

OPERATION MANUAL



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ESH-A Remote Sensor

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1 POLICIES

1.1 Important Note

Read and understand this manual prior to using this instrument. Carefully read the warranty policy, service policy, notices, disclaimers and revisions on the following pages.

This product must be installed by a qualified electrician or factory trained technician and according to instructions indicated in this manual. This instrument should be inspected and calibrated regularly by a qualified and trained technician.

This instrument has not been designed to be intrinsically safe. For your safety, **do not** use it in classified hazardous areas (explosion-rated environments).

INSTRUMENT SERIAL NUMBER:

PURCHASE DATE:

PURCHASED FROM:

1.2 Warranty Policy

Critical Environment Technologies Canada Inc. warrants the products we manufacture (excluding sensors, battery packs, batteries, pumps, and filters) to be free from defects in materials and workmanship for a period of two years from the date of purchase from our facility. Sensors are consumable items and once they leave our factory, we cannot reuse or resell them. As such, all sensor sales are final. Should the sensor itself be faulty, there is a one-year pro-rated warranty that would apply from the date of purchase from our facility.

The warranty status may be affected if the instrument has not been used and maintained as per the instructions in the manual or has been abused, damaged, or modified in any way. The product is only to be used for the purposes stated in the manual. Critical Environment Technologies is not liable for auxiliary interfaced equipment or consequential damage.

Prior to shipping equipment to CET, contact our office for an RMA #. All returned goods, regardless of reason, must be accompanied with an RMA number. Please read our Warranty and Returns Policy and follow our RMA Instructions and Form.

Due to ongoing research, development, and product testing, the manufacturer reserves the right to change specifications without notice. The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data.

1.3 Service Policy

CET maintains an instrument service facility at the factory. Some CET distributors / agents may also have repair facilities; however, CET assumes no liability for service performed by anyone other than CET personnel.

Repairs are warranted for 90 days after date of shipment (sensors have individual warranties). Should your instrument require non-warranty repair, you may contact the distributor from whom it was purchased, or you may contact

CET directly.

Prior to shipping equipment to CET, contact our office for an RMA #. All returned goods, regardless of reason, must be accompanied with an RMA number. Please read our Warranty and Returns Policy and follow our RMA Instructions and Form.

If the product is deemed repairable, for liability reasons, CET will perform all necessary repairs to restore the instrument to its full operating condition.

1.4 Copyrights

This manual is subject to copyright protection; all rights are reserved. Under international and domestic copyright laws, this manual may not be copied or translated, in whole or in part, in any manner or format, without the written permission of CET.

Modbus® is a registered trademark of Gould Inc. Corporation.

BACnet® is a registered trademark of American Society of Heating, Refrigeration and Air Conditioning (ASHRAE).

1.5 Disclaimer

Under no circumstances will CET be liable for any claims, losses or damages resulting from or arising out of the repair or modification of this equipment by a party other than CET service technicians, or by operation or use of the equipment other than in accordance with the printed instructions contained within this manual or if the equipment has been improperly maintained or subjected to neglect or accident. Any of the forgoing will void the warranty.

Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires. It is CET policy that all wiring of our products meet this requirement and all wiring be within properly grounded (earth or safety) conduit.

1.6 Revisions

This manual was written and published by CET. The manufacturer makes no warranty or representation, expressed or implied, including any warranty of merchantability or fitness for purpose, with respect to this manual.

All information contained in this manual is believed to be true and accurate at the time of printing. However, as part of its continuing efforts to improve its products and their documentation, the manufacturer reserves the right to make changes at any time without notice. In addition, due to improvements made to our products, there may be information in this manual that does not exist in the version of the product the user has. Should you detect any error or omission in this manual, or should you want to inquire regarding upgrading the device's firmware, please contact CET at the following address:

Critical Environment Technologies Canada Inc.

**Unit 145 - 7391 Vantage Way,
Delta, BC V4G 1M3 Canada**

Toll Free: +1.877.940.8741

Telephone: +1.604.940.8741

Email: help@cetci.com

Website: www.cetci.com

In no event will CET, its officers or employees be liable for any direct, special, incidental or consequential damages resulting from any defect in any manual, even if advised of the possibility of such damages.

The most up-to-date version of the manual will always be on our website.

2 SAFETY INFORMATION

THE ESH-A Remote sensor complies with:

- CSA-C22.2 No. 205-12
- UL508 (Edition 17):2007
- EMC Directive 2004/108/EC
- EN 50270:2006, Type 1, EN61010
- FCC. This device complies with part 15 of the FCC Rules, Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- CERTIFIED FOR ELECTRIC SHOCK & ELECTRICAL FIRE HAZARD ONLY.
LA CERTIFICATION ACNOR COUVRE UNIQUEMENT LES RISQUES DE CHOC ELECTRIQUE ET D'INCENDIE D'ORIGINE ELECTRIQUE.
- RoHS compliant circuit boards

2.1 General Safety Warnings

The ESH-A Remote Sensor is intended for indoor use, permanently mounted at a height that is appropriate for the type of gas being monitored. Refer to Section 4.2.3 *Mounting Heights*. The ESH-A Remote Sensor should be protected from extreme weather conditions.

