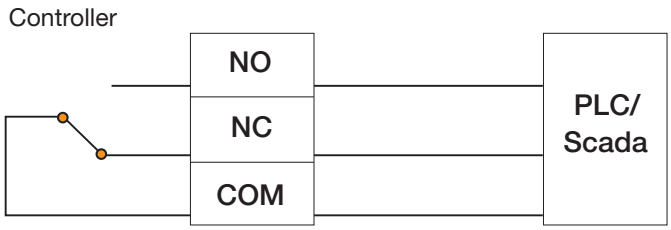
Refer to Figure 6, connector 14 on the image on page 9.

The connection of each Relay Output is as follows:

TERMINAL	DESCRIPTION
NO	Normally Open Contact
NC	Normally Closed Contact
COM	Common Contact

Refer to the Description section to determine the appropriate connection for your installation.

Figure 10: Alarm Relay contacts



Analogue Outputs (EMP6 only)

Refer to Figure 6, connector 15 on the image on page 9.

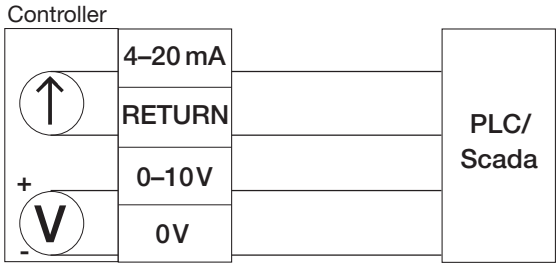
The Analogue Output connections are as follows:

TERMINAL	DESCRIPTION
4 to 20 mA	4 to 20 mA drive. Connect to load +
RETURN	4 to 20 mA return. Connect to load –
0 to 10 V	0 to 10 V output positive
0 V	0 to 10 V output negative

Note: The 4 to 20 mA load resistance may be no higher than 470 ohms.

The 0 to 10 V load should be high-impedance isolated.

Figure 11: 4 to 20 mA and 0 to 10 V output



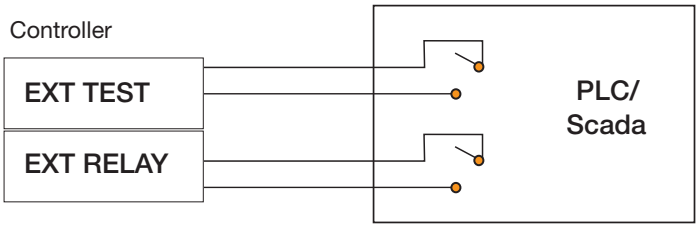
External Inputs (EMP6 ONLY)

Refer to Figure 6, connector 16 on the image on page 9.

The External Input connections are as follows:

EXT TEST	Short these terminals together to activate the EXT TEST function (e.g. using a relay).
EXT RELAY	Short these terminals together to activate the EXT RELAY function (e.g. using a relay).

Figure 12: External inputs



FUNCTIONS

POWER SUPPLY

The EMP6 is available in either low-voltage DC or mains AC-powered configurations. This is a factory build option, and may not be changed in the field. The BBD6/BBD6S is only available in the mains AC-powered configuration. The power supply for each unit is indicated on the front panel.

Figure 13: Location of power supply information

Power supply panel

DUST LEVEL DISPLAY

The EMP6/BBD6/BBD6S reads the dust level reported by the Active Head, and displays the level on the 20-segment LED bar graph.

ANALOG OUTPUTS (EMP6 ONLY)

The EMP6 has two analogue outputs, which indicate the current dust level. The outputs are 4 to 20 mA and 0 to 10 V.

DUST LEVEL LOGGING (EMP6 ONLY)

The EMP6 includes an SD memory card which stores dust level readings in real time. It is located at the front of the control unit baseboard (Figure 2, item 10, page 4).

The logging interval is programmed using the SPController application, which can be downloaded from the Pentair Environmental Systems website at: *http://www.cleanairsystems.com/tes_downloads/emissio]n#emission (located on the right-hand side of the page under Software Downloads, entitled 'EMP6 Controller Set Up'). This software requires Windows XP, Vista or Windows 7 to operate.*

Initialising the Data Logger

With the serial communications cable provided (taped to the inside of the control box), connect the EMP6 (Figure 2, item 11, page 4) to a computer with the SPController program installed.

From the PC Start menu, locate the EMP6 folder and launch the SPController application. A screen, similar to the one shown in Figure 14, should appear. Ensure that the Com Port number matches the RS232 port on the PC.

Within SPController, you can set the internal clock and the logging intervals on the SD card.

- Logging rate: Displays how frequently the control unit will log data to the SD card.
- Real Time Clock: Displays the time and date.
- Poll: Reads and displays the control unit's internal clock/logging rate.
- Set: Sets the control unit's date and time/logging rate.
- Com Port: Sets the communication port on the PC.

If 'Set' was selected in the above example, the control unit would log data every minute, starting from 6:40:28 a.m. on 30th July, 2008.

Reading the Logged Data

To read the logged data, power down the EMP6 and isolate from the supply. Remove the SD card and read the data using a standard SD Card reader on a PC.

