

HLM-2000-EX

Flammable Gas Transmitter

User Manual

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2 WARRANTY

This Arjay Engineering Ltd. equipment is warranted against defects in material and workmanship from the date of shipment from factory. Please check equipment specifications following this page for particular warranty periods. Maintenance items are not warranted. During the warranty period, *The Arjay Engineering Ltd.* will repair or replace components that prove to be defective in the opinion of Arjay. Any equipment deemed to be defective by the user should be returned to *The Arjay Engineering Ltd.* for evaluation (see product return below). **Site visits by Arjay Engineering Ltd. personnel, to evaluate / repair equipment, are not covered by this warranty.** Arjay is not liable for auxiliary interfaced equipment, nor for consequential damage. This warranty shall not apply to any product, which has been modified in any way, which has been repaired by any other party other than a qualified technician or authorized Arjay representative, or when failure is due to misuse or conditions of use.

2.1 LIABILITY

All ARJAY products must be installed and maintained according to instructions. Only qualified personnel should install and maintain the equipment.

ARJAY shall have no liability arising from auxiliary interfaced equipment, for consequential damage, or the installation and operation of this equipment. ARJAY shall have no liability for labor or freight costs, or any other costs or charges in excess of the amount of the invoice for the products.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND SPECIFICALLY THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE THEREOF.

WARNING

CHECK TO ASSURE THE WORKING AREA IS FREE FROM HAZARDS DURING INSTALLATION OR WHEN PERFORMING MAINTENANCE, AND USE PROPER PRECAUTIONS.
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2.2 PRODUCT RETURN

All products returned for warranty or service should be shipped by prepaid freight and will be accepted only with an R.M.A. number issued by ARJAY. All products returned to the client will be shipped by freight collect.

2.3 MODIFICATIONS AND SUBSTITUTIONS

Due to an ongoing development program, ARJAY reserves the right to substitute components and change specifications at any time without incurring any obligations.

3 PRODUCT INFORMATION

3.1 TRANSMITTER

Sensor/transmitter Unit Order Number	_____
Transmitter Part Number / WARRANTY	_____
Transmitter Serial Number.....	_____
Sensor Part Number / WARRANTY	_____
Sensor Serial Number.....	_____
Power Supply Requirement.....	12 to 26 VDC
Current Consumption.....	300 mA max

3.2 FACTORY SETTINGS

Gas Type.....	_____
Range 4 – 20 mA Scale.....	_____
Target Gas Ratio to Methane CH ₄	20% LEL CH ₄ = %LEL

3.3 CONTAMINANTS & INTERFERANTS

3.3.1 CONTAMINANTS

The performance of Arjay Engineering Ltd. catalytic combustion type gas sensors may be affected by exposure to substances known as poisons and inhibitors. Inhibitors are present in volatile substances containing halogens or sulphur compounds. Sensors may recover their sensitivity characteristics after exposure to inhibitors has ceased. Some substances produce a permanent poisoning effect on the catalyst. These poisons include silicone oils, greases and petroleum additives such as tetraethyl lead and phosphate esters. Always be cautious of by products that may evolve from the thermal decomposition of materials such as plastics.

3.3.2 INTERFERANTS

Partial list of other gases that detector will respond to

Acetaldehyde	n-Decane	Methylcyclohexane
Acetic Acid	Diethylamine	Methylethylether
Acetic Anhydride	Dimethylamine	Methylethylketone
Acetone	2, 3-Dimethylpentane	Methyl Formate
Acetylene	2, 2-Dimethylpropane	Methyl Mercaptan
Alkyl Alcohol	Dimethylsulphide	Methylpropionate
Ammonia	1, 4-Dioxane	Methyl n-propylketone
n-Amyl-Alcohol	Ethane	Napthalene
Aniline	Ethyl Acetate	Nitromethane
Benzene	Ethyl Alcohol	n-Nonane
Biphenyl	Ethylamine	n-Octane
1, 3-Butadiene	Ethyl Benzene	n-Pentane
n-Butane	Ethylcyclopentane	iso-Pentane
iso-Butane	Ethylene	Propane
Butene-1	Ethylene Oxide	n-Propyl Alcohol
cis-Butene-2	Dimethyl Ether	n-Propylamine
trans-Butene-2	Diethyl Ether	Propylene
n-Butyl Alcohol	Ethyl Formate	Propylene Oxide
iso-Butyl Alcohol	Ethylmercaptan	iso-Propylether
tert-Butyl Alcohol	n-Heptane	Propyne
n-Butyl Benzene	n-Hexane	Toluene
iso-Butyl Benzene	Hydrazine	Triethylamine
n-Butyric Acid	Hydrogen Cyanide	Trimethylamine
Carbon Disulphide	Hydrogen	Vinylethylether
Carbon Monoxide	Hydrogen Sulphide	o-Xylene
Carbon Oxysulphide	Methane	x-Xylene
Cyanogen	Methyl Acetate	p-Xylene
Cyclohexane	Methyl Alcohol	
Cyclopropane	Methylamine	

3.4 OPTIONAL ACCESSORIES

The following options are available for your HLM-2000-EX Series Transmitter:

HLM-2000-EX 6000-08 Duct Adapter

HLM-2000-EX 6000-06 Splash Guard

HLM-2000-EX 6000-01 Flow Through Adapt

HLM-2000-EX 4309 Charcoal Filter

Poison resistant sensor.

