GasSens

Infrared Gas Detector

E12-15 IR NH3 Detector



Badger Meter

ATI-UM-04410-EN-05 (May 2026)

User Manual

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INTRODUCTION

The family of Infrared gas transmitters are microprocessor-based intelligent gas sensors that continuously monitors ammonia gas in the % level up to 15%. It is ideally suited for use in harsh environments and where the cost of required maintenance for conventional catalytic sensors is prohibitive. The Infrared gas sensor performs reliably in the presence of silicone and other catalytic poisoning agents and can also operate in oxygen free environments or where high background gas levels are present. There are no known poisons that affect this technology.

The E12-15 is a stand-alone device providing a continuous 4-20 mA output.

Features

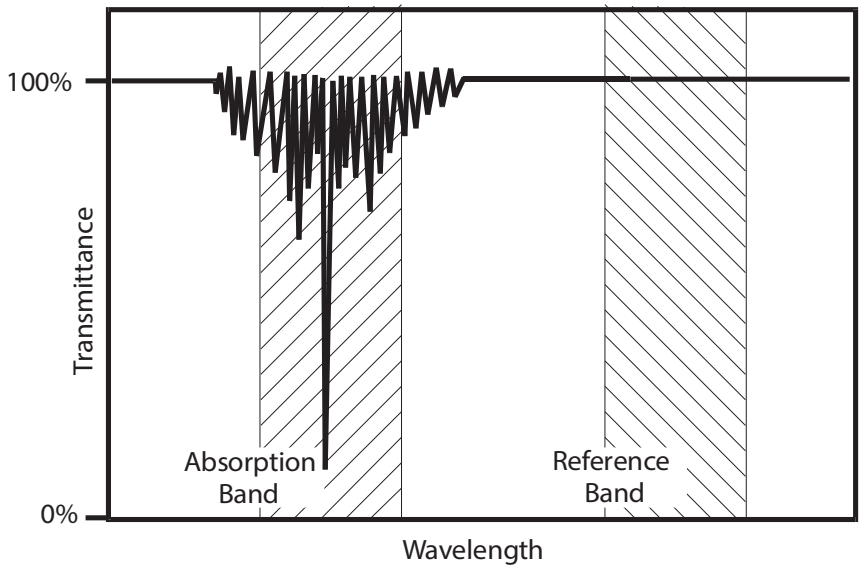
- Requires no routine calibration to ensure proper operation.
- Continuous self-test automatically indicates a fault, with fail to safe operation.
- A multi-layered filtering system protects optics from dirt and water ingress.
- Straight optical path eliminates the need for reflective surfaces, such as mirrors or beam splitters.
- Performs well in the presence of high concentrations or constant background levels of hydrocarbons and in oxygen depleted atmospheres.
- Immune to poisoning and etching.
- Standard 4-20 mA output (current source).
- Optional explosion-proof junction box with terminal block.

SPECIFICATIONS

Detection Method	Infrared absorption
Output	4-20 mA (Source type), max. 1000 Ohm load at 24V DC supply voltage
Response Time	T50 < 15 seconds T90 < 30 seconds
Construction	6061 Aluminum
Dimensions	5.75 L × 2.75 in. Dia. (146 L × 70 mm Dia.)
Unit Weight	1.9 lb (0.862 kg)
Accuracy	±3% of full scale for applied gas concentrations up to 50% of full scale ±5% of full scale for applied gas concentrations above 50% of full scale
Operating Temperature Rating	–40 to 70 °C @ 0–99% RH (non-condensing)
Operating Voltage	18–32V DC
Power Consumption	5.1 Watt max.
Max. Current Draw (at 24V DC)	Average: 210 mA (Peak: 400 mA)