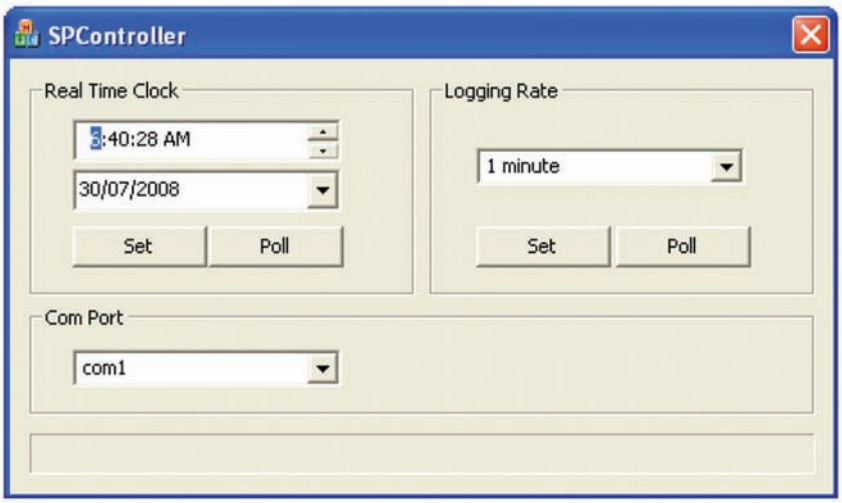
The file generated on the SD card is a CSV file which can be opened in Excel. Each line in this file represents one logged interval. It logs the date (DD/MM/YYYY) and time (HH:MM:SS) in 24-hour time, averaged reading over the logged interval (XXX.XX%) and whether relay 1 or relay 2 was active at any time during the logged interval (1 or 0).

An example of a reading:

20/01/2009 19:22:28 62.00% 1 0

This shows that on 20th January, 2009 at 7:22 p.m., the control box recorded an average reading of 62% over the logged interval. During this interval, relay 1 was active, whereas relay 2 was not.

Figure 14: SPController display



If an external relay is read by the control unit at any time during the logging rate, the SD card would log the event:

20/01/2009 10:09:10 'External Relay'

When the sensor test is activated, the unit enters into self-test mode immediately and records a span check, as in the example below:

20/01/2009 9:35:42 49.85% 'Sensor Test'

If communications with the Active Head fail, the error is logged:

20/01/2009 10:42:59 'Probe Fail'

The following table is a guide of the time it takes an SD card with a memory capacity of 1 Gigabyte to fill up at various logging rates.

LOGGING RATE	1GB SD CARD WILL LAST
1 minute	22 days
15 minutes	11 months
1 hour	44 months

Note: This table is meant to be used as a guide only.

If the SD Card becomes full, the oldest entries will be overwritten by the new entries.

Note: High-density SD cards are not compatible with the EMP6.

DUST LEVEL ALARMS

The EMP6/BBD6/BBD6S supports two user-configurable dust level alarms. If the dust level exceeds the alarm level, an alarm condition will occur.

Note: To set the dust level alarm, refer to the *Quick Reference* section: Setting the Alarm Levels on page 4.

As soon as an alarm condition exists, the corresponding ALARM LED will indicate.

The first LED can indicate alarms for the BBD6S.

RELAY LEDS

When an alarm occurs, the corresponding Relay LED will indicate after the user-specified DELAY period. The DELAY period can be adjusted by the delay switch (item 5, Figure 1, page 4). It may be set between 0 and 18 seconds in two-second intervals. Note that the Relay LED indicates the actual state of the relay.

Each Relay LED has a corresponding output relay, with normally open (NO) and normally closed (NC) contacts.

EXTERNAL ALARM ACTIVATION (EMP6 ONLY)

When the EXT RELAY contacts are shorted, the Alarm Relays will go into the alarm state. This allows an external device to cause an Alarm condition.

FAILSAFE MODE

When the MODE switch is set to Failsafe (F), the Alarm Relays will be de-energised in an Alarm condition and energised when an Alarm does not exist. This means that if the EMP6/BBD6/BBD6S loses power, the relays will de-energise, which will signal an Alarm condition.

In Normal mode (N) the Alarm Relays are energised during an Alarm condition, and de-energised when an Alarm does not exist.

Note: The TEST relay is not affected by the Failsafe switch.

ACTIVE HEAD SELF-TEST (ZERO & SPAN)

If the application demands verification of the calibration of the Active Head, an external setup to the installation is required to initiate an automatic self-test, such as a relay and timer connected to the EMP6 'EXT TEST' relays. This self-test can be conducted periodically as required by local legislation.

The self-test is an independent Electronic Dust Signature (EDS, an artificial emission signal) built into the Active Head and is activated when:

- the EMP/BBD6 is powered up;
- the SENSOR TEST button on the EMP6/BBD6 is pressed (Figure 1, item 8, page 4); and/or
- the 'EXT TEST' pins on the EMP6 are shorted out (Figure 6, connector 16, page 9).

For the EMP6, the self-test can be read the same as any emission signal over the 4 to 20 mA, 0 to 10 V output and logged on the SD card. For the EMP6 and BBD6 the output can be read over the LED bar graph display; however, the LED display is indicative only and is not accurate enough to meet local legislation.

The Active Head's calibration can be monitored by checking the deviation between each self-test; however, all test values should be between 40% and 60%. Should a test result produce a value outside of this range, or indicate any significant drift, it is advised to repeat the test to eliminate any external influence. Should a drift be evident with the system, please contact Pentair Environmental Systems.

