



360 SERIES

Flammable Gas
Sensor / Transmitter

INSTRUCTION MANUAL

For Flammable Gas Sensor / Transmitter

IMPORTANT:

Please read these installation and operating instructions completely and carefully before starting.

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1 WARRANTY

The AMC-360 transmitter is warranted against defects in material and workmanship for a period of two (2) years from date of shipment (except electrochemical sensor elements, catalytic elements and portable monitors – one (1) year – refer to individual spec sheets for additional exceptions). **Calibration is not warranted.** During the warranty period, Armstrong will repair or replace components that prove to be defective in the opinion of Armstrong Monitoring. The corporation is not liable for auxiliary interfaced equipment, nor consequential damage.

NOTE: Any substitution or tampering with components without expressed, written permission of ARMSTRONG MONITORING may result in intrinsic damage which will cancel the effectiveness of the warranty. Extended warranties are available through the factory. Please contact factory. Service agreements may supersede standard warranty terms.

1.1 LIABILITY

All Armstrong Monitoring systems shall be installed by a qualified technician and maintained according to Armstrong Monitoring Installation and Maintenance Manual instructions.

Armstrong Monitoring shall not be responsible for any liability arising from auxiliary interfaced equipment, consequential damage, the installation, or the operation of this equipment. Armstrong's total liability is contained in the warranty conditions stipulated above. No other acceptance of liability is expressed or implied by Armstrong Monitoring. Except as set forth herein, Armstrong Monitoring makes no warranty, expressed or implied, with respect to the fitness for any particular purpose or use or otherwise of the products or services, or on any parts or components or labour furnished as part of the sale. In no event shall Armstrong Monitoring, its officers, directors, employees, agents or servants be liable to the buyer or any other party for any loss of profit, loss of use, incidental, consequential or special damages arising out of the sale, delivery, servicing, use, loss of use, of the products or of any part thereof, irrespective of whether Armstrong Monitoring or any of its officers, directors, employees, agents or servants has advanced notice of the possibility of such damages. In no event will the total liability to the buyer exceed the sum paid to Armstrong Monitoring by buyer for the products and services.

1.2 PRODUCT RETURN

All products that must be returned for warranty service will be shipped by prepaid freight and will only be accepted with a Returned Materials Authorization (RMA) number issued by ARMSTRONG MONITORING. Goods returned to the client will be by freight collect.

1.3 MODIFICATIONS AND SUBSTITUTIONS

Due to an ongoing development program, Armstrong Monitoring reserves the right to modify the design and substitute components in any of its products without prior notice. All changes are at the sole discretion of Armstrong Monitoring, and the corporation shall not be liable for any cost arising out of such modifications or substitutions that may be incurred by the user.



2 PRODUCT INFORMATION

The AMC-360 series sensor/transmitter is designed to provide continuous, reliable surveillance of surrounding air for combustible gases (listed in section 2.2). 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.

2.1 SENSOR/TRANSMITTER

Sensor/Transmitter Unit Order Number	_____
Transmitter Part Number	_____
Transmitter Serial Number.....	_____
Sensor Part Number.....	_____
Sensor Serial Number.....	_____
Sensor Warranty.....	_____
Power Supply Requirement.....	12 to 26 VDC
Current Consumption.....	300 mA max
Operating Temperature.....	-40 to +40 °C (-40 to +104 °F)
Operating Pressure.....	Ambient atmospheric pressure
Operating Humidity.....	0 to 99% RH, non-condensing
Initial Burn-in time.....	24 hours
Certification.....	CSA C-22.2 #152-M1984

2.2 FACTORY SETTINGS

Gas Type.....	_____
Zero air at 4 mA signal.....	_____
Gas Concentration at 20 mA signal.....	_____
Target Gas Ratio to Methane (CH4).....	20% LEL CH4 = ____ %LEL____
Calibration Adapter Part Number.....	_____

2.3 HOUSING OPTIONS

The AMC-360 series transmitter/sensor units are available in the following explosion-proof housings (see Figure 1). The explosion-proof housings are also available with a corrosion resistant finish.

- Explosion-Proof (rated for Class I, Groups B, C, D)
- Explosion-Proof (rated for Class I, Groups A, B, C, D)