Note: The use of optional accessories may affect the response time.

Note:

All Arjay Engineering Ltd. Monitoring systems must be installed and maintained according to instructions, to ensure proper operation. Only qualified personnel should install and maintain the equipment.

4 PRODUCT DESCRIPTION

4.1 GENERAL DESCRIPTION

The ARJAY HLM-2000-EX series sensor/transmitter is designed to provide continuous, reliable surveillance of surrounding air for combustible gases (listed in Product Information, page 3). This unit provides a 4 to 20 mA, variable current signal, which is proportional to the gas concentration detected. Each sensor/transmitter is factory calibrated and ready for field installation and operation.

4.1.1 SENSOR / TRANSMITTER SPECIFICATIONS

OPERATING TEMPERATURE:	−40 to +40 °C (−40 to +104 °F)
OPERATING PRESSURE:	Ambient atmospheric pressure.
HUMIDITY:	0 to 99% RH, non-condensing.
SIGNAL OUTPUT:	4 to 20 mA into 250 Ohms maximum.
CERTIFICATION:	CSA C-22.2 #152-M1984
SENSOR TYPE:	Catalytic pellistor.
RESPONSE TIME:	50% < 10 secs ; 90% < 30 secs
ZERO DRIFT:	Less than 3% full scale per month.
SENSOR LIFE:	2 to 5 years in clean air.

5 INSTALLATION

5.1 LOCATION

To select a suitable instrument and effective location to properly safeguard any particular area the user must have a basic knowledge of gas / vapor properties and phenomena as to how gases and vapors propagate and whether the gases are heavier or lighter than air. The user must also be aware of the conditions which may prevail in the areas being protected such as the direction and velocity of gas movement, humidity and temperature variation, presence of particulates or detrimental contaminants and ease of gaining access for periodic instrument maintenance and adjustment.

The following points will aid the user in selecting a solid non-vibrating mounting surface subject to the general location dictated by industry standards and the regulatory authorities.

1) **Density of gases to be monitored.**

Lighter than air vapors / gases tend to rise and heavier than air vapors / gases tend to settle.

2) **Air movement.**

Air velocity and direction influence the dispersion of vapors / gases to be monitored.

3) **Potential sources.**

The location and nature of the potential vapor / gas sources such as pressure, amount, source temperature and distance need to be assessed.

4) **Ambient temperature.**

Avoid installation in environments likely to promote condensation.

5) **Accessibility.**

Future maintenance and calibration requirements should be considered when selecting detector locations.

6) **Structural arrangements.**

Structural arrangements such as walls, troughs or partitions could allow vapor / gas to accumulate.

7) **Mechanical damage and contamination.**

Detectors should be installed in locations to preclude mechanical damage from cranes, traffic, exhausts and washdowns from normal operations.

5.2 MOUNTING

The sensor housing SHOULD NOT touch the mounting surface. Do not install the sensor facing up. Please refer to the mounting installation diagram at the end of this manual.