The ESH-A Remote Sensor requires no assembly. There are no serviceable elements other than the calibration instructions outlined in this manual. There are no replaceable components except the sensors.

It is important to ensure that excess water and/or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components. Keep the gas detector, including the vents free of dirt, dust and debris.

If in a damp location, source of water should be shielded from entering the enclosure.

Check for physical damage, tampering, etc. on a consistent basis.

If painting is to be done in the same area, the gas detector needs to be protected from overspray and the sensor vent should be covered so as to not receive paint fumes. Paint fumes may damage and / or reduce the life of the sensor.

2.2 Protection Against Electrical Risks

Disconnect all power before servicing. There may be multiple power sources. The power supply may have a building installed circuit breaker / switch that is suitably located and easy to access when servicing is required and should be labelled as ESH-A Remote Sensor supply (disconnecting power to the ESH-A). Appropriate markings should be visible at the circuit breaker / switch that is supplying power to the ESH-A.

This device may interfere with pacemakers. Modern pacemakers have built-in features to protect them from most types of interference produced by other electrical devices you might encounter in your daily routine. If you have a pacemaker, follow your healthcare provider's instructions about being around this type of equipment.

2.3 Protection Against Mechanical Risks

The door of the enclosure can be removed if absolutely necessary to facilitate installation of the base, but it is not recommended on this model. Extreme care and caution must be exercised when removing the door to avoid damaging the hinges. The door should only be removed when absolutely required. Any damage occurring from the door removal procedure will not be covered under warranty.

If the unit is installed on a wall, open the enclosure fully, grasp the door, keeping it open and being careful not to make contact with any of the internal components (circuit board). If the base is not mounted, grasp the base with your other hand. Tug on the door, pulling towards you making sure the door is still open and straight. **DO NOT TWIST.** The section of the hinges located on the

base should “snap” apart from the part of the hinges located on the door.

After installation, place the door hinges over the installed base hinges, with the unit fully open and push towards the wall. The hinges should easily “snap” back into place.

The enclosure has one screw securing the door to the base for electrical safety and provides an opening to allow the user to apply a padlock or tie wrap if they desire the transmitter to be locked.

Be aware that the hinged door that could potentially pinch fingers and the sharp edges and/or jumper pins on the board could potentially prick or cut fingers if not handled carefully.

3 INSTRUMENT SPECIFICATIONS

3.1 General Description

The ESH-A Remote Sensor offers flexible location monitoring of combustible or PID TVOC gases in non-hazardous, non-explosion rated commercial and light industrial applications.

The ESH-A Remote Sensor communicates with a controller or transmitter using a current loop into a 100 ohm load or a voltage signal of 0.40 to 2 volts.

Each ESH-A is given the same serial number as the device it is being connected to. Make sure to connect the ESH-A to the controller or transmitter that has the same serial number or the system won't work and the factory calibration will be void.

The sensor is protected in our standard water/dust tight, corrosion resistant ABS/poly-carbonate enclosure which also provides easy mounting components. An optional splash guard may be installed to further protect the

remote sensor in water spray or wash down applications.

All ESH-A Remote Sensors operate by diffusion. The sensors utilized in this device are accurate enough to measure to Occupational Health & Safety (OHS) hazardous levels for toxic gases.

3.2 Technical Specifications

GAS TYPE

Combustible (catalytic)	Acetylene (C_2H_2), Hydrogen (H_2), Methane (CH_4), Propane (C_3H_8),
PID	TVOCs
Infrared	Propane (C_3H_8)

MECHANICAL

Enclosure	ABS / Polycarbonate, IP54 rated with optional splash guard installed.
Weight	340 g (12 oz)
Size	127 mm x 127 mm x 53 mm / 5.0" x 5.0" x 2.1"

ELECTRICAL

Power Requirement	12 - 24 VDC, 1W, Class 2
Outputs	current or voltage
Wiring	VDC four conductor shielded 16 - 18 awg stranded within conduit (refer to Section 4.4.1 <i>Wire Gauge vs. Run Length</i>)

ENVIRONMENTAL

Operating Temperature	-20°C to 40°C / -4°F to 104°F
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Operating Humidity	15 - 90% RH non-condensing
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COMPATIBLE WITH THESE CET PRODUCTS