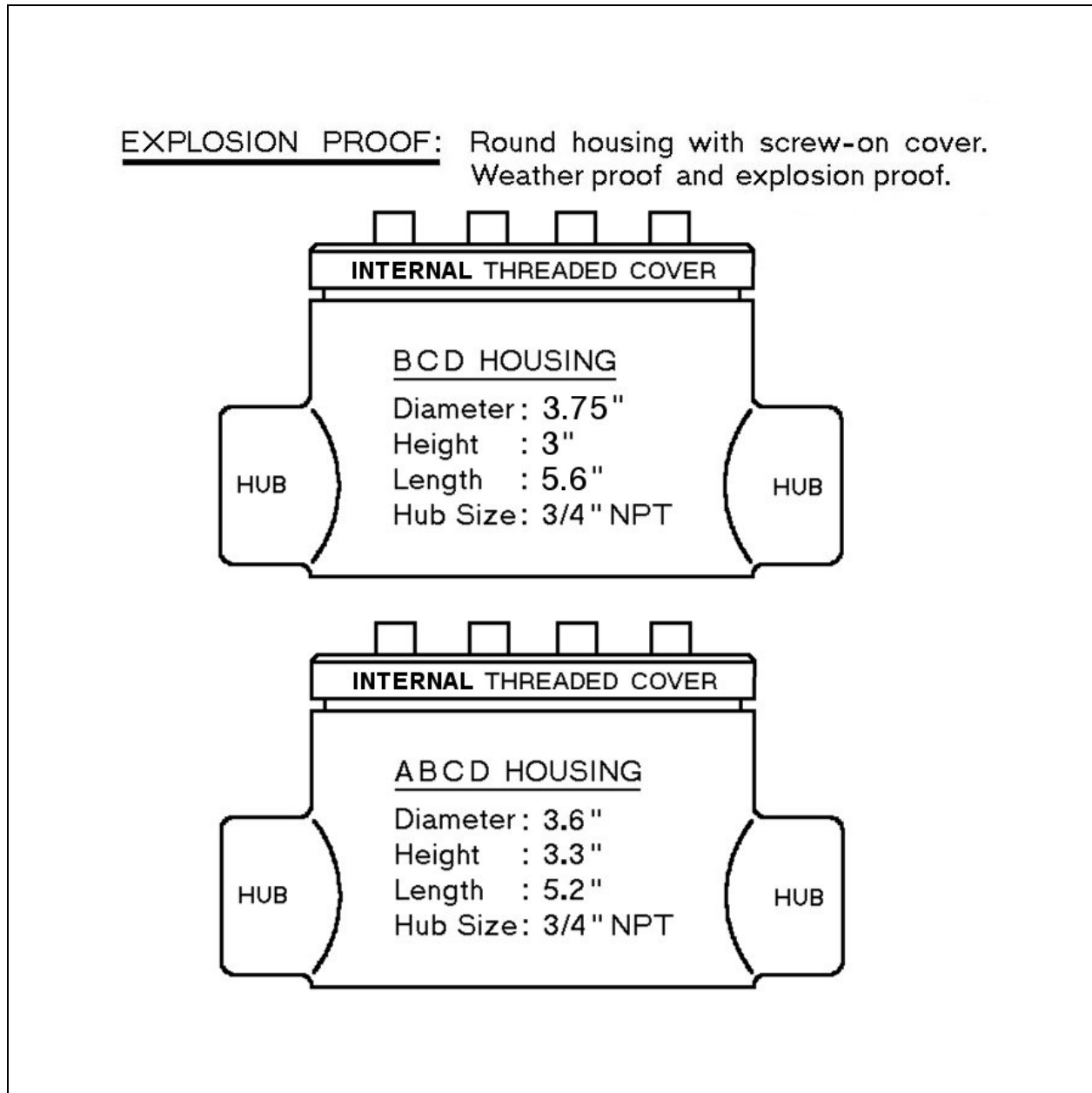


FIGURE 1: Housing options.

2.4 CONTAMINANTS & INTERFERANTS

2.4.1 CONTAMINANTS

The performance of the 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.

2.4.2 INTERFERANTS (partial list of other gases that the detector will respond to)

Nitrogen Compounds	Diolefins	Organic Acids
ammonia	1.3-butadiene	acetic acid
hydrazine	1,4-hexadiene	acetic anhydride
cyanogens		n-butyric acid
hydrogen cyanide	Acetylenes	
methylamine	acetylene	Esters
ethylamine	propyne	methyl formate
trimethylamine		methyl acetate
triethylamine	Cycloparaffins	methyl propionate
n-propylamine	cyclopropane	ethyl formate
aniline	cyclohexane	ethyl acetate
nitromethane	methylcyclohexane	
		Sulphur Compounds
Elementary	Alcohols	carbonyl sulphide
hydrogen	methyl alcohol	carbon disulphide
	ethyl alcohol	hydrogen sulphide
Paraffins	n-propyl alcohol	dimethyl sulphide
methane	iso-propyl alcohol	methyl mercaptan
ethane	n-butyl alcohol	ethyl mercaptan
propane	iso-butyl alcohol	
n-butane	tert-butyl alcohol	Halides
iso-butane		methyl bromide
n-pentane	Ethers	methyl chloride
iso-pentane	dimethyl ether	methylene chloride
neo pentane	ethyl methyl ether	ethyl bromide
n-hexane	diethyl ether	ethyl chloride
methylpentane	diiso-propyl ether	vinyl chloride
dimethylbutane	1, 4 dioxane	ethylene dichloride
n-heptane		n-propyl chloride
methylhexane	Ketones	chlorobenzene
ethylpentane	acetone	
dimethylpentane	methyl ethyl ketone	Oxides
trimethylbutane	methyl propyl ketone	carbon monoxide
n-octane		ethylene oxide
n-nonane	Olefins	1, 2-propylene oxide
n-decane	ethylene	
	propene	Aldehydes
Aromatics	1-butene	acetaldehyde
benzene	cis-butene-2	
toluene	trans-butene-2	
o-xylene	isobutylene	
m- xylene	1-pentene	
p- xylene		
ethyl benzene		



2.5 OPTIONAL ACCESSORIES

The following options are available for your AMC 360 Series Transmitter:

AMC 6000-08 Duct Adapter
AMC 6000-06 Splash Guard
AMC 6000-01 Flow Through Adapter
AMC 4309 Charcoal Filter
AMC-E6222 Poison resistant sensor.