Note: Refer to the electrical code for mounting regulations

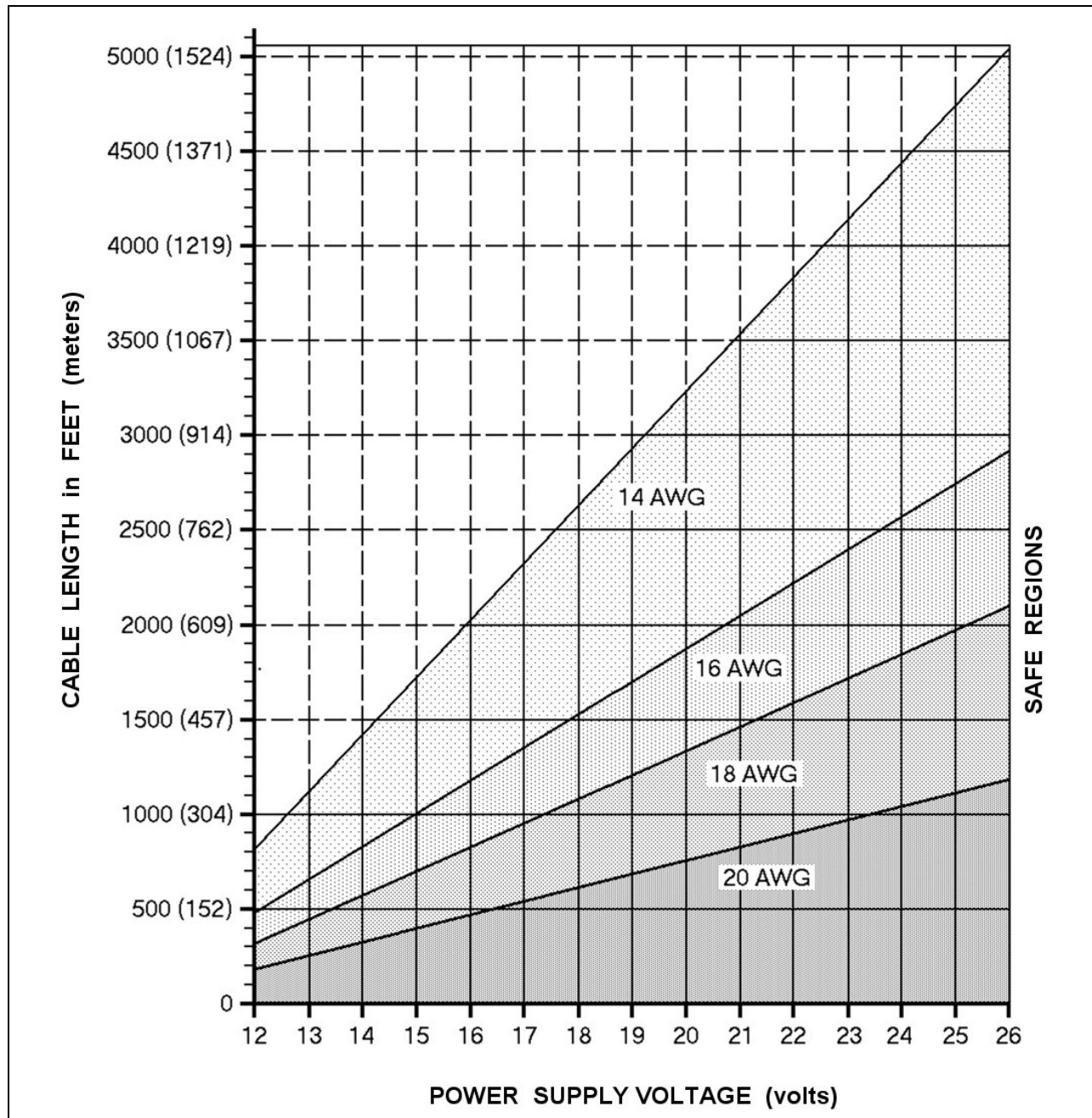
The mounting arrangement of the transmitter housing, dependant on the transmitter location and mounting surface, must comply with local electrical regulations and codes.

5.3 CABLE SELECTION AND WIRING

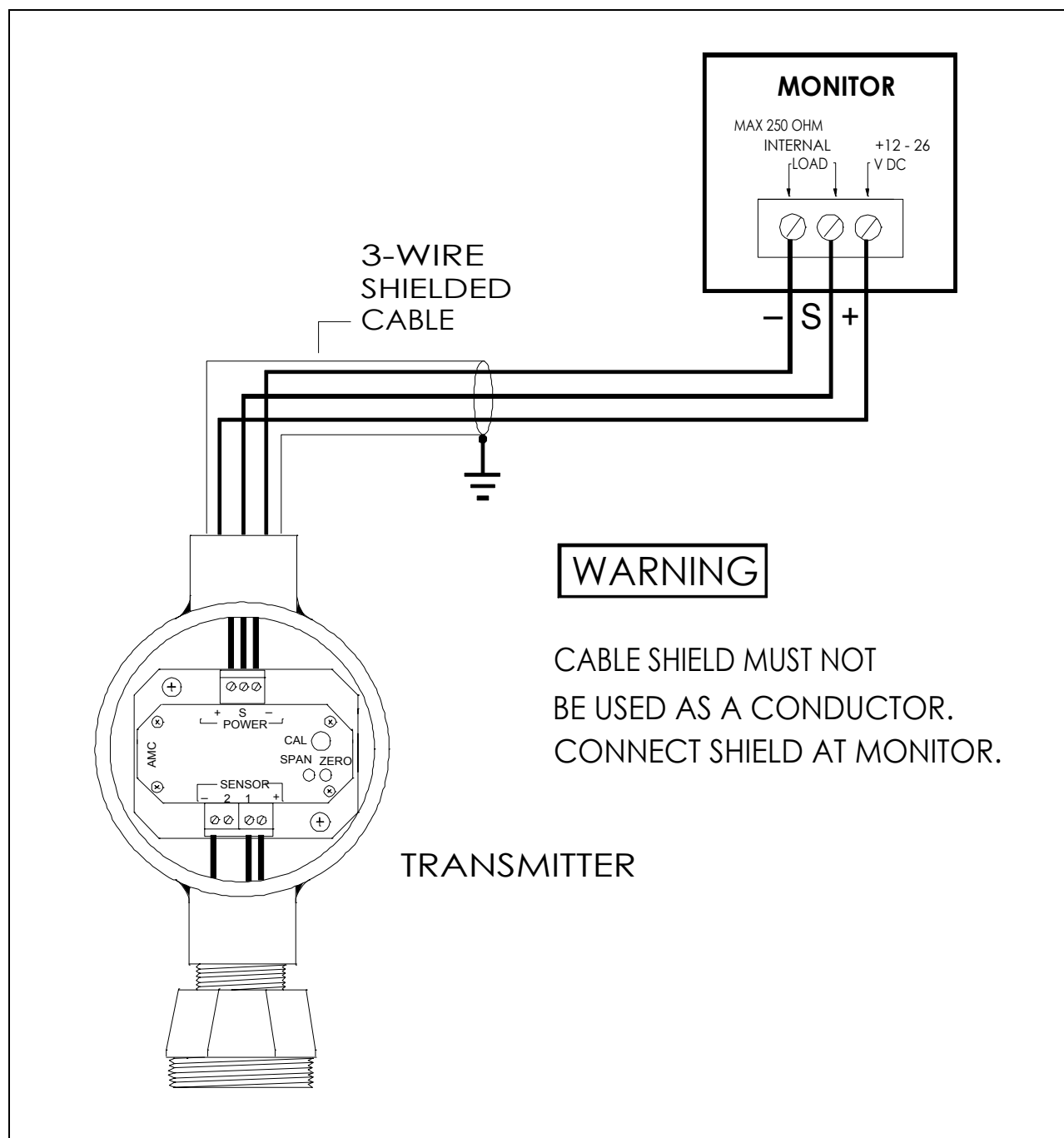
The transmitter output (–,S,+) terminal block connects to the (–,S,+) connections on a channel terminal block of the monitor (one transmitter per channel), as shown in Figure 5.3.2.