Controllers	cGas-SC Self Contained SCC Self Contained (discontinued) DCC Dual Channel Self Contained (discontinued)
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Transmitters	CGAS-A Detector Analog CGAS-D Detector Digital LPT-A Analog (discontinued) LPT-P Car Park Digital (discontinued) LPT-M Modbus (discontinued) LPT-B BACnet (discontinued)
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CERTIFICATION

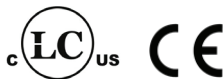
Model: ESH-A-XXXX

S/N: same serial# as controller or transmitter connected to

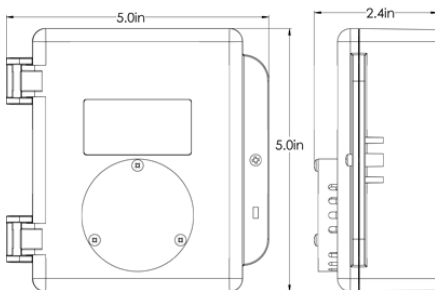
Rating: 12 - 30 VDC, 1W, Class 2

CERTIFIED FOR ELECTRIC SHOCK & ELECTRICAL FIRE HAZARD ONLY. LA CERTIFICATION ACNOR COUVRE UNIQUEMENT LES RISQUES DE CHOC ELECTRIQUE ET D'INCENDIE D'ORIGINE ELECTRIQUE.

Conforms to: CSA-C22.2 No. 205-12, UL508 (Edition 17):2007
Conforms to: EMC Directive 2004/108/EC, EN 50270:2006, Type 1, EN61010
Conforms to: FCC. This device complies with part 15 of the FCC Rules,
Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



3.3 Standard Enclosure Dimensions



Above dimensions are shown with optional splash guard. Without splash guard, thickness is 53.34 mm (2.1"). The area required for enclosure door to be open 90 degrees is 155.7 mm (6.13") or 243.84 mm (9.6") for fully open. With the splash guard, the enclosure has an IP54 rating.

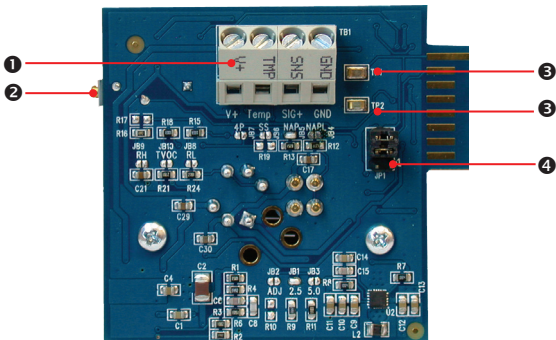
NOTE: Response time will be slower with a splash guard installed.

3.4 Exterior Enclosure



NUMBER	FEATURE	FUNCTION
1	Door Hinge	Secures door
2	Gas Type	Indicates sensor gas type
3	Door Screw	Secures door
4	Sensor Opening	Allows gas diffusion into sensor
5	Padlock Opening	For security padlock

3.5 Interior System Layout



NUMBER	FEATURE	FUNCTION
1	Wiring Terminal	V+ is the 12 - 24 VDC power supply TMP/Temp is for the temperature signal output to the controller/transmitter SNS/SIG+ is the signal output to the controller/transmitter GND is the ground connection
2	POT RN1 (Potentiometer)	Used for Zero calibration of a new / replacement sensor, turn to increase or decrease the current.
3	Test Points: TP1 & TP2	For measuring the amperage of a new or replacement sensor during zero calibration.

4

JP1 Jumper Bank
Pin 1 - internal load resistor
Pin 2 - resting position
Pin 3 - external connection

JP1-1 and JP1-2 are used to calibrate a new sensor
JP1-1 and JP1-3 are used to set the voltage output
JP1-2 and JP1-3 are used to set the current output

3.6 List of Available ESH-A Remote Sensors

ESH-A Remote Sensors - Combustible Catalytic Bead

Acetylene (C_2H_2)	ESH-A-CC2H2-100	0 - 100% LEL	~5 years
Hydrogen (H_2)	ESH-A-CH2-100	0 - 100% LEL	~5 years
Methane (CH_4)	ESH-A-CH4-100	0 - 100% LEL	~5 years
Propane (C_3H_8)	ESH-A-C3H8-100	0 - 100% LEL	~5 years

ESH-A Remote Sensors - TVOC PID

TVOC PID	ESH-A-SPL	0 - 30 ppm	usage / application dependent
TVOC PID	ESH-A-SPH	0 - 300 ppm	

ESH-A Remote Sensors - Infrared

Propane (C_3H_8)	ESH-A-JET	0 - 100% LEL	~8 years
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3.7 Factors Affecting Lifespan and Performance of Sensors

Sensors have an operational life expectancy, a shelf life for storage and a recommended calibration frequency that is commonly dependent on the type of sensor, type of application and particular environment. Most sensors will suffer general wear and tear and it may not always be easy to detect the damage caused, making regular maintenance important to help keep the sensors in good working order. CET does not accept any liability for mishaps, misuses or damages that could occur to a sensor, reducing its performance or lifespan.