For accurate results, it's required that during the self-test no emissions such as dust passing near the probe are present, as the values will be affected. Similarly, if these tests are conducted outside of a duct, electrostatic interference (e.g. from human movement, laser printers, etc.) may elevate the test value, or mains interference may swamp the preamplifier and reduce the test value. To avoid these effects, it is recommended that:

- the Active Head is detached from the probe and removed from the stack;
- the emission reading has settled before running the self-test; and
- the Active Head remains properly grounded while running the self-test.

The SD card does not log a zero when the unit performs a self-test; however, a zero check for calibration purposes can be recorded via the 4 to 20 mA/0 to 10 V output.

SPECIFICATIONS

STANDARD CONDITIONS

ACTIVE HEAD	
Ambient Temperature:	–20°C to 60°C (–4°F to 140°F) for electronics
Vibration:	1 G (10 m/s^2) RMS max. continuous, any direction or frequency (with short or separately supported wire rope probe)
Environment:	IP66/NEMA4, ATEX II 3D&G non-corrosive (aluminium alloy body, stainless steel inserted parts).
Duct Gas Pressure:	100 kPa (15 PSI) gauge max.
Duct Gas Temperature:	–20°C to 200°C max. (–4°F to 390°F) standard models, higher temp. to order
Purge Air Pressure:	400 kPa (60 PSI) max.
Duct Gas Velocity:	5 m/s to 30 m/s (16 ft/s to 98 ft/s (virtually unlimited with appropriate probe installation))
Particle Size:	0.1 µm to 1000 µm (wider with some changed characteristics)
Duct Size:	50 mm to 10 m diameter (2 in to 33 ft [using the appropriate probe options])
Humidity:	0 to 80% non-condensing
Magnetic Field:	60 A/m max. at 50 Hz (= 50 Ampere-turns in a 1 m x 1 m square coil)

CONTROL UNIT	
Ambient Temperature:	–20°C to 60°C (–4°F to 140°F) for electronics
Environment:	Plastic Composite ATEX II 3D&G enclosure, IP66/Nema 4

MECHANICAL

ACTIVE HEAD	
Purge Air:	RC 1/8 inch or NPT 1/8 purge air connection point is provided. Periodically pulsed purge air may reduce particulate build-up
Probe:	Removable, M8 thread fitting. 300 x 5 mm stainless steel wire cable is standard. Probe length and type in accordance with installation requirements
Probe Options:	Wire cable (standard), solid rod, tubular, extendable, PTFE coated, tubular ceramic, wear-resistant alloys, multiple supports, any length
Probe Mounting:	1-inch male BSPT requires 1-inch female pipe fitting on duct (optional quick-disconnect).
Cable Glands:	1 x PG7, cable range 3.5 to 6.0 mm (0.138″ to 0.236″)

CONTROL UNIT	
Cable Glands:	2 x M12 cable glands, cable range 3.0 to 6.5 mm (0.118″ to 0.256″) 2 x M16 cable glands, cable range 5 to 10 mm (0.197″ to 0.394″)

ELECTRICAL

ACTIVE HEAD	
Power supply:	Powered from Control Box via 4-core screened data cable (Maximum recommended cable length for the Belden 9534 cable is 200 m.)

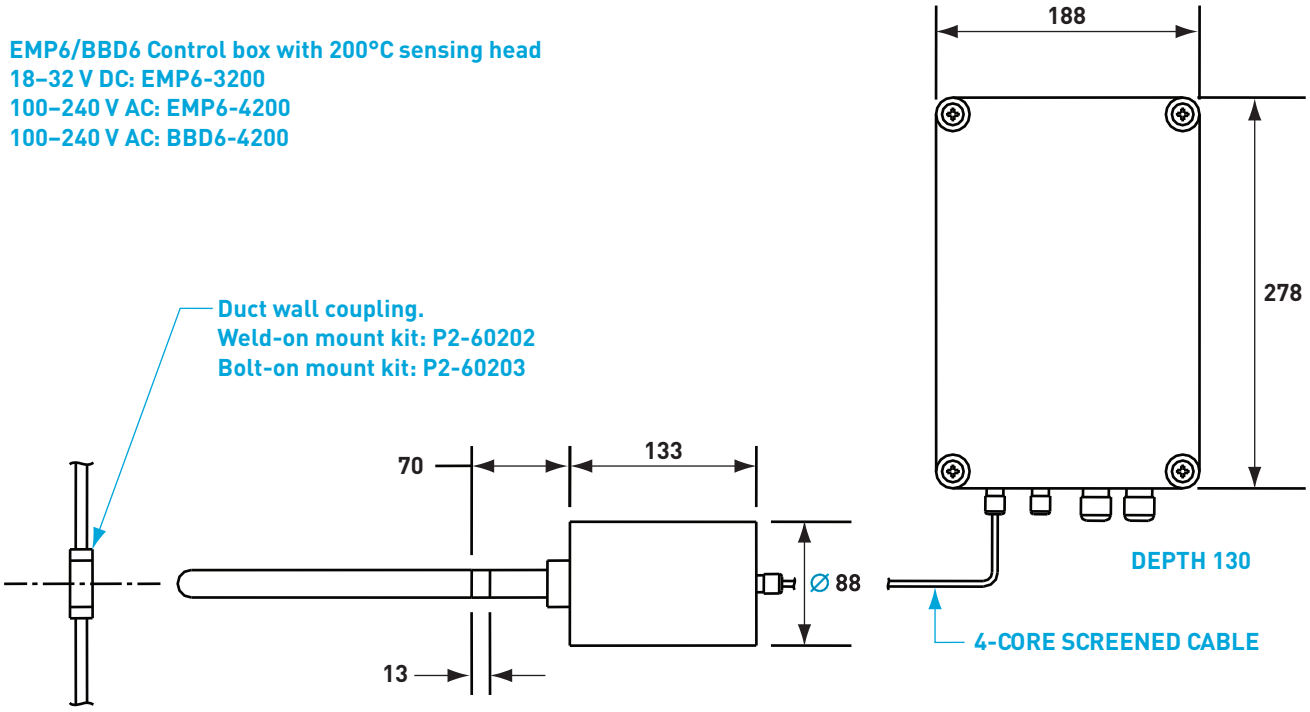
CONTROL UNIT	
Power Supply:	AC EMP6/BBD6: 100 to 240 V AC +/–10% 50/60 Hz (12 VA) DC EMP6: 18 to 32 V AC regulated +/– 10% (0.3 A max.)
Alarm Outputs:	Alarm 1, Alarm 2 and Test Relays Resistive load: 8 A/30 V DC, 8 A/250 V AC Inductive load: 3.5 A/30 V DC, 3.5 A/250 V AC
Replacement Fuse:	DC-powered EMP6, 2A-T TE5 series anti-surge AC Mains variants, 1A-T 20 x 5 mm ceramic anti-surge HRC (one per phase) *Important: Replace only with the same type and rating of fuse.*