Connection should be made using 3-conductor, shielded cable (shield is to be grounded at the monitor and not grounded at the transmitter housing). Run cable through steel conduit for best signal transmission. The maximum permissible distance between the transmitter and monitor is dependant on wire gauge as shown in the following Cable Selection Chart.

5.3.1 FIGURE: Cable selection chart.



5.3.2 FIGURE: Wiring layout.



6 OPERATION AND CALIBRATION

6.1 OPERATION

The ARJAY HLM-2000-EX series sensor/transmitter is factory calibrated for the gas listed in Factory Calibration at the beginning of this manual. The sensor/transmitter should not need re-calibration when first installed and powered up, but a test for correct operation is suggested. All testing should be done after the recommended stabilization period of 24 hours.

Following stabilization the transmitter should be sending, in a clean air environment, a 4 mA signal to the monitor or controller. However, there are a few situations where a slightly higher or lower than normal signal may be noticed. In many facilities there can be residual levels of the gas being detected in the air at all times. These can cause a minor response from the sensor expressed as a rise in signal. Other causes for minor signal variations include extremes in temperature. The application of a clean air sample will verify if the elevated signal is from background gas or equipment error.

6.2 CALIBRATION

Verification of calibration should be done at least once every 6 months for safety reasons. Monthly verification is recommended for highly demanding applications.

Calibration is necessary after replacing the sensor. The new sensor requires an initial burn in time of 24 hours.

Factory or on-site calibration services, customer training and calibration kits are available. Specify the sensor / transmitter Part Number and Serial Number noted in section 3.1 **TRANSMITTER** and Gas Type noted in section 3.2 **FACTORY SETTINGS** to order any of the above.

Note:

Turn off power supply before removing or replacing the transmitter or sensor.

Caution:

Only qualified personnel should perform the calibration.

6.2.21 EQUIPMENT REQUIRED

- digital multimeter with a minimum display range of 20.0 mA
- remote calibration lead provided with the transmitter
- miniature screwdriver
- calibration kit : zero & span gases, regulator, hose & adapter cup
- contact factory for information on cal kits

6.3.1 CALIBRATION PROCEDURE

The remote calibration lead is required to measure the transmitter output signal. The insertion of the calibration lead plug into an HLM-2000-EX 3 wire model transmitter cal jack will disable the transmitter output signal. This will result in a FAIL ALARM condition at the monitor during the calibration / verification procedure.

Zero and Span adjustment terminals are provided to set the zero and span while the sensor is exposed to known concentration sample gas mixtures. It is always best to calibrate the transmitter with the intended gas to be detected. When this is not possible nor practical theoretical cross sensitivity calibration may need to be used.

- 1) Remove cover from transmitter housing
- 2) Connect remote calibration lead to multimeter. BLACK lead to negative or common (-). RED lead to positive (+) mA scale.
- 3) Switch ON multimeter and select the DC milliamp range of 20 mA or greater scale.
- 4) Insert plug end of remote calibration lead fully into CAL jack on transmitter cover plate. This will block the outgoing signal and probably causing a "fail" at the monitor.
- 5) Apply a Zero gas sample or fill a garbage bag with clean outdoor air and apply to sensor. Check for a stabilized ZERO signal of 4.0 mA. Set ZERO trimmer to 4.0mA.
- 6) Apply a Span gas sample. Since the transmitter output range is 4 to 20 mA, a full-scale concentration should register 20 mA after a few moments exposure. Proportionately, a half-scale concentration of gas should register 12 mA, and so on.

For non-Methane target gas, see the specifications in section **3.2 FACTORY SETTINGS** for the Methane ratio. Methane at 20% LEL can be cross ratioed for most target combustible gases. Apply the "span" gas and adjust the SPAN trimmer to the appropriate mA output. It is good instrumentation practice to verify the zero reading after performing any span adjustments. Perform the span procedure after all zero adjustments.