3.7.1 Catalytic Bead Sensors

Target gas: Methane, Propane, Hydrogen, Acetylene

- Typically designed to operate within specific temperature ranges. High temperatures can accelerate wear and reduce lifespan.
- Excessive humidity can affect sensor components, leading to corrosion or malfunction. Maintaining optimal humidity levels is crucial.
- Paint fumes, cleaning products, sand, water, insects can reduce lifespan and compromise performance.
- Dust and dirt can compromise sensor performance lifespan, both during storage and operation. When storing, package securely in a sealed container.
- Silicone, lotions, hair products, lubricants, gas additives, lead, sulfur compounds and chlorinated hydrocarbon vapours can poison catalytic sensors. Other compounds, especially hydrogen sulphide, halogenated hydrocarbons and anything containing astatine, bromine, fluorine, chlorine, and iodine can be absorbed or form compounds that are absorbed by sensor which can result in the temporary loss of sensitivity and in most cases a sensor will recover after a period of operation in clean air. Even when the sensor is not powered, exposure to compounds that poison or inhibit the sensor can impact its lifespan.
- Requires calibration gas with air balance.
- When storing, package securely in a sealed container.
- Excessive vibration or impact can damage the sensor.

3.7.2 PID Sensors

Target: TVOCs

- Dust and dirt can compromise sensor performance lifespan, both during storage and operation.
- Protect from extreme temperatures and being physically damaged.
- High humidity environments may affect sensor performance.
- Paint fumes, cleaning products, dust, sand, water, insects can compromise performance.
- The presence of interfering compounds may affect sensor accuracy.
- When storing, package securely in a sealed container.

3.7.3 Non-Dispersive Infrared (NDIR) Sensors

Target gas: Propane

- Do not use in locations where corrosive chemicals such as chlorine, ammonia and other oxidizers are present, especially if there is a higher humidity level.
- High humidity can affect response and promote corrosion.
- Water or vapour condensation can impair sensor performance.
- Dust and dirt can compromise sensor performance.
- Excessive vibration or impact can damage the sensor.
- Continuous exposure to gas will not poison the sensor but it may require a long time to clear before accurate readings can be taken again.

4 INSTALLATION

The ESH-A is not a standalone sensor, it must be connected to a CET Self Contained Controller or Transmitter.

NOTE: The ESH-A is not designed to connect directly to the FCS System Controller.

Each ESH-A is given the same serial number as the device it is being connected to. Make sure to connect the ESH-A to the self contained controller or transmitter that has the same serial number or the system won't work and the factory calibration will be void.

4.1 Sensor Warm-Up time

Factory installed sensors go through a burn-in period at our factory prior to shipping, so they are ready for operation upon arrival after a warm-up period. The length of warm-up time will depend on the type of gas, sensor type, environment, and other factors. As a general rule, CET suggests that upon power-up, all sensors be left to warm up for a minimum of 24 hours to stabilize before they can be considered to provide accurate gas readings.

CO and NO₂ sensors typically stabilize quickly and, under normal operating temperatures, can become operational within approximately 5 minutes of power-up.

If the ESH-A remote sensor is being installed in an environment that is greater than +/- 10 degrees from ambient (22°C (71.6°F)) then a calibration should be done in that same temperature range.

If the ESH-A is not installed within two weeks of delivery, the sensor may require a longer warm up time (24-48 hours) to stabilize to provide accurate readings.

4.2 Mounting the ESH-A Remote Sensor

The ESH-A Remote Sensor should be installed on a flat vertical surface like a wall or a column using the four 4.4 mm (0.175") diameter mounting holes provided to maintain water tight status.

Care should be taken to ensure that the face of the ESH-A is not obstructed in order to maximize the sensor's exposure to the environment being monitored. Do not mount the device upside down, sideways or flat on the floor or other surface.

Two 12.7 mm ($\frac{1}{2}$ ") conduit entry points are provided in the enclosure. Both are located in the enclosure base. One in the rear of the base and one on the bottom edge of the base. See Section 4.3 *Enclosure Mounting Components*.

The clearance from the PCA to the base enclosure is 12.7 mm ($\frac{1}{2}$ "). **Do not use a conduit connector that has more than 12.7 mm ($\frac{1}{2}$ ") of thread length.**

NOTE: When mounting the enclosure, allow enough room to allow the end user to open the door fully to access the internal adjustments.