EMISSION SIGNAL

ACTIVE HEAD & CONTROL UNIT	
Resolution:	Typical, at max. gain 1.0 mg/m^3 on the bar graph display (0.2 mg/m^3 on BBD6S) 0.001 mg/m^3 on the SD card as well as on the 4 to 20 mA and 0 to 10 V DC outputs
Zero Drift:	Better than 0.3% of range per year Better than 0.3% of range over specified temperature range
Gain Drift:	Better than 1% of range per year Better than 1% of range over specified temperature range
Circuit Linearity:	Better than 1% of range
Gain Switch:	Three positions (located on the Active Head): High (0 to 20 mg/m^3), Medium (0 to 150 mg/m^3) Low (0 to 1000 mg/m^3). Nominal only: depends on material velocity, geometry For BBD6S High (0 to 4 mg/m^3).

All controller components are high stability, rated for –20°C to +60°C industrial temperature range (no trim pots).

Figure 15: Control Unit and Active Head Mounting Dimensions



MAINTENANCE

It is desirable to periodically remove, inspect and clean the inserted parts of the Active Head. Maintenance frequency should be determined based on the material characteristics.

After initial installation, the Active Head should be removed and inspected weekly, and then monthly to gain a working knowledge of the interval that would be required for maintenance.

Your local Pentair Environmental Systems office can aid in this process.

INSPECTION

This is a visual inspection to ensure that the system is in good working order.

As these devices are typically mounted outdoors, inspection of cabling, moisture ingress and general condition of the monitor is vital.

Things to look for are:

- moisture ingress into the body of the monitor;
- warn or frayed cabling;
- any burn marks on termination;
- tightening of all screws (terminals, lid, probe shaft, etc.); and
- particulate build-up on the sensor front end and probe shaft.

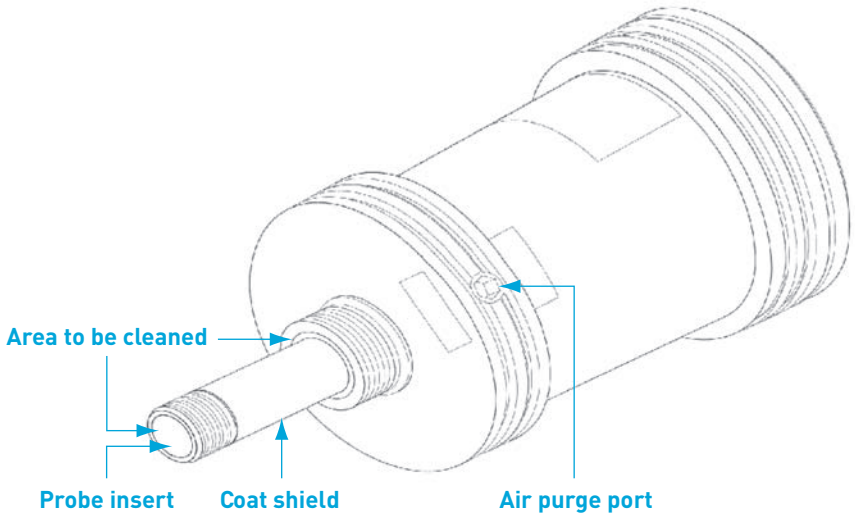
CLEANING

Cleaning of the probe is a vital part of the maintenance process to ensure that no bridging occurs between the probe shaft and any grounded material.

Particles can build up across the probe shaft to the 'coat shield' and even to the duct wall, resulting in a LOW reading from the monitor.

To clean the monitor it needs to be removed from the stack and all inserted parts cleaned with compressed air. See images below for components to be cleaned.

Figure 16: Components to be cleaned on the Active Head



Air purging can help to minimise the frequency of cleaning.