NOTE: The use of optional accessories may affect the response time and void the CSA 152 approval.

Note:

All Armstrong Monitoring systems must be installed and maintained according to instructions, to ensure proper operation. Only qualified technicians should install and maintain the equipment.

3 INSTALLATION

3.1 LOCATION AND MOUNTING

Select an appropriate height and location for the sensor/transmitter with consideration of density and source of target gas. Mount the transmitter/sensor unit on a solid, non-vibrating surface or structure in an area where the local concentration of gas is unaffected by the presence of ventilation systems and away from sources of interference gases. The sensor housing SHOULD NOT touch the mounting surface. Some cases may require the use of a spacer between the mounting surface and the transmitter housing (see Figure 2).

Note:

Mounting arrangement of the transmitter housing depends on location of transmitter and mounting surface. Mounting hardware is not supplied.

Warning:

Qualified personnel should perform the installation according to applicable electrical codes, regulations and safety standards. Insure correct cabling and sealing fitting practices are implemented.

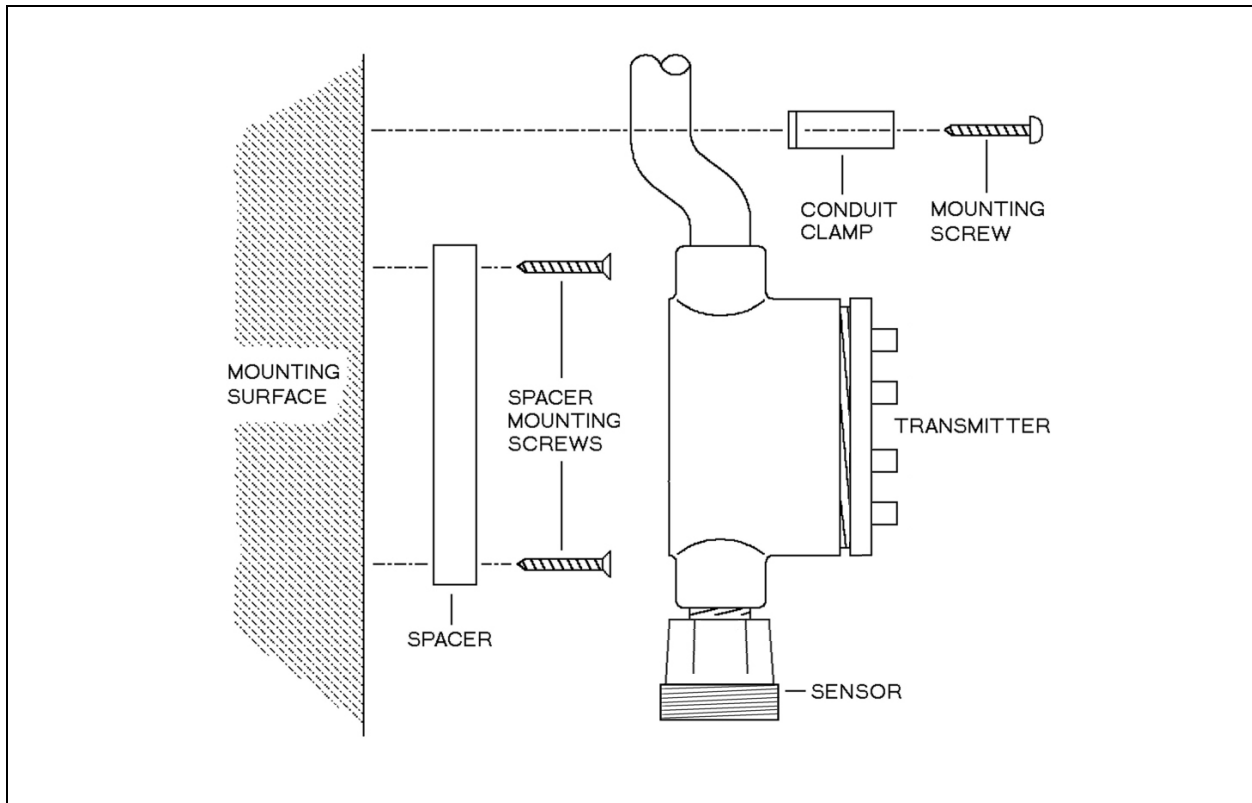


FIGURE 2: Mounting of the transmitter housing.

3.2 CABLE SELECTION AND WIRING

Connection should be made using 3-conductor, shielded cable (shield is to be grounded at the power supply/monitor). Run cable through steel conduit for best signal transmission and maximum noise rejection. The maximum permissible distance between the transmitter and power supply/monitor is dependant on wire gauge and supply voltage as shown in the following Cable Selection Graph.