6.3.1 MEASURING SENSOR SWING

For ongoing monitoring of sensor condition you can check the sensor "swing" during calibration. Sensor power supply is 2.0V between sensor terminals + and -. Signal "swing" is measured between - and 1 terminals. Compare the clean air environment Voltage and the cal gas environment Voltage. A new sensor will have approximately 0.75 mV swings per % LEL CH₄. Minimum swing should be 3 mV with 20% LEL CH₄. For 50% LEL CH₄ minimum swing would be 7.5mV. Sensor swing data should be logged for performance evaluation and sensor replacement purposes.

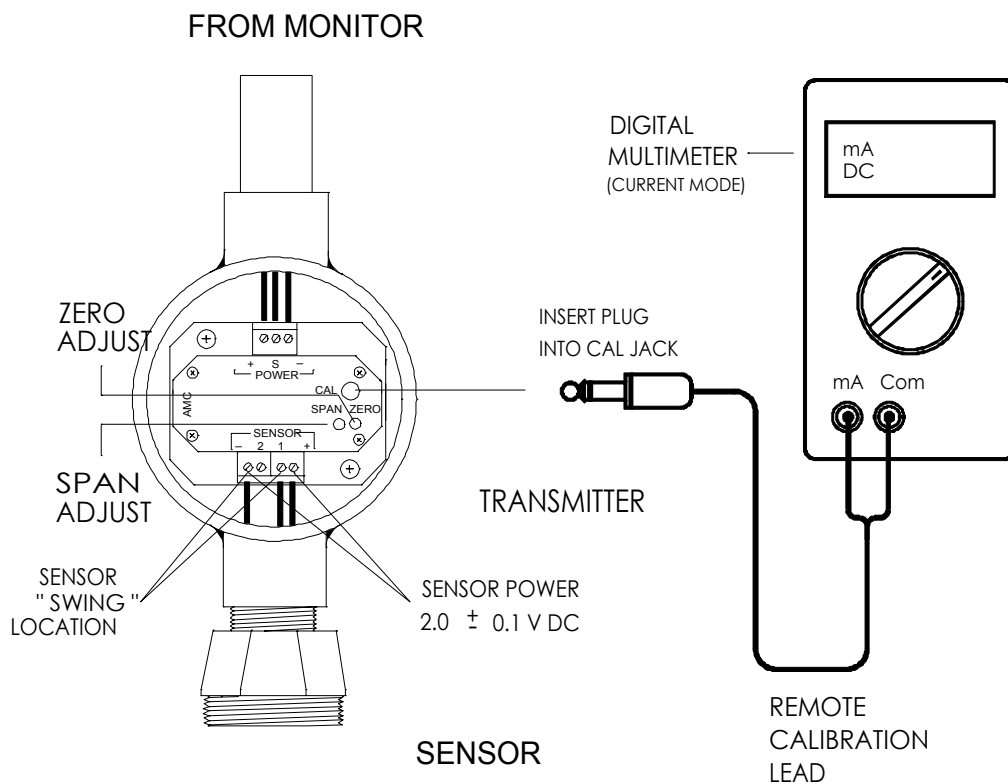


FIGURE: Calibration / verification set-up procedure.

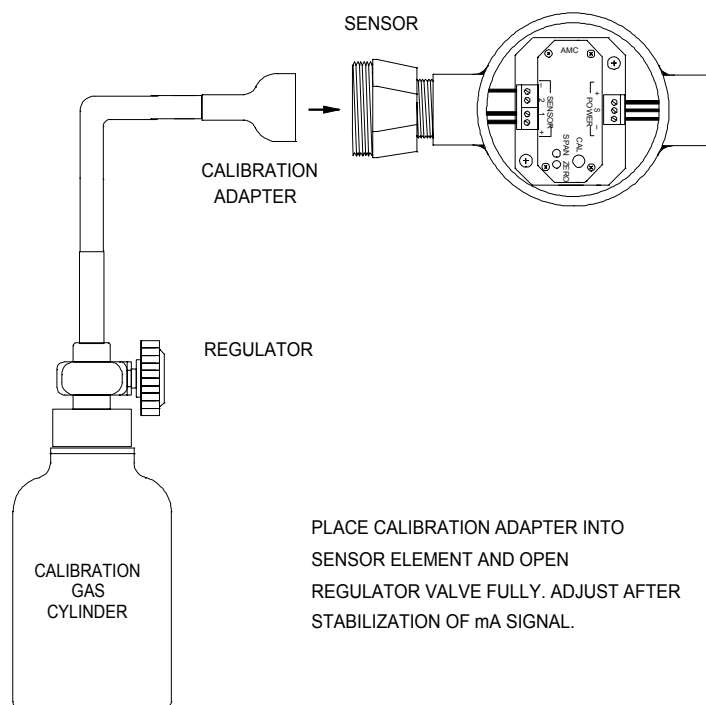


FIGURE: Calibration procedure.

7 PREVENTIVE MAINTENANCE

7.1 GENERAL

The enclosure should be brushed or wiped clean once a year or more, depending on the accumulation rate of dust or dirt.