ACTIVE HEAD PURGING

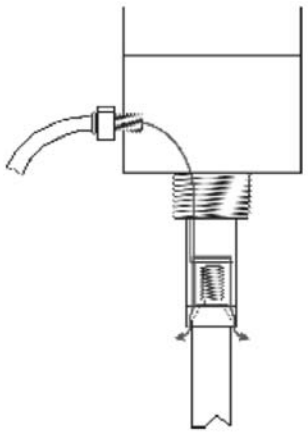
PARTICULATE BUILD-UP

Particulate build-up on the probe itself can be minimised by the use of PTFE-coated probes (consult Pentair Environmental Systems); however, build-up on the probe will not cause errors in any case. Build-up across the insulation barrier from the probe to the earthed metalware will, however, progressively attenuate the emission signal, so it should be avoided where possible. A low-level alarm can be configured to detect this condition.

CONNECTING THE PURGE AIR

If build-up across the insulators is considered to be a potential problem, then the purge port must be connected to a source of periodically pulsed, clean, dry instrument air to dislodge recently deposited particles. The pulsed air will flow as indicated in Figure 17 below. NEVER exceed the rated pressure of the purge port (400 kPa/60 Psi), or over-tighten the air fitting. If the purge facility is not used, the original sealing plug and O-ring must be fitted at all times.

Figure 17: Purge function



CORROSIVE GASES

If the gas is corrosive, it should not be allowed to enter the body of the monitor; in these circumstances the purge air path can be sealed off completely by a plug inserted before the probe is screwed in (please see the supplier).

PROBE OPTIONS

The Emission Monitor Active Head is widely adjustable; however, probe length also has a significant effect on sensitivity, so choose the probe length according to these recommendations:

- Below 1 mg/m^3: 0.8 duct diameters
- Above 100 mg/m^3: 0.1 duct diameters
- Otherwise: 0.5 duct diameters

Probes are made from stainless steel wire rope; however, the more traditional solid stainless steel rod is also available on request.

Wire rope has a number of advantages over solid rod:

- The surface texture and small diameter minimise downstream gas-flow disturbances to flow transmitters, isokinetic sampling probes, etc.
- The high internal damping eliminates resonance effects which can damage probes and Emission Monitors.
- The inherent sagging minimises the probability of a probe unscrewing itself in operation.
- The wire strands slide slightly against each other with normal movement of the probe in the gas stream, which tends to dislodge accumulated matter.

Wire rope probes are commonly fitted in one of these forms:

- Cantilevered probe 0 to 800 mm: use a simple wire rope probe alone.
- Probe 800 to 2000 mm total: supported on opposite side by P2-60230 support head.
- Probe above 2000 mm: string the probe across the duct with egg insulators in line at both ends, and strong supports. Add another short section of stainless steel wire to connect the Emission Monitor to the probe.

Alternatively, consult Pentair Environmental Systems to discuss other probe options including: rigid rod, PTFE coated rod, rod or rope in wear-resistant material.

TEMPERATURE OPTIONS

The monitor may be mounted via an extension tube such as the high-temp. kits P2-60205 (300 mm) or P2-60210 (450 mm). A reflective metal heat shield (e.g. 400 mm dia. ss) may be clamped along the extension tube using two nuts on the threaded exterior of the tube.