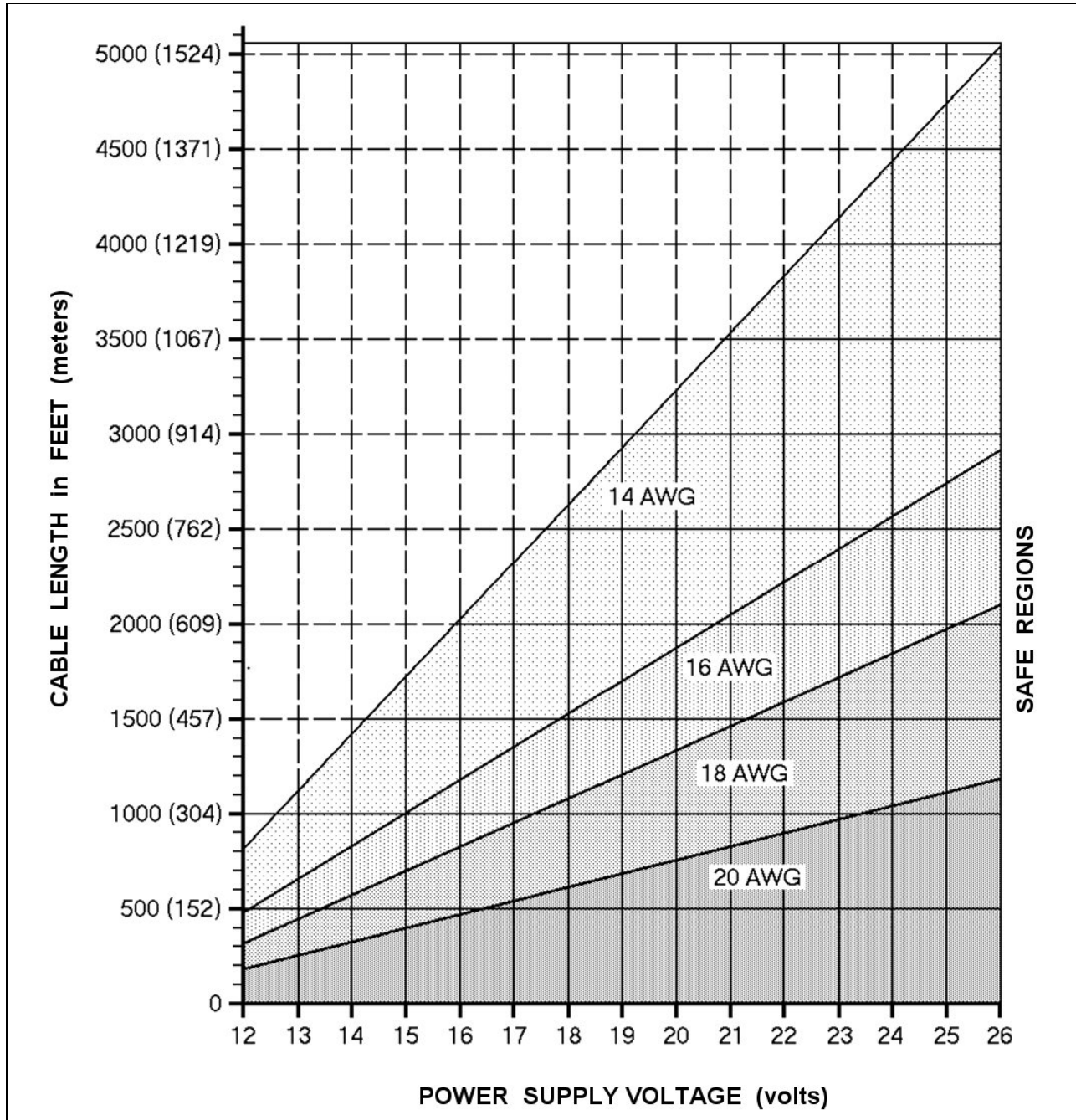


FIGURE 3: Cable selection graph.

3.2.1 TRANSMITTER TO MONITOR WIRING

The transmitter output (-,S,+) terminals connect to the (-,S,+) terminals on a channel terminal block of the monitor (one transmitter per channel), as shown in Figure 4. Each transmitter MUST BE CONNECTED TO ITS CORRESPONDING CHANNEL to retain factory calibration of the trip points.