4.2.1 Wet Environment Considerations

If the ESH-A is to be installed in a potential hose-down application or any application whereby liquid could be directed towards the sensor opening, the ESH-A should be ordered with an optional attached splash guard (factory installed).

If used in a wet or wash down application, the conduit hub entering the ESH-A enclosure must be liquid tight type.

Any water or physical damage to the transmitter that occurs from the installer drilling their own installation holes will not be covered under warranty.

4.2.2 EMI and RF Interference Considerations

All electronic devices are susceptible to EMI (Electromagnetic Interference) and RFI (Radio Frequency Interference). Our detectors have been designed to reduce the effects of these interferences and we meet CSA FCC and CE requirements for these type of devices. However there are still circumstances and levels of interference that may cause our equipment to respond to these interferences and cause them to react as if there has been gas detected. There are some installation procedures that will reduce the likelihood of getting faulty readings:

1. Locate the detectors and controllers out of the way from normal foot traffic and high energy equipment.

2. Confirm the devices are properly grounded using conduit and shielded cabling.
3. Inform operators and technical staff working in the surrounding area to be aware of these possible conditions and that two way radios, Bluetooth enabled devices, cell phones and other electrical equipment may interfere with the response of the gas detectors.

4.2.3 Mounting Heights (sensor and application dependent)

The ESH-A needs to be mounted where it will best detect the target gas.

Some applications may require some adjustments, but generally speaking, the mounting height will depend on the density of the target gas relative to air.

Heavier than air gases fall towards the floor and collect in low lying areas. Thus heavier than air gas sensors should be mounted 6 in / 15 cm from the floor. Lighter than air gases float upwards and collect at the ceiling. Lighter than air sensors should be placed on or near the ceiling. Gases that have a density close to that of air should have the sensors installed in the breathing zone. The breathing zone refers to the area 1.2 - 1.8 m / 4 - 6 ft from the floor, where most human breathing takes place. This is a good default location for sensors, as many gases are often well dispersed in air.

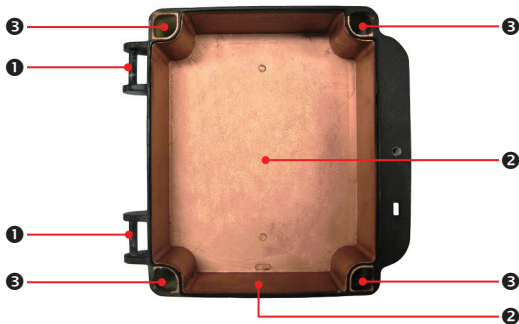
Typical Mounting Height by Gas:

GAS TYPE	MOUNTING HEIGHT	COVERAGE (ft ²)	COVERAGE (m ²)
Acetylene (C ₂ H ₂) (combustible)	on or near the ceiling	5000	465
Hydrogen (H ₂) (combustible)	on or near the ceiling	5000	465
Methane (CH ₄) (combustible)	on or near the ceiling	5000	465

Propane (C_3H_8) (combustible)	6 in (15 cm) from floor	3000	279
TVOCs (PID)	target gas dependent	3000	279
Propane (C_3H_8) (infrared)	6 in (15 cm) from floor	3000	279

4.3 Enclosure Mounting Components

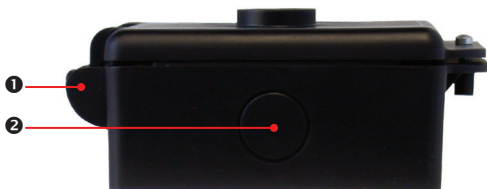
4.3.1 Enclosure Base



NUMBER	FEATURE
1	Door hinge
2	Conduit Entry Points 12.7 mm / 1/2 in diameter

-
- | | |
|----------|---|
| 3 | Mounting Holes 4.47 mm / 0.175 in diameter maximum head diameter 8 mm / 0.32 in, #8 or 4 mm screw |
|----------|---|
-

4.3.2 Enclosure Bottom



NUMBER	FEATURE
1	Door hinge
2	Conduit Entry Points 12.7 mm / 1/2 in diameter

4.4 Wiring Connections

IMPORTANT: Each ESH-A is given the same serial number as the device it is being connected to. Make sure to connect the ESH-A to the controller or transmitter that has the same serial number or the system won't work and the factory calibration will be void.

The ESH-A Remote Sensor is a low voltage powered device. Any application of operating voltages higher than indicated in the specification may result in damage. Double check wiring connections prior to powering the system. Damage from incorrect wiring connections or from too much voltage applied is not covered under warranty.

The ESH-A Remote Sensor must be used with appropriately rated equipment. External 12 - 24 VDC power to the ESH-A is supplied by the controller or transmitter it is connected to.