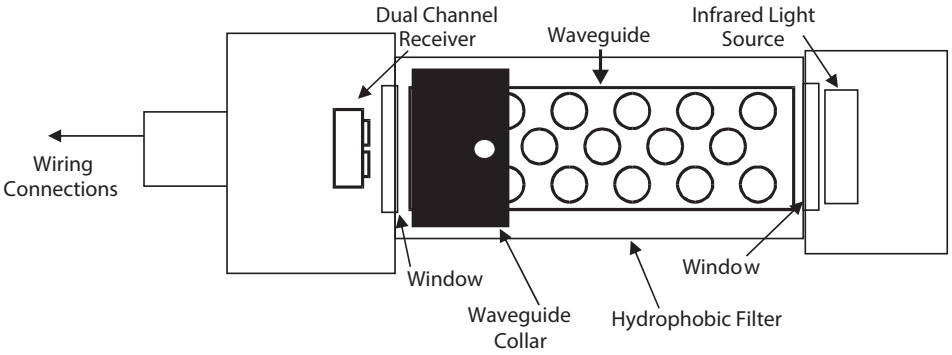
MEASUREMENT PRINCIPLE

The E12-15 gas transmitter uses infrared absorption technology for detecting ammonia gas. Gases absorb infrared light only at certain wavelengths. The concentration of a gas can be measured by the difference of two channels (wavelengths), a reference and a measurement channel. The E12-15 uses a collimated infrared light source that passes through a waveguide. At the end of the waveguide is a dual channel receiver. The dual channel receiver measures the intensity of two specific wavelengths, one at an absorption wavelength and another outside of the absorption wavelength. The gas concentration is determined by a comparison of these two values.



Infrared Absorption Spectrum for Methane

The dual channel receiver is a single wafer, double filtered, dual receiver with an internal optical barrier. The elements are perfectly matched resulting in overall stability and superior performance throughout the entire temperature range. Using a dual channel receiver there is no need to use any special lenses or beam splitters to achieve the different measurement bands.



INSTALLATION

The first step in the installation process is to establish a mounting location for the transmitter. Select a location that is typical of the atmosphere to be monitored or close to the anticipated source of a dangerous gas.

It is very important that the E12-15 be properly located to enable it to provide maximum protection. The most effective number and placement of sensors vary depending on the conditions of the application. When determining where to locate sensors the following factors should be considered.

- What are the characteristics of the gas that is to be detected? Is it lighter or heavier than air? If it is lighter than air the sensor should be placed above the potential gas leak. Place the sensor close to the floor for gases that are heavier than air or for vapors resulting from flammable liquid spills. Note that air currents can cause a gas that is heavier than air to rise. In addition, if the temperature of the gas is hotter than ambient air or mixed with gases that are lighter than air, it could also rise.
- How rapidly does the gas diffuse into the ambient air? Select a location for the sensor that is close to the anticipated source of a gas leak.
- Wind or ventilation characteristics of the immediate area must also be considered. Movement of air may cause gas to accumulate more heavily in one area than in another. The transmitter should be placed in the areas where the most concentrated accumulation of gas is anticipated. For outdoor applications with strong wind conditions, it may require the sensors to be mounted closer together and on the down wind side, to the anticipated area of a gas leak. Also take into consideration for indoor applications, the fact that many ventilation systems do not operate continuously.
- The sensor should be accessible for maintenance.
- Excessive heat or vibration can cause premature failure of any electronic device and should be avoided if possible.
- Follow all national and local installation codes and practices.

The transmitter has a 3/4-inch NPT threaded connector for mounting to a junction box. Badger Meter can provide a junction box with terminals for this purpose.

A user-supplied junction box can be used providing it has the appropriate sized NPT conduit entries. The junction box must be suitable for use in the application and location in which it is being installed. After the device has been installed, a calibration is required. Refer to the *"Calibration"* section of this manual.