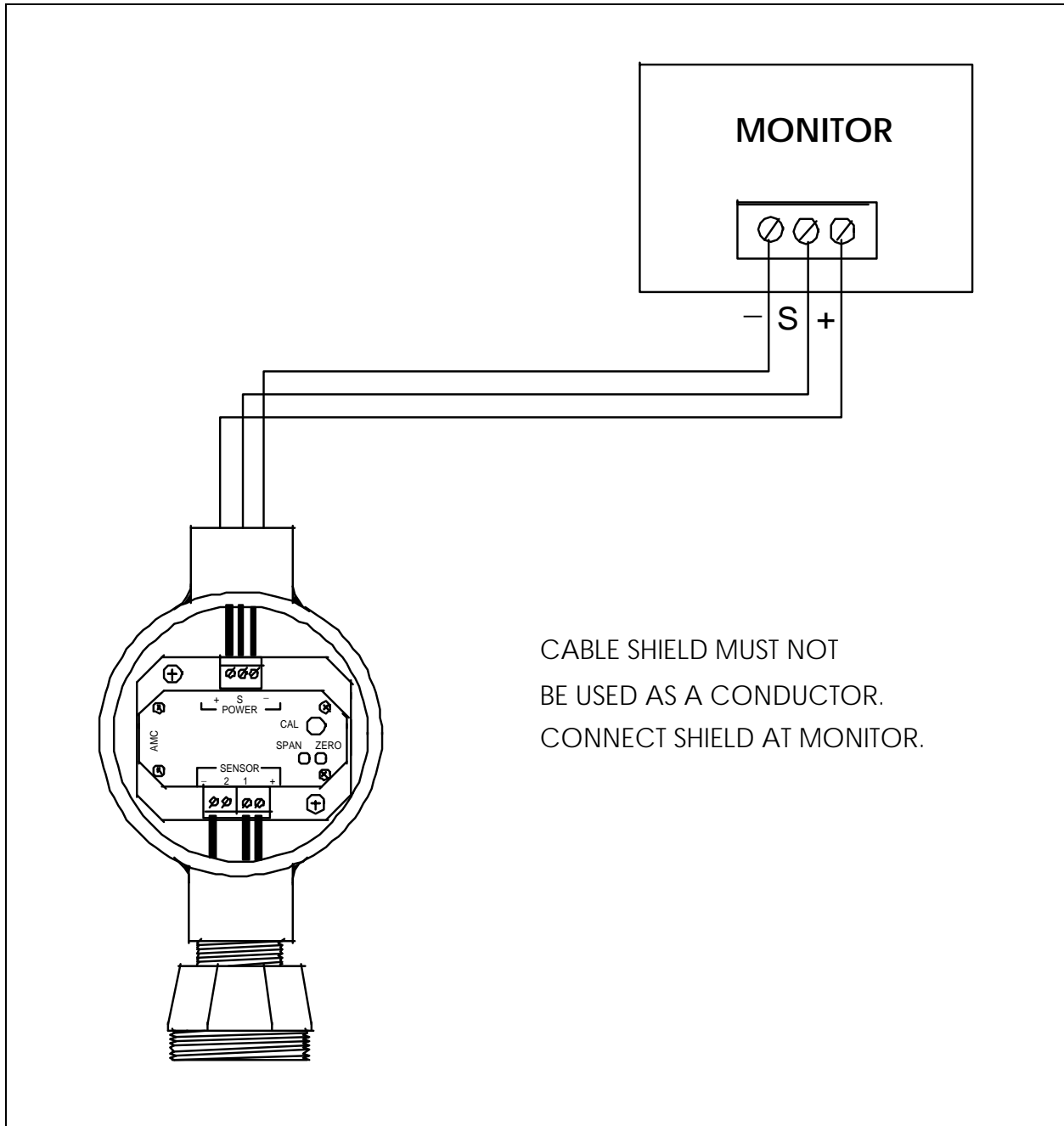


FIGURE 4: Transmitter to monitor wiring layout.

3.2.2 INTERFACING TO COMPUTER, DATALOGGER, OR NON-AMC MONITOR

All 3-wire sensor/transmitters can be connected to computers or dataloggers through analog-to-digital converters or to non-AMC monitors. The transmitter output (-, S, +) terminals connect to a filtered 12 to 26 VDC power supply through field wiring, as shown in Figure 5.

The signal output from the transmitter is a 4 to 20 mA DC current. This signal can be measured or recorded anywhere in the supply loop if required. Alternatively, if a voltage measurement is needed, a resistor can be connected between the negative (-) and positive (+) terminals of the computer, datalogger or non-AMC monitor, as shown in Figure 5.