All wiring should be run within properly grounded (earth or safety) conduit. Signal output and supply should be in shielded cable. The cable shield should be connected to earth ground at the controller/transmitter that is providing power for the ESH-A Remote Sensor.

Under most local electrical codes, low voltage wires cannot not be run within the same conduit as line voltage wires.

NOTE: WARRANTY VOID IF SOLID-CORE WIRE IS USED AT THE WIRING TERMINALS. The wiring terminal strips on the ESH-A Remote Sensor circuit board are mounted on a 30 degree angle, making the wiring connections easier to install.

When using solid core wiring for distribution (in the conduit), use stranded wire pigtails 14 - 18 AWG within the enclosure to connect to the circuit board. The rigidity of solid-core wire can pull a soldered terminal strip completely off a circuit board and this will not be covered under warranty.

Four-conductor, 16-18 AWG stranded shielded cable is required for the ESH-A Remote Sensor wiring. This wiring should be run in a conduit, separate from the signal output, and should not exceed the cable lengths specified in this manual. The voltage at the remote sensor (Red V+ to Black GND) should be 12 - 24 VDC. If this voltage is not met after installation, the wrong gauge wire may have been used or the wiring run is too long.

Refer to the Installation Manual of the self contained controller or transmitter you are connecting the ESH-A Remote Sensor to for specific wiring instructions.

4.4.1 Wire Gauge vs Run Length by CET Device

TRANSMITTER / CONTROLLER	SUPPLY VOLTAGE (from transmitter / controller)	MAXIMUM LOAD (Wire + Termination Resistor) (ohms)	WIRE GAUGE (AWG)	MAXIMUM CABLE LENGTH
CGAS-A Analog Transmitter	12 - 24 VDC	100	16	15 m / 50 ft
CGAS-D Digital Transmitter	12 - 24 VDC	100	16	15 m / 50 ft
LPT-A Analog Transmitter	12 - 24 VDC	100	16	15 m / 50 ft
LPT-B BACnet Transmitter	12 - 24 VDC	100	16	61 m / 200 ft
LPT-M Modbus Transmitter	12 - 24 VDC	100	16	61 m / 200 ft
LPT-P Car Park Digital Transmitter	12 - 24 VDC	100	16	61 m / 200 ft
cGas-SC Self Contained Controller	16 - 30 VDC	100	16	61 m / 200 ft
	90 - 240 VAC	100	16	61 m / 200 ft
SCC Self Contained Controller	12 - 24 VDC	100	16	61 m / 200 ft
	90 - 240 VAC	100	16	61 m / 200 ft

DCC Dual Channel Controller	12 - 24 VDC	100	16	61 m / 200 ft
	90 - 240 VAC	100	16	61 m / 200 ft

5 SYSTEM OPERATION

The ESH-A is not a standalone sensor, it must be connected to a CET self contained controller or transmitter.

NOTE: The ESH-A is not designed to connect directly to the FCS System Controller.

Each ESH-A is given the same serial number as the device it is being connected to. Make sure to connect the ESH-A to the controller or transmitter that has the same serial number or the system won't work and the factory calibration will be void.

Upon application of power, there is a warm-up period (typically five minutes, but varies with sensor type) the output signal is fixed at 4.0 mA (current) or 0.40 volts (voltage). After the warm up period, the system may exhibit gas alarm condition if the sensor has not completely stabilized during the warm up period. This is normal and the length of time the gas alarm exists is dependent upon the length of time since the unit was last powered up and the state of the environment it is installed in.

During normal operation, the gas level will be reported through the current loop (or voltage) output back to the controller or transmitter.

5.1 Fault Detection

In the event of a problem with the measurement circuitry or dead or damaged sensor, the signal between the ESH-A Remote Sensor and the controller or transmitter may drop and the controller/transmitter may indicate a fault condition on the display (if equipped with one) or via the Fault LED. Normal operation will resume once the fault condition has been rectified.

5.2 Selecting the Output Signal

The default signal output mode is a current loop. Zero concentration gas will output 4.0 mA and full scale gas concentrations will depend on the sensor age and output.

The output can be changed to voltage (0.4 - 2.0 volt) **only if directed by CET**, by moving the jumper at JP1 from the JP1-1 to the JP1-3 position. The voltage signal will swing from 0.4 volts to indicate no gas detected, to 2.0 volts (depending on age of sensor) to indicate full scale gas detected.

6 CALIBRATION

6.1 Calibration Specifications

6.1.1 Gas

Calibration span gas cylinders should have at least $\pm 5\%$ accuracy and have a current date stamp.

The type of gas mixture, how old the gas is and what temperature it has been stored at will affect repeatability during field calibration. If the sensor is being used in an extreme temperature range, calibration should be done in that same temperature range.