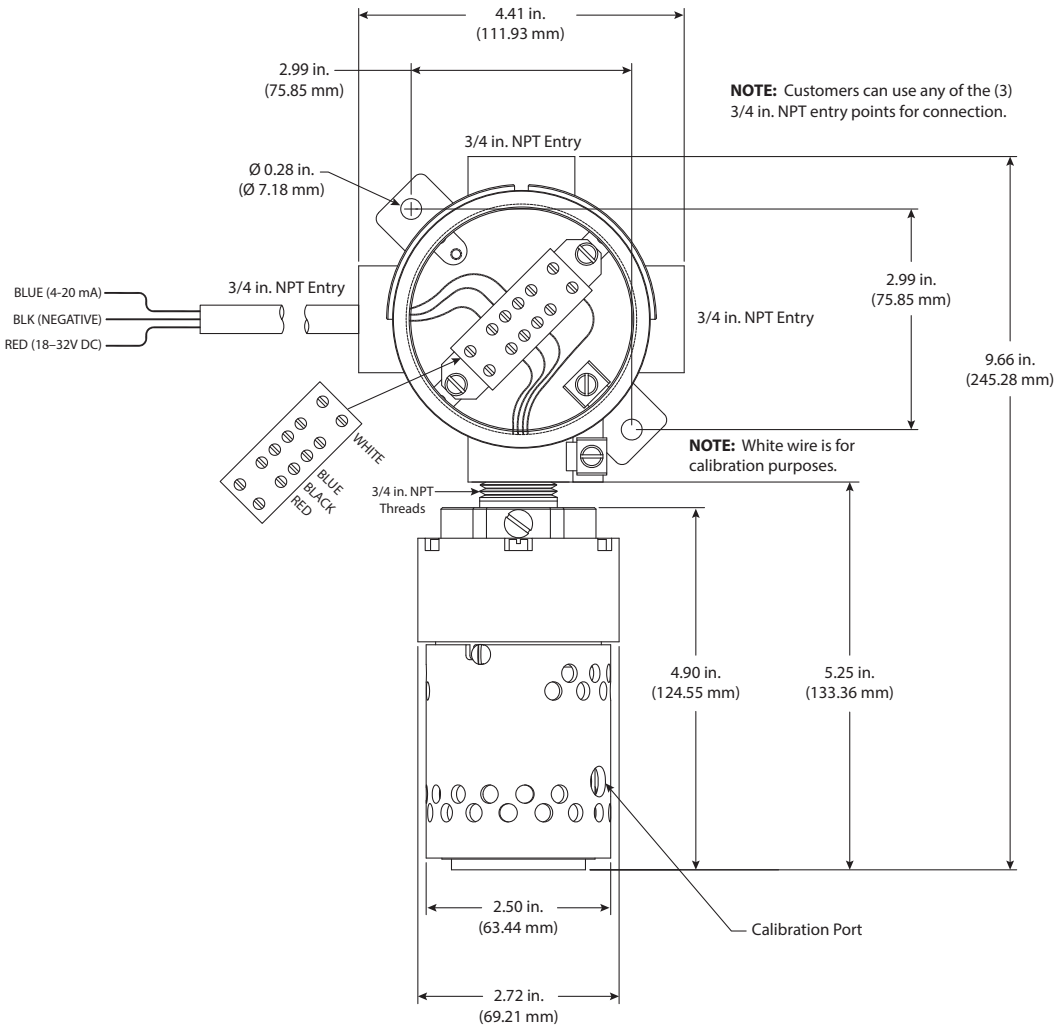


Figure 1: Sensor dimensional / connection diagram

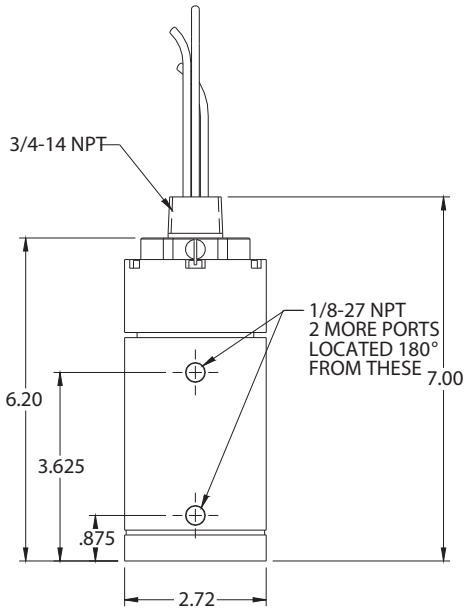


Figure 2: Sensor dimensional drawing, flow cell type

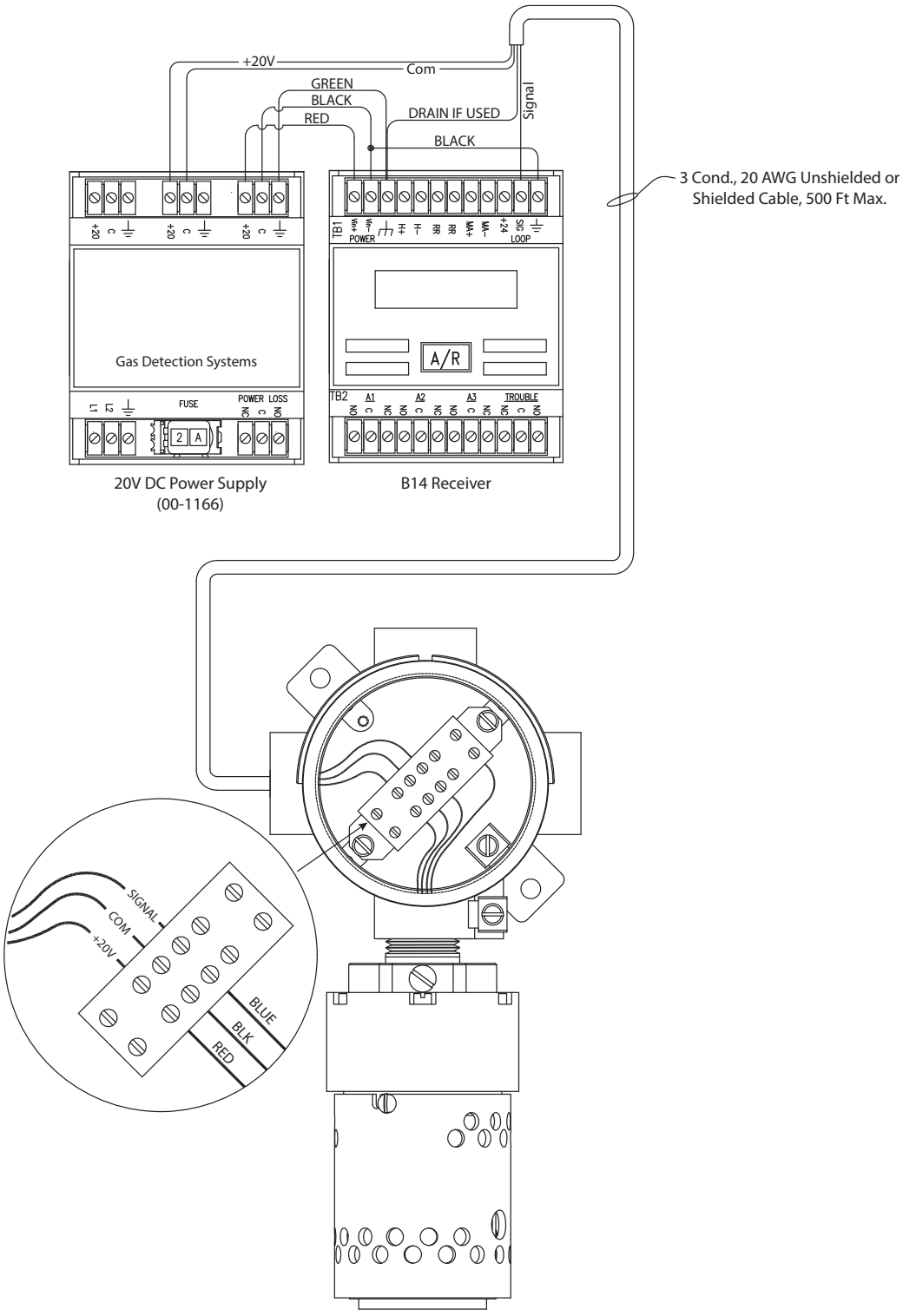