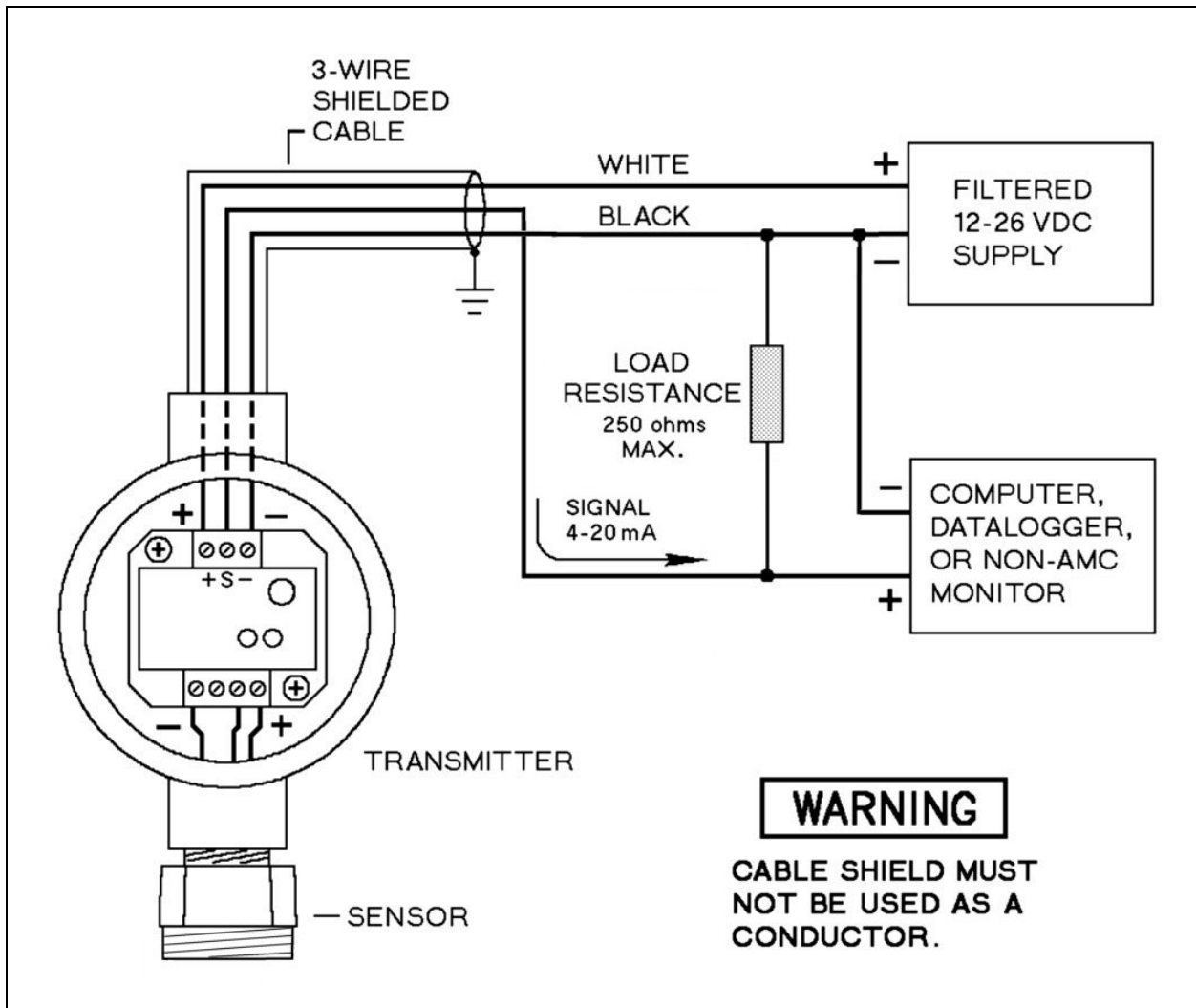


FIGURE 5: Interfacing to a computer, datalogger or non-AMC monitor.



4 OPERATION AND CALIBRATION

4.1 OPERATION

The AMC-360 series transmitter/sensor unit is factory calibrated for the gas listed in section 2.2 at the beginning of this manual. The unit should not need recalibration when first installed and powered up, but a test for correct operation is recommended. All testing should be done after a stabilization period of 24 hours.

In general, after the stabilization period, the transmitter should be sending (in a clean air environment) a signal of approximately 4 mA 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 background gases (including the gas being detected) in the air at all times. These can cause a minor response from the sensor, normally causing a rise in signal. Other causes for minor signal variations include extremes in temperature. In the case of large signal variations (in a clean air environment), check for an installation problem, RF interference or the possibility of an interference gas being present. The application of clean air from a zero air source will verify if the elevated signal is from background gas or equipment calibration error.

Be aware that extended exposure of a detector element to certain concentrations of combustible gases and air can introduce stress to the element seriously affect its performance, and therefore that recalibration should be carried out or the sensor replaced, or both, after an alarm due to an indication of a high concentration.

4.2 CALIBRATION

The transmitter is equipped with a remote calibration feature allowing one-man calibration at the transmitter location. The transmitter output is measured using a “plug-in” type “Remote Calibration Lead” (P/N 2900-01) designed to be adaptable to most multimeters. Zero and span adjustments are made at the transmitter. Recalibration is necessary when replacing the sensor. Scheduled calibration should be done at least once every 6 months for safety reasons and for highly demanding applications more frequent calibration is recommended.

Caution:

- Only qualified personnel should perform the actual calibration.
- Users are advised to consult The Armstrong Monitoring Corporation as to the calibration procedure and recommended gas concentration for the application.

For some exotic gases, calibration standards needed for field calibration are not readily available. The Armstrong Monitoring Corporation offers the following calibration plans:

1. Factory pre-calibrated replacement sensor/transmitter units
2. On site installation and calibration by Armstrong Monitoring
3. On site calibration by Armstrong Monitoring
4. Training by Armstrong Monitoring
5. Extended warranty calibration program



For all above options, please contact AMC for details.

4.2.1 EQUIPMENT REQUIRED

- Digital multimeter with a minimum display range of 20.0 mA.
- Remote calibration lead provided with the transmitter, available from AMC.
- Miniature screwdriver trimmer adjustment tool.
- Calibration adapter, available from AMC.
- Zero & Span gases and regulator (Contact AMC for information).

4.2.2 CALIBRATION PROCEDURE

The remote calibration lead is required to measure the transmitter output signal. The insertion of the calibration lead plug into an AMC 3-wire model transmitter cal jack will disable the transmitter output signal. This will result in a FAIL ALARM condition at the monitor or controller during the calibration 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 neither possible nor practical, theoretical cross sensitivity calibration may need to be used.

Refer to Figure 6 to perform the following calibration procedure:

- 1) Remove cover from transmitter housing
- 2) Connect "Remote Calibration Lead" to multimeter.

BLACK lead to negative or common (-).

RED lead to positive (+).
- 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, causing a "fail" at the monitor or controller.
- 5) Apply Zero air @ .5L/min to the sensor. After the signal reading has stabilized (approx 1 min) 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 2.2 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.