IMPORTANT NOTES:

- Catalytic sensors require min 18% oxygen to work and thus the user **MUST** flow clean air or oxygen to obtain a true zero and the span gas must have "air" balance, not N_2 balance.
- The catalytic sensors in the ESH-A Remote Sensor need to be calibrated using a humidification chamber. Flowing dry gas over these sensors can result in a negative a reaction and inaccurate readings.

6.1.2 Regulators & Flow

Calibration gases that are lighter than or the same weight as air (H_2 , CH_4 , C_2H_3) should be flowed at 0.5 LPM. Gases heavier than air (C_3H_8) should be flowed between 0.5 and 1.0 LPM. Fixed flow regulators provide more accuracy.

6.1.3 Calibration Adapters

The CET Calibration Cap needs to be used during calibration to make sure the gas diffuses around the sensor properly. The cap fits over the sensor vent for ESH-A models without a splash guard. For models with a splash guard, the Calibration Clip ("Cal Clip") needs to be used. The Cal Clip fits around the splash guard and has a nozzle to attach the tubing to.

WARNING: Remember to remove the Cal Clip after calibration. The Cal Clip is designed to prevent entry or exit of air except via the hose barb fitting, therefore it must be removed during normal operation or else the gas readings will not be accurate.

6.1.4 Humidification Chamber

Flowing dry gas over the catalytic sensors in the ESH-A Remote Sensor can result in a negative a reaction and inaccurate readings. Using a humidification chamber adds humidity and assists in recreating a "real-world" environment for the sensor.

All ESH-A catalytic sensor models should be calibrated with a humidification chamber including:

- ESH-A-CCH4-100
- ESH-A-CC3H8-100
- ESH-A-CC2H2-100
- ESH-A-CH2-100, etc.

NOTE: Other types of sensors that require the use of a humidification chamber include solid state refrigerants and solid state TVOCs.

6.1.5 Calibration Frequency

- Parking garage detectors: Once every 12 months
- OHS applications: Once every 6 months (OHS: Occupational Health & Safety)
- For best performance and to meet published specifications calibrate once every six months and always after a failed bump test

NOTE: A calibration label should be applied after every calibration to confirm work performed and the date it was confirmed. If a controller is involved, the alarm set points should be indicated on a label on the front door of the enclosure so anyone working in the environment can be aware.

Equipment: Calibration Kit, Calibration gases

Users can order the calibration kit, calibration accessories and / or gases from any CET authorized distributor or you can supply your own gas and equipment as long as the gas meets the minimum specifications. CET does not ship gas cylinders outside of Canada.

6.1.6 Gas Testing Frequency (Bump Testing)

For the purpose of safety in OHS applications, sensors should be gas tested (bump tested) once every month to confirm response and alarm activation.

A bump test will help you determine if a sensor requires calibration. If the sensor still does not respond as it should after a successful calibration, it probably requires replacing.

6.2 Zero Calibration of an Installed, Responsive Sensor

If the sensor does not need to be replaced and is responding correctly, the Zero and Span calibrations will need to be done at the self contained controller or transmitter that the ESH-A is connected to.

Follow the instructions in the Calibrating an ESH-A Remote Sensor section of the Operations Manual of the self contained controller or transmitter that the ESH-A is connected to, **with the exception that the gas should be applied to the ESH-A sensor opening instead of the transmitter or controller's sensor opening.**

Make sure you select the channel assigned to the ESH-A by either moving the Channel Select jumper on the self contained controller or transmitter or selecting the Channel in the menu. The channel select method will depend on which self contained controller or transmitter the ESH-A is connected to.

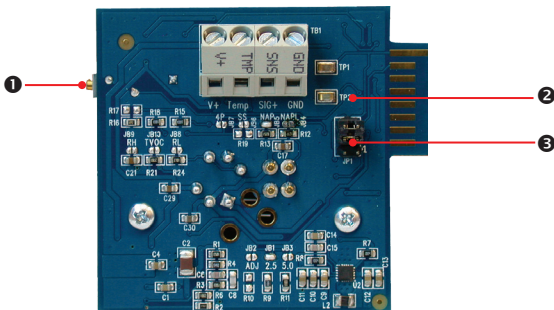
6.3 Zero Calibration of a New / Replacement Sensor

When you order a replacement sensor you will need to contact CET and provide the following information which can be found on the label on the outside of the ESH-A enclosure:

- Model
- S/N #
- Date of Mfr

When you install the replacement sensor, the ESH-A will require a Zero (or Null) calibration of the sensor, especially if it is not a clean air environment. This process is normally required if the sensor has been replaced or there is concern that the sensor is not responding correctly.

The indicated features on the ESH-A are required for calibration.