Figure 3: Typical wiring diagram E12-15 to B14 receiver

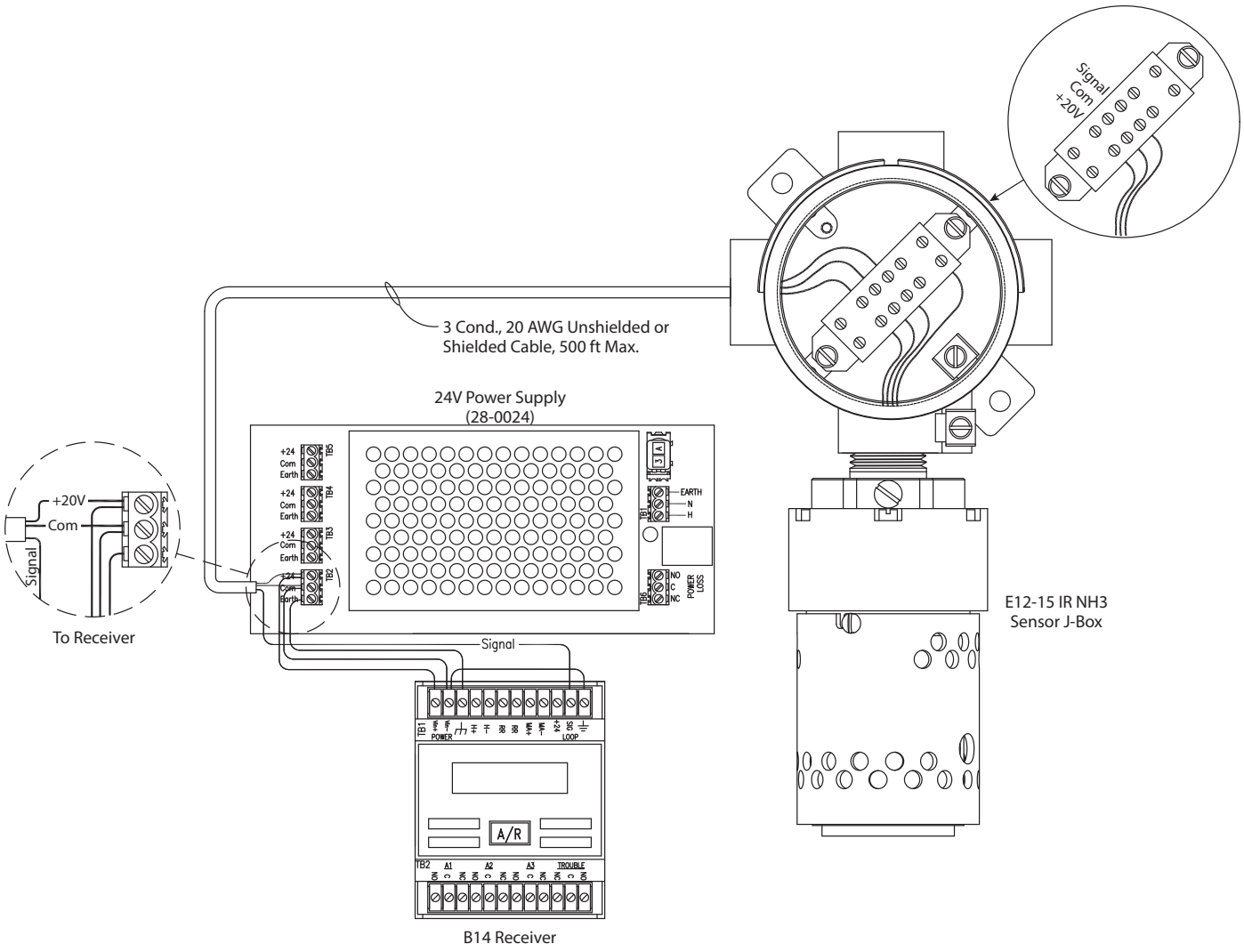


Figure 4: Typ. diagram E12-15 to 24V universal P/S to B14 receiver

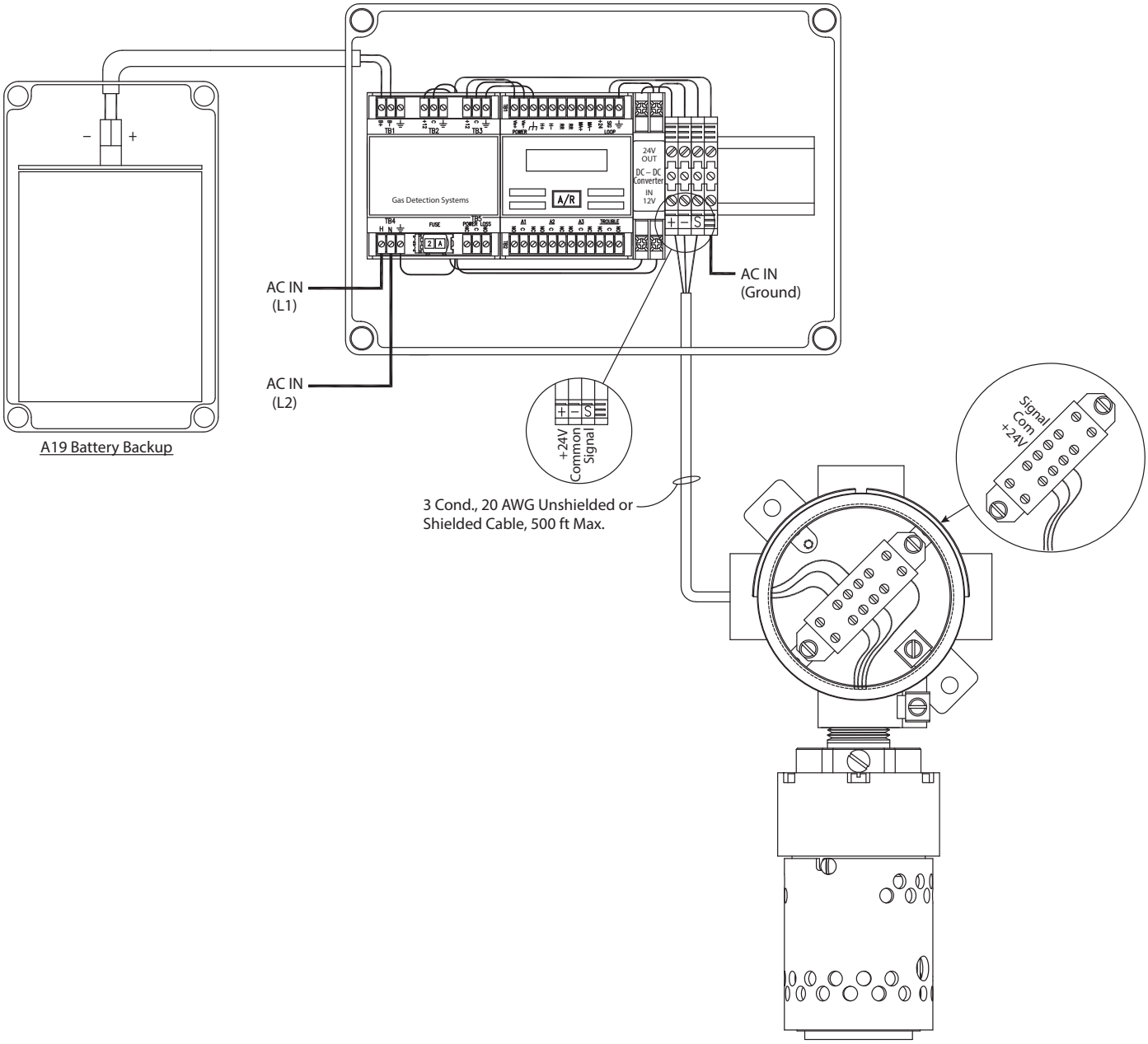


Figure 5: E12-15 w/12V to 24V converter and battery backup

Warm-up

When power is applied to the transmitter, it enters a one (1) minute warm-up mode. The output current is 4.0 mA during the warm up time period. At the end of the warm-up period with no faults present, the transmitter automatically enters the normal operating mode (4 mA). If a fault is present after warm-up, the transmitter current output indicates a fault. See the following chart for fault code status.