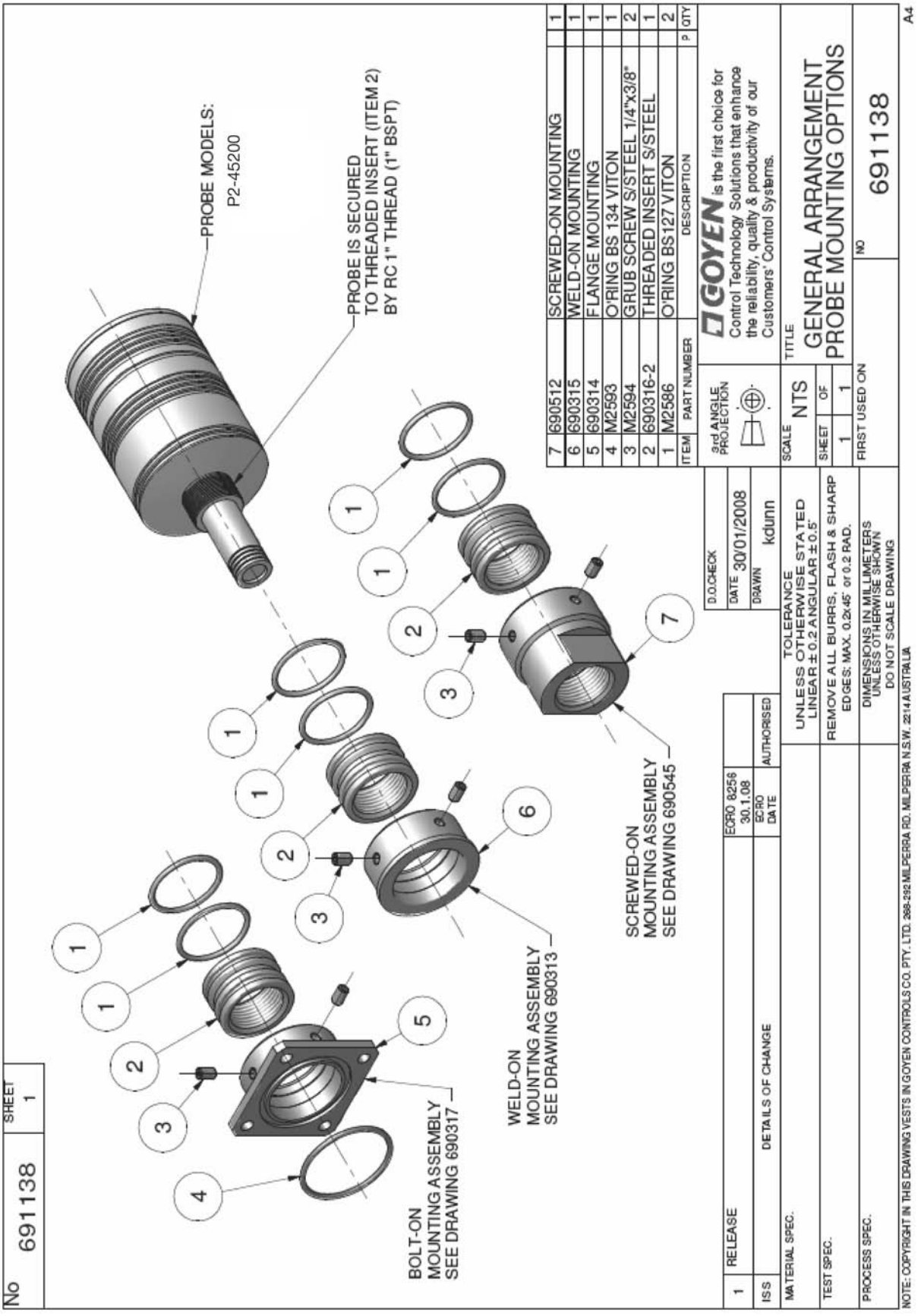
Provided the gas path is at negative pressure and non-toxic (the usual case for a stack) and the emission monitor body is protected from rain or other contaminants, the monitor may be cooled by drilling several holes around the outermost end of the extension tube, thus allowing ambient air to coat the emission monitor's nose and part of the probe. By these means it is possible to use monitors rated for 200°C (390°F) max. insertion temperature at gas temperatures of up to 500°C (P2-60205) or 600°C (P2-60210).

MOUNTING OPTIONS

If a quick-release tapping point is required, the Bolt-on Mount Kit P2-60203-SS or the Weld-on Mount Kit P2-60202-SS (see Figure 5 on page 8) can be used.

REFERENCE

MOUNTING ASSEMBLY DRAWINGS



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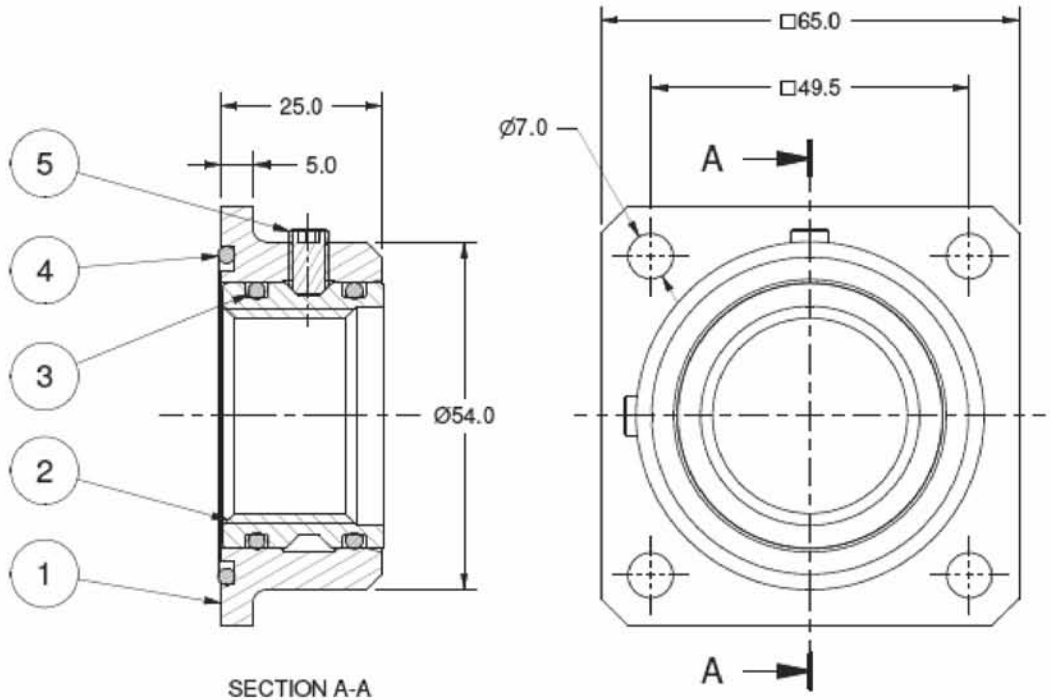
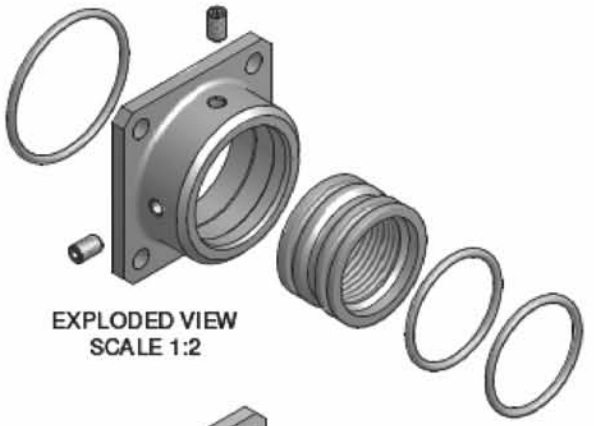