To avoid sensor damage, the unit **MUST NOT** be submerged in any liquids. Hosing or splashing the unit with any liquids must also be avoided.

7.2 TROUBLESHOOTING GUIDE

Symptom	Possible Cause	Test Action	Corrective Action
No Current Output From TRX	Power Supply Problem	Measure TRX supply voltage. Should be between 12-26 VDC	Isolate Power supply Problem
	Blown Multimeter Fuse	Test meter fuse	Replace meter fuse
	Excessively low zero setting (common if changing sensor)	Attempt zero adjustment	Reset zero, readjust span also
	Failed sensor	Bad connection at sensor or damaged sensor	Perform sensor tests as below
Steady 1 mA Output from TRX	Bad sensor connection	Measure sensor signal voltage on TRX sensor Terminal Block. Voltage should be 2 VDC between (+) and (-) and Approx. 1 VDC between (-) and (1)	Ensure good connection between sensor terminal block and sensor
	Damaged sensor	Disconnect power, remove sensor and measure sensor voltage. Voltage should be 2 VDC between (+) and (-) and Approx. 1 VDC between (-) and (1)	If sensor is open on any combination of wires, call factory for replacement sensor
Not enough sensor response with Cal gas, cannot adjust or correct span output	Expired or weak sensor	Measure sensor signal on TRX sensor terminal block from (S) and (-). A typical sensor has a net signal change of 1 mV for every percent LEL when new. Minimum recommended swing is 3 mV with 20% LEL CH ₄ .	Contact factory for replacement sensor.
Not enough sensor response with Cal gas, cannot adjust or correct span output	Expired or weak sensor	Measure sensor signal on TRX sensor terminal block from (S) and (-). A typical sensor has a net signal change of 1 mV for every percent LEL when new. Minimum recommended swing is 3 mV with 20% LEL CH ₄ .	Contact factory for replacement sensor.
Upscale zero reading	Background gas	Apply zero gas or ensure a clean air environment	Adjust zero if clean air does not lower signal. Recheck span if zero is adjusted.
Short sensor life	Poisoned sensor	Calibrate sensor	If sensor life is shorter than expected, a poison resistant sensor may be more suitable for the application. Contact an ARJAY application consultant at the factory

7.3 SENSOR REPLACEMENT

Sensor life is typically 2 to 5 years, depending on environmental conditions. The sensor should be replaced under the following conditions:

1. If the sensor element becomes an open circuit, the transmitter outputs a fixed 1 mA signal that cannot be readjusted.
2. When the sensor no longer responds to the presence of gas or produces an unstable "zero" signal.
3. A recommended minimum of 3 mV sensor responses to 20% LEL of Methane is required for stable reliable operation. Measure the sensor swing as per section 6.3.1.

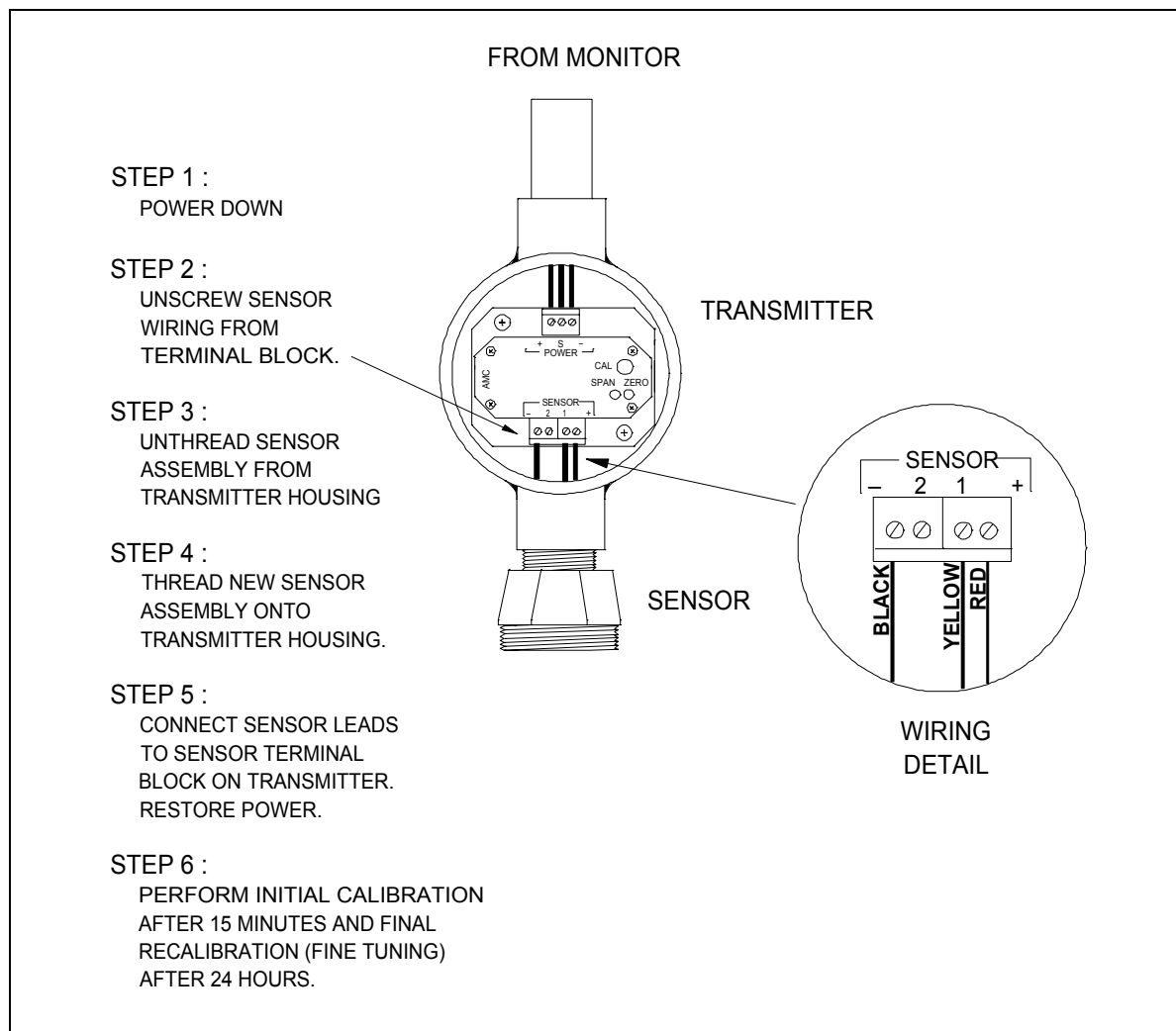
When the sensor needs replacing, reorder the "Sensor Part Number" listed in the Product Information on page 3. Refer to Figure 7.3.1 for the sensor replacement and wiring procedure.