Normal Operation

In the normal operating mode, the 4–20 mA signal levels correspond to the detected gas concentration. The transmitter continuously checks for system faults or initiation of calibration and automatically changes to the appropriate mode.

The 4–20 mA output of the E12-15 is a non-isolated current source.

Current Output and Corresponding Status

Current Output	Status
0–20 mA	Normal measuring mode
0.6 mA	Unit fault
1.0 mA	Optics fault
1.2 mA	Zero drift fault
1.6 mA	Calibration fault
2.0 mA	Unit spanning
2.2 mA	Unit zeroing
2.4 mA	Reference channel fault
2.6 mA	Analytical channel fault
4.0 mA	Unit warm-up
4.0 mA	Zero gas level (0% LEL)
20 mA	Full scale (100% LEL)
20.1–23 mA	Over range (> 100% LEL)

Calibration

The E12-15 is factory-calibrated for zero and span. Unlike catalytic sensors it does not require routine span gas calibration for proper operation.

A typical field calibration only requires the use of zero air (or 99.99% nitrogen). If the sensor is located in an area that is known to be free of ammonia then ambient air can be used as a zero reference. If zero air is used for the calibration, there is a fitting on the bottom of the sensor for a 1/8-inch ID tubing connection.

Before beginning calibration, use the Insulation Tube to cover outer cylinder holes and connect a clean air source to the sensor's calibration port for a minimum of 3 minutes. To enter into the zero calibration mode, the calibration wire must be connected to common of the power supply (touch the white wire to the black wire) for ten (10) seconds. Upon release, the sensor automatically enters the zero calibration routine. The electronics automatically adjust the sensor's signal to the new zero reference level. During the zero calibration routine, the current output of the E12-15 goes to 2.2 mA. Although this can be accomplished manually, installation of a switch (contact closure) can accomplish the zeroing procedure. It is recommended that this switch be a momentary type switch to prevent it from inadvertently being left in the calibrate position. If after 20 seconds the calibration lead has not been removed from common, the transmitter ignores the signal and continues operation as normal.

MAINTENANCE

The E12-15 transmitter is continuously monitoring for gas concentrations and faults. If an optical fault is indicated, first try to calibrate the device. If calibration does not correct the fault condition, try to clean the device. The outer barrel (tube with two sets of holes) can be removed (unscrewed) to inspect the cleanliness of the hydrophobic filter. The hydrophobic filter is a Teflon coated stainless steel mesh that keeps moisture out of the optical path. A setscrew holds the filter to the housing. Once the hydrophobic filter is removed, the internal waveguide tube should be inspected for cleanliness. The waveguide and waveguide collar can be removed by inserting rigid tools such as Allen wrenches into one hole of the waveguide and one hole of the collar. Turning the two tools in opposite directions loosens the waveguide, allowing the collar to be screwed down on to the waveguide until it can be removed from the housing. This allows the windows of the sensor to be cleaned.

Isopropyl alcohol and cotton tipped swab provide the best results to clean the windows. Wipe any residue or film left by the alcohol on the windows with a clean dry cotton swab. The internal electro polished wave-guide tube can be cleaned the same way. Be careful not to leave any particles of the cleaning swab in the waveguide. The waveguide holes can collect pieces of the cleaning swab. After reassembling the unit (the waveguide and collar should be very tight to both ends of the housing after installation. Once the unit is completely reassembled and power is reapplied, the transmitter must be calibrated. Refer to the calibration section of this manual.

SPARE PARTS LIST

Part Number	Description
60-0059	Complete IR NH_3, 0–1% gas transmitter
60-0075	Complete IR NH_3, 0–2% gas transmitter
60-0076	Complete IR NH_3, 0–5% gas transmitter
60-0077	Complete IR NH_3, 0–10% gas transmitter
60-0078	Complete IR NH_3, 0–15% gas transmitter
80-0126	Junction box assembly
63-0056	Flow cell
43-0018	Flow cell O-ring

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