SECTION A-A
SCALE 1:1



EXPLODED VIEW
SCALE 1:2

ASSEMBLED VIEW
SCALE 1:2

MODEL: P2-60203-SS

ITEM	PART NUMBER	DESCRIPTION	P	QTY
5	M2594	1/4"x3/8" GRUB SCREW S/STEEL		2
4	M2593	O'RING BS134 VITON		1
3	M2586	O'RING BS127 VITON		2
2	690316-2	THREADED INSERT		1
1	690314	FLANGE MOUNTING		1

ISS	DETAILS OF CHANGE	ECRO DATE	AUTHORISED
2	REDRAWN IN INVENTOR 690316-2 WAS 690316	ECRO 8256 16.1.08	
1	PRODUCTION RELEASE	ECRO 4289 15.6.94	RRB

D.O.CHECK
DATE 16/01/2008
DRAWN kdunn

3rd ANGLE PROJECTION

GOYEN is the first choice for Control Technology Solutions that enhance the reliability, quality & productivity of our Customers' Control Systems.

MATERIAL SPEC.

TEST SPEC.

PROCESS SPEC.

TOLERANCE
UNLESS OTHERWISE STATED
LINEAR ± 0.2 ANGULAR ± 0.5°

REMOVE ALL BURRS, FLASH & SHARP EDGES: MAX. 0.2x45° or 0.2 RAD.

DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE SHOWN
DO NOT SCALE DRAWING

SCALE 1:1
SHEET 1 OF 1
FIRST USED ON

TITLE
BOLT-ON PROBE MOUNTING ASSEMBLY

NO 690317

A4

No	SHEET
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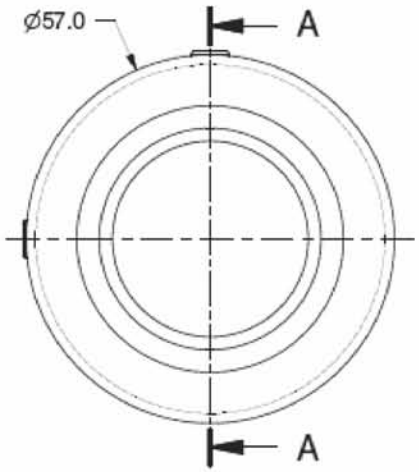

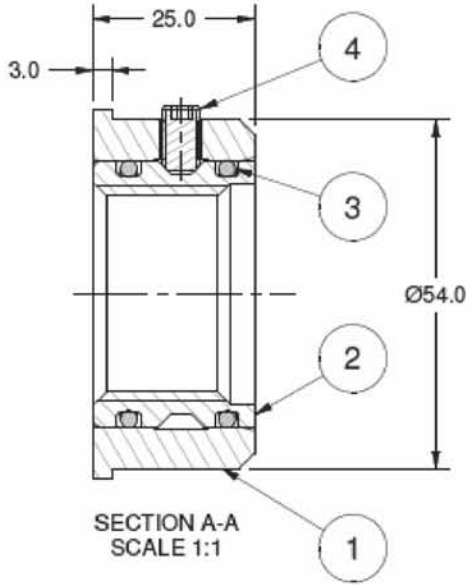

SECTION A-A
SCALE 1:1

EXPLODED VIEW
SCALE 1:2

ASSEMBLED VIEW
SCALE 1:2

MODEL: P2-60202-SS

ITEM	PART NUMBER	DESCRIPTION	P	QTY
4	M2594	1/4"x3/8" GRUB SCREW S/STEEL		2
3	M2586	O'RING BS127 VITON		2
2	690316-2	THREADED INSERT		1
1	690315	WELD-ON PROBE MOUNTING		1

ISS	DETAILS OF CHANGE	ECRO DATE	AUTHORISED
2	REDRAWN IN INVENTOR 690316-2 WAS 690316	ECRO 8256 16.1.08	
1	PRODUCTION RELEASE	ECRO 4289 16.6.94	RRB

D.O.CHECK
DATE 17/01/2008
DRAWN kdunn

3rd ANGLE PROJECTION

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MATERIAL SPEC.

TEST SPEC.

PROCESS SPEC.

TOLERANCE
UNLESS OTHERWISE STATED
LINEAR ± 0.2 ANGULAR ± 0.5°

REMOVE ALL BURRS, FLASH & SHARP EDGES: MAX. 0.2x45° or 0.2 RAD.

DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE SHOWN
DO NOT SCALE DRAWING

SCALE 1:1

SHEET 1 OF 1

TITLE
WELD-ON PROBE MOUNTING ASSEMBLY

FIRST USED ON

NO 690313

A4

No	SHEET
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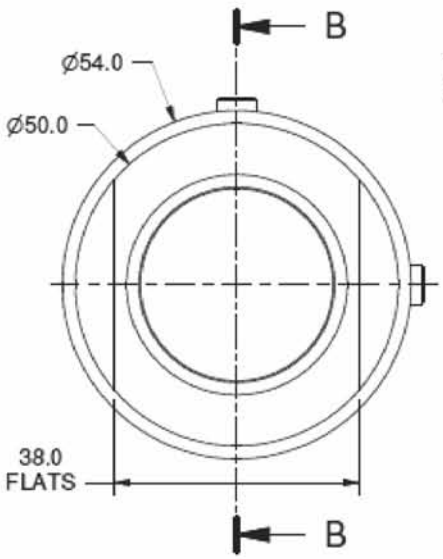
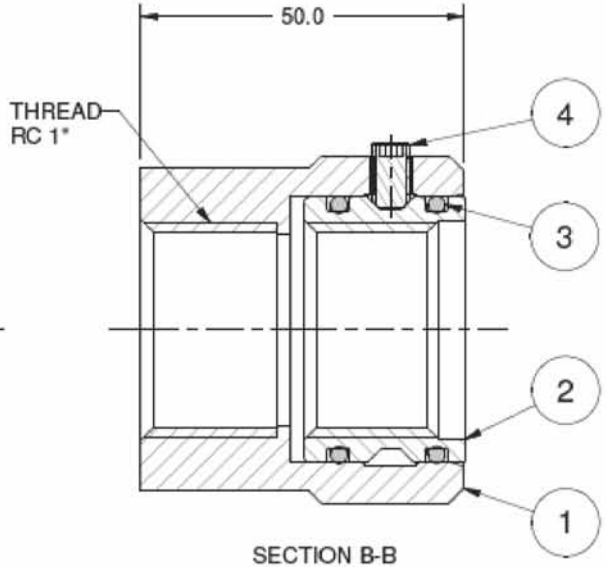
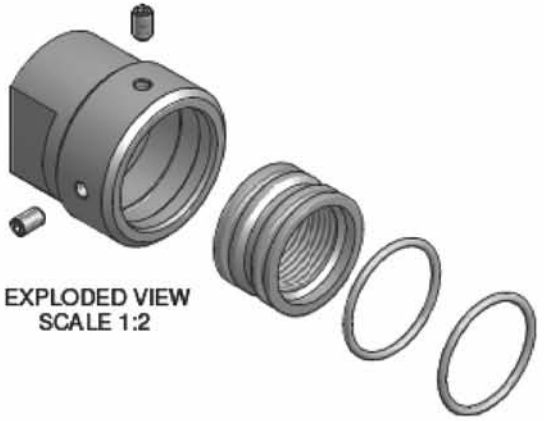




SECTION B-B
SCALE 1:1



EXPLODED VIEW
SCALE 1:2

ASSEMBLED VIEW
SCALE 1:2

MODEL: P2-60204-SS

ITEM	PART NUMBER	DESCRIPTION	P	QTY
4	M2594	1/4"x3/8" GRUB SCREW S/STEEL		2
3	M2586	O'RING BS127 VITON		2
2	690316-2	THREADED INSERT		1
1	690512	SCREWED-ON COUPLING		1

ISS	DETAILS OF CHANGE	ECRO DATE	AUTHORISED
2	REDRAWN IN INVENTOR 690316-2 WAS 690316	ECRO 8256 16.1.08	
1	PRODUCTION RELEASE	ECRO 5259 18.10.96	RRB

D.O.CHECK

DATE 14/12/2007

DRAWN kdunn

3rd ANGLE PROJECTION

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MATERIAL SPEC.

TEST SPEC.

PROCESS SPEC.

TOLERANCE
UNLESS OTHERWISE STATED
LINEAR ± 0.2 ANGULAR ± 0.5°

REMOVE ALL BURRS, FLASH & SHARP EDGES: MAX. 0.2x45° or 0.2 RAD.

DIMENSIONS IN MILLIMETERS
UNLESS OTHERWISE SHOWN
DO NOT SCALE DRAWING

SCALE 1:1

SHEET 1 OF 1

TITLE
SCREWED-ON PROBE MOUNTING ASSEMBLY

FIRST USED ON

NO 690545

A4

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE/S	REMEDY
No signal	No power to the device Incorrect input being read in data input device Probe shaft not connected Bridging of the probe shaft to ground	Apply power. Ensure that input connections have been made to the correct location. Connect probe shaft. Probe needs to be cleaned (see *Maintenance*).
Erratic signal	No earth wire connected Earth potential is above recommendation Loose connection to probe shaft Ambient temperature has exceeded the rating for the monitor/control unit (60°C, 140°F)	Connect external earthing lug to ground. Earthing point needs to be improved to eliminate high potential. Ensure that the probe shaft is tight. Steps need to be taken to ensure the temperature does not exceed the rating. Contact Pentair Environmental Systems for further assistance.
Probe overload LED remains on	Active Head and Control Unit not connected Damaged cables or bad connection Gain switch changed while unit was powered	Connect two devices together. Replace cables. Upgrade EMP6 or BBD6 to current firmware version. Down power and repower Active Head.
Device showing lower than usual signal	Emissions from the stack have decreased Bridging of the probe shaft to ground No probe shaft connected	Actual emissions have decreased. No action needs to be taken. Probe need to be cleaned (see *Maintenance*). Ensure probe shaft is connected and tight.

If the problem cannot be rectified by following these steps, contact Pentair Environmental Systems.

NOTES

NOTES

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EMP6, BBD6 and BBD6S Manual Rev01 04/14