NUMBER	FEATURE	FUNCTION
❶	POT RN1	Potentiometer: turn to increase or decrease the current
❷	TP2	Test point for negative probe
❸	JP1	Bottom jumper for positive probe

Step 1

Disconnect the power and install the replacement sensor.

Step 2

Power up the device and let the sensor warm up for at least 5 minutes.

Step 3

Attach the AMP meter negative probe to TP2 test point and the positive probe to JP1 bottom jumper. Using the POT RN1 potentiometer, adjust until the AMP

meter measures 4.0 ± 0.1 mA.

- To increase the current, turn the potentiometer clockwise
- To decrease the current, turn the potentiometer counterclockwise

Step 4

Follow the instructions in the Calibrating an ESH-A Remote Sensor section of the self contained controller or transmitter Operation Manual that the ESH-A is connected to, **with the exception of applying the gas to the ESH-A sensor opening instead of the CGAS sensor opening.**

7 ACCESSORIES

7.1 Splash Guard (p/n: S)

The splash guard attaches to the front of the enclosure to protect the sensor during water spray or wash down applications. It is factory installed and when attached the enclosure meets IP54 standards.



NOTE: The splash guard will slow down the response time of the sensor.

7.2 Calibration Clip “Cal Clip” (p/n: CET-SGC)

To calibrate an ESH-A with a factory installed splash guard (Option -S), attach the Cal Clip around the splash guard. The small barb hose fitting accommodates standard or Teflon tubing of 1/8" (3.175 mm) ID and 3/16" (4.762 mm) ID. The Cal Clip **must be removed during normal operation** or else the gas readings will not be accurate.





7.3 Metal Protective Guard (p/n: SCS-8000-RSG)

The metal protective guard is made of heavy duty metal and helps to protect against abrasive damage, theft and vandalism to the transmitters. It is made from 16 gauge powder coated steel and has 13 mm ($\frac{1}{2}$ ") square openings in the front to allow gas and air to flow through to the sensor. With four slotted mounting holes, installation and removal for equipment servicing is easy.

Enclosure	16 gauge powder coated steel
Weight	800 g (28 oz)
Size	178 mm W x 160 mm H x 91 mm D 7.0" W x 6.3" H x 3.6" D

7.4 Calibration Kit (p/n: CET-CAL-KIT)

The complete Calibration Kit contains all the items necessary for common field and shop calibrations. It comes in a durable, hard plastic



carrying case and includes a fixed flow regulator @0.5 LPM for 34, 58, 74 and 100 litre cylinders, calibration cap and clip, humidification chamber, brass fitting, hand tools and tubing. It does not include cylinders of gas. These must be ordered separately.

Many gases, but not all, are carried in inventory. Check with any CET authorized distributor for availability of specific gas types. **Gas cylinders cannot be shipped from Canada to other countries, including the USA.**

8 MAINTENANCE

Regular maintenance includes inspecting, cleaning if necessary, bump testing and calibration. Check the unit for wear and tear, tampering, accidental or deliberate damage; for cracks, water damage, loose screws or wires and make sure there isn't a buildup of dust on the outside or inside of the enclosure. It is important to ensure that excess water and/or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components.

Each device should be monitored for possible damaging conditions:

- The sensor port should be kept free of dirt or soot build up.
- If in a damp location, source of water should be shielded from contacting the top of the device.
- If located in a working area, the front of the device should be kept clear.
- If painting is to be conducted in close proximity, the device needs to be protected from over spray and the sensor port should not receive paint fumes as these fumes may damage or reduce the life of the sensor.

Monthly bump tests are recommended for sensors used to monitor toxic gases (ammonia, chlorine, refrigerants, combustibles, etc.) in environments that are unfrequented like chiller rooms, boiler rooms, cylinder storage rooms

and in areas where workers are exposed for extended periods of time. CET recommends calibration every 6-12 months depending on application, standards and local regulations. A calibration should always be done immediately following a failed bump test.

Keep a maintenance log. All bump tests and calibration functions along with notes about performance, anomalies or otherwise should be noted in a log book. This information could prove useful for troubleshooting or proving due diligence, etc.

9 TROUBLE SHOOTING

ESH-A won't power up.

Check the connections. Is the ESH-A properly connected to the self contained controller or transmitter and is the self contained controller or transmitter connected properly to a power supply?

Controller or transmitter shows a fault.

Check the ESH-A remote sensor. The signal will drop if the sensor fails.

After suggested warm up period, controller or transmitter shows readings that don't make sense.

Check to make sure the ESH-A that is connected to the transmitter or self contained controller matches the serial number of said transmitter/controller. Each ESH-A is given the same serial number as the device it is being connected to. Make sure to connect the ESH-A to the self contained controller or transmitter that has the same serial number or the system won't work properly. If that is not the cause, check voltage readings and do a calibration of the ESH-A as if it has a new / replacement sensor.

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