4.2.3 MEASURING SENSOR RESPONSE

For ongoing monitoring of sensor condition, you can check the sensor response during calibration. Sensor power supply is 2.0V measured between sensor terminals (+) and (-). Signal response is measured between (-) and (1) terminals. In clean air, the voltage for a functional sensor should be about 1.00 VDC. When a sample of 20% LEL method is applied, you should observe a minimum of 0.003 V (3 mV) shift. Anything less is inadequate sensor output to achieve regular operation and the sensor should be replaced. A new sensor will have approximately 0.75 mV response per % LEL CH4.

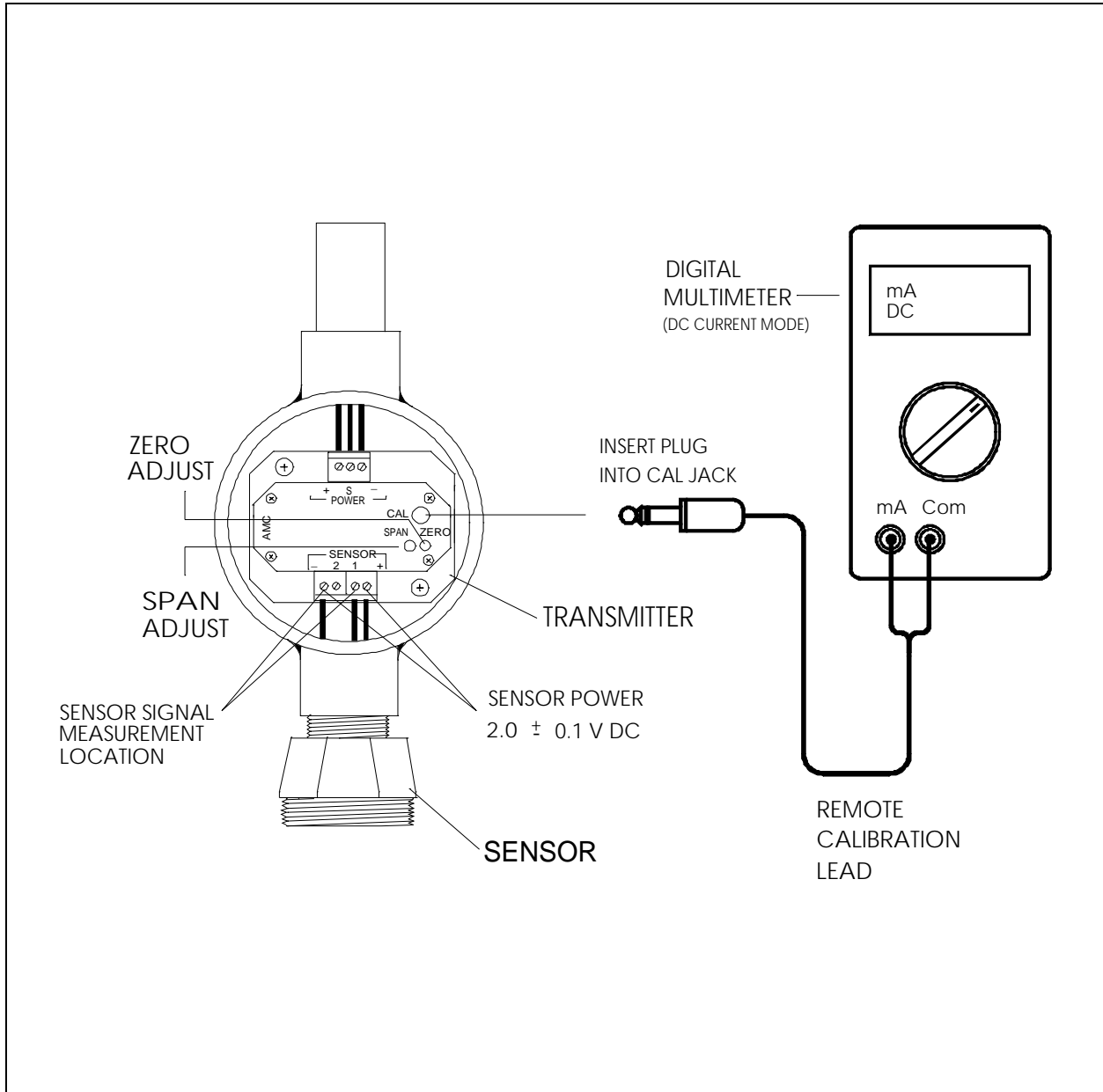


Figure 6: Calibration set-up procedure.



5 PREVENTIVE MAINTENANCE

5.1 GENERAL

The transmitter/sensor unit should be brushed or wiped clean once a year or more, of any dust or dirt which settles on it, depending on the accumulation.

The unit SHOULD NOT be submerged in water or other liquids. Also, hosing and other conditions that could cause a liquid to enter the enclosure should be avoided. Properly seal sensor and turn off detectors in areas of paint and paint curing. Precautions should be taken when knowingly introducing high concentrations of volatile organic vapours in sensor areas.

5.2 SCHEDULED CALIBRATION

Scheduled calibration is critical in maintaining proper function of gas sensor/transmitters.