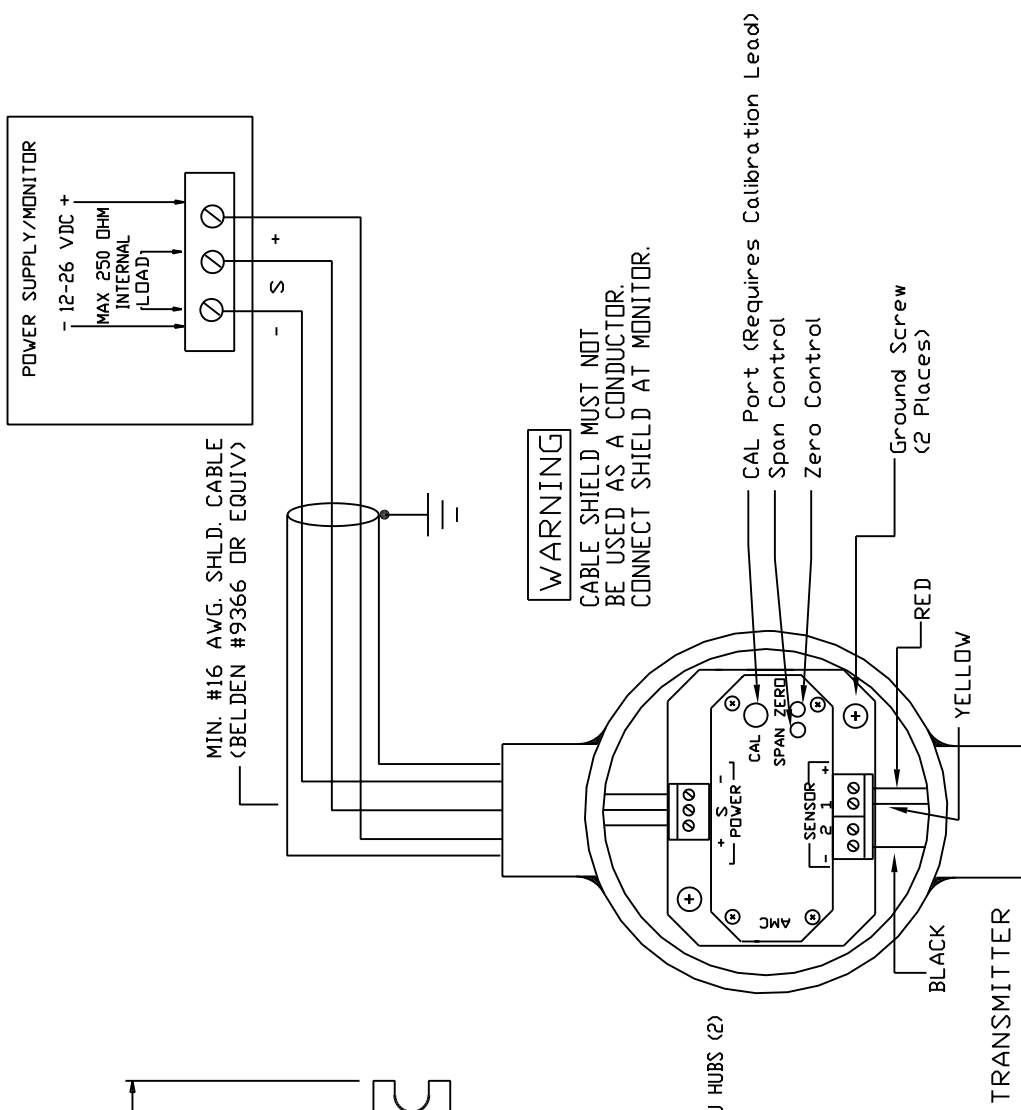
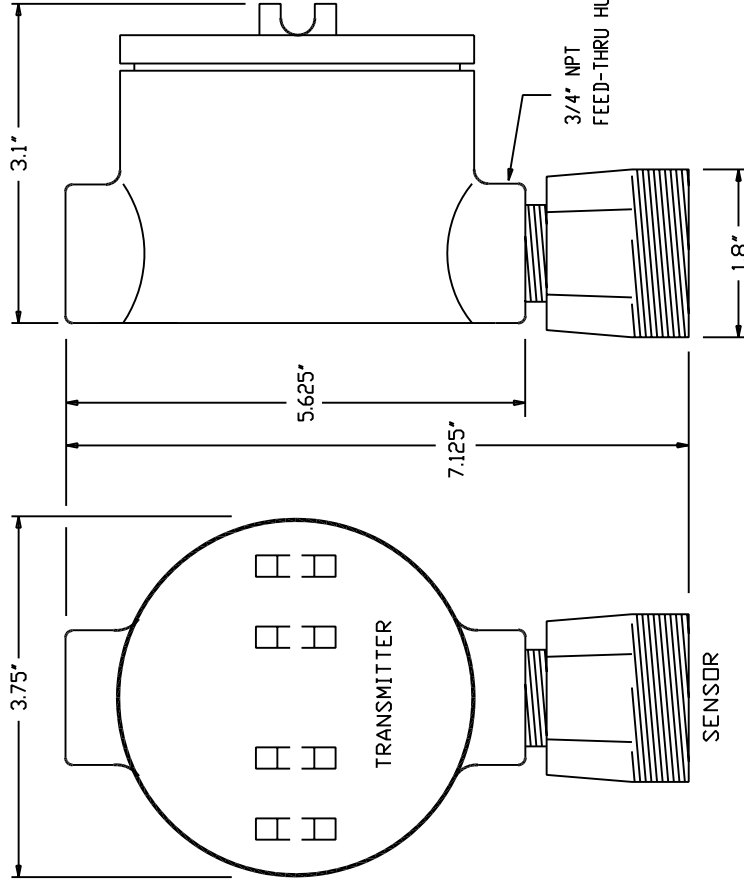
Perform initial approximate calibration after a minimum of 15 minutes of sensor being powered.