It is recommended that the sensor/transmitter be calibrated a minimum of twice a year. For more demanding applications, verification should be performed on a monthly basis.

As mentioned, Armstrong Monitoring offers a number of different maintenance plans to suit your requirements see section 4.2.

5.3 SENSOR REPLACEMENT

CAUTION

TURN OFF THE MAIN POWER SUPPLY BEFORE ATTEMPTING THE FOLLOWING PROCEDURE.

The sensor should be replaced under the following conditions:

1. When the sensor element becomes an open circuit, the transmitter outputs a fixed 1 mA signal.
2. When the sensor no longer responds to the presence of gas or has an unstable “zero” signal.
3. A minimum of 3 mV sensor response to 20% LEL of Methane or equivalent is required for stable, reliable operation. Measure voltage swing between the ground (–) and 1 (one) on sensor terminal block. Compare the clean air voltage to the “in gas” voltage.

When its signal is greatly reduced or unstable, the sensor/transmitter replacement is required; see section 2.1 for replacement sensor P/N.

See Figure 7 for sensor replacement and wiring procedure.

Note:

Allow 24 hours for the new sensor element to stabilize (burn-in) before recalibration, then follow instructions in the transmitter calibration section 4.2 of this manual.

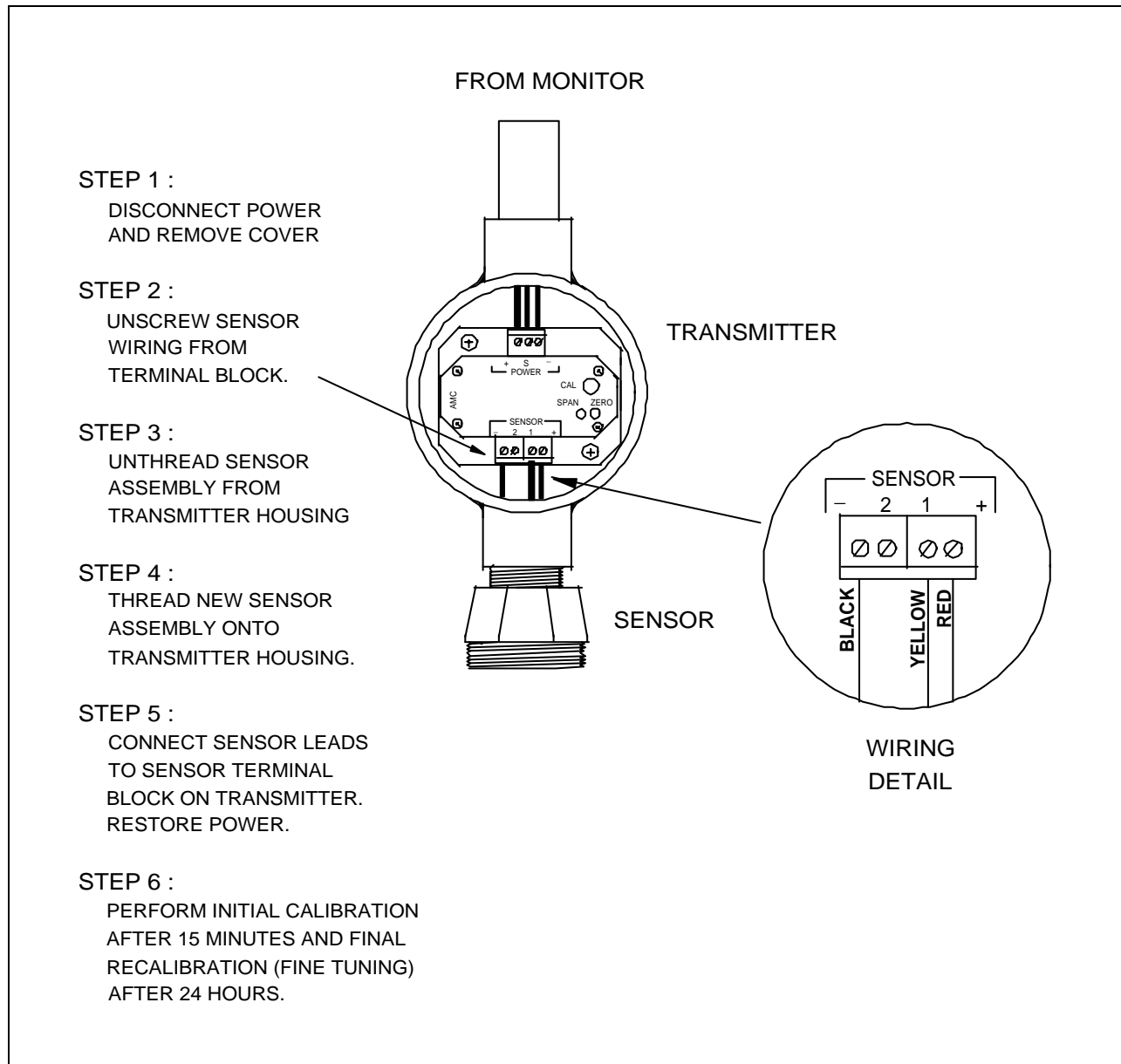


FIGURE 7: Sensor replacement and wiring procedure