Note:

Allow 24 hours for the new sensor element to stabilize (burn-in) before final calibration. Refer to calibration section 6.3 of this manual.

7.3.1 FIGURE: Sensor replacement and wiring procedure.





SIDE VIEW

FRONT VIEW

Note: Always mount sensor pointing down.

REV	DATE	DESCRIPTION	CHKD	APPD
REVISIONS				
PROJECT: ARJAY ENGINEERING LIMITED				
TITLE: HLM 2000-EX				
Field Wiring Connections and Component Detail				
DWG. STATUS	BY	DATE	SCALE	
DRAWN	V.H.	03/06/08	N.T.S.	
CHECKED				
APPROVED				
REF. DWGS			DWG NO.	SMT. REV.
			20010384	1 0



MAINTENANCE AND CALIBRATION

Your **ARJAY / ENMET** gas detector is the state of the art in gas detection, but like any other part of your ventilation system, it requires periodic maintenance and calibration.

There are various sensor technologies that may be used in your Arjay gas monitor; including solid state MOS, Electrochemical, Infrared and Pellister Pair (Hot wire). These have a normal operating life of 3 to 5 years under ambient conditions. You should consider a preventive maintenance schedule whereby you test your system on a periodic basis to ensure its proper calibration and operation.

For solid state (MOS) sensors, we recommend calibration every 3 to 4 months for a typical garage application. For Electrochemical sensors, we recommend calibration every 6 months for a typical garage application. Pellister Pair we recommend every 3 to 4 months and Infrared we recommend every 6 months. For applications that are more sensitive, or where internal policies exist, a higher frequency of calibration may be required. This is a simple procedure which will indicate any problems with your system. A test and calibration kit may be purchased from **ARJAY ENGINEERING** for this purpose. Parts are also readily available from our facility.

MAINTENANCE CONTRACT

Alternatively you may wish to consider a Maintenance Contract with **ARJAY ENGINEERING** whereby one of our service technicians comes to your site and checks out the unit for proper calibration and operation on a regularly scheduled basis. This is done on a flat per annum fee. All parts are extra. Typical target gases are included, however, exotic or specialty gases may have a surcharge. If you wish us to quote a Maintenance Contract fill in the section below and return to our office.

COMPANY:			
ADDRESS:			
CONTACT PERSON:			
PHONE:		FAX:	
EMAIL:			
MODEL AND SERIAL NO. OF GAS DETECTOR:			

Fax to address below or e-mail to arjay@arjayeng.com

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