



210 Series

Transmitter with External
Electrochemical Sensor

INSTRUCTIONS

Installation and Operation of the
AMC-210 Series Transmitter with
External Electrochemical Sensor

IMPORTANT:

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

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1 WARRANTY

The AMC-210 transmitter is warranted against defects in material and workmanship for two (2) years from the date of shipment from factory. **Please check equipment specifications following this page for sensor warranty periods.** Maintenance items are not warranted. During the warranty period, *The Armstrong Monitoring Corporation* will repair or replace components that prove to be defective in the opinion of AMC. We are not liable for auxiliary interfaced equipment, or 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 AMC representative, or when failure is due to misuse or conditions of use.

1.1 LIABILITY

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

AMC shall have no liability arising from auxiliary interfaced equipment, for consequential damage, or the installation and operation of this equipment. AMC shall have no liability for labour 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.
--

1.2 PRODUCT RETURN

All products returned for warranty or service should be shipped by prepaid freight and will be accepted only with a repair number issued by AMC. All products returned to the client will be shipped by freight collect.

1.3 MODIFICATIONS AND SUBSTITUTIONS

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



2 PRODUCT INFORMATION

2.1 SENSOR/TRANSMITTER

Sensor/Transmitter Unit Order Number. _____

Transmitter Part Number..... _____

Transmitter Serial Number..... _____

Sensor Part Number..... _____

Sensor Serial Number..... _____

Power Supply Requirement..... 12 to 30 VDC @ 20 mA

Sensor Warranty..... _____

2.2 FACTORY CALIBRATION

Gas Type..... _____

Zero Gas, at 4 mA Signal..... _____

Gas Concentration at 20 mA Signal..... _____

Calibration Adapter Part Number..... _____

Note:

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



3 PRODUCT DESCRIPTION

3.1 GENERAL DESCRIPTION

The AMC-210 series sensor/transmitter is designed to provide continuous, reliable surveillance of surrounding air for traces of a specific hazardous gas(es) (listed in Factory Calibration, 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 unit is factory calibrated and is ready for field installation and operation.

3.1.1 SENSOR / TRANSMITTER SPECIFICATIONS

SENSOR TYPE:	Electrochemical cell.
RESPONSE TIME:	Better than ___% step change in ___ seconds
DRIFT:	Less than ___% of full scale per ___
SENSOR SIGNAL OUTPUT:	_____ Linear to the concentration of gas
OPERATING TEMPERATURE:	___ to ___ °C (___ to ___ °F)
HUMIDITY:	___ to ___% RH, non-condensing.
EXPECTED SENSOR LIFE:	Greater than ___year(s)

Note:

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



3.2 HOUSING OPTIONS

The AMC-210 series sensor/transmitter units are available in the housings shown in Figure 1. The explosion proof transmitter housing is rated explosion proof for Class 1, Groups B, C and D locations and can have a corrosion resistant finish (optional). The sensors are also available as standard or explosion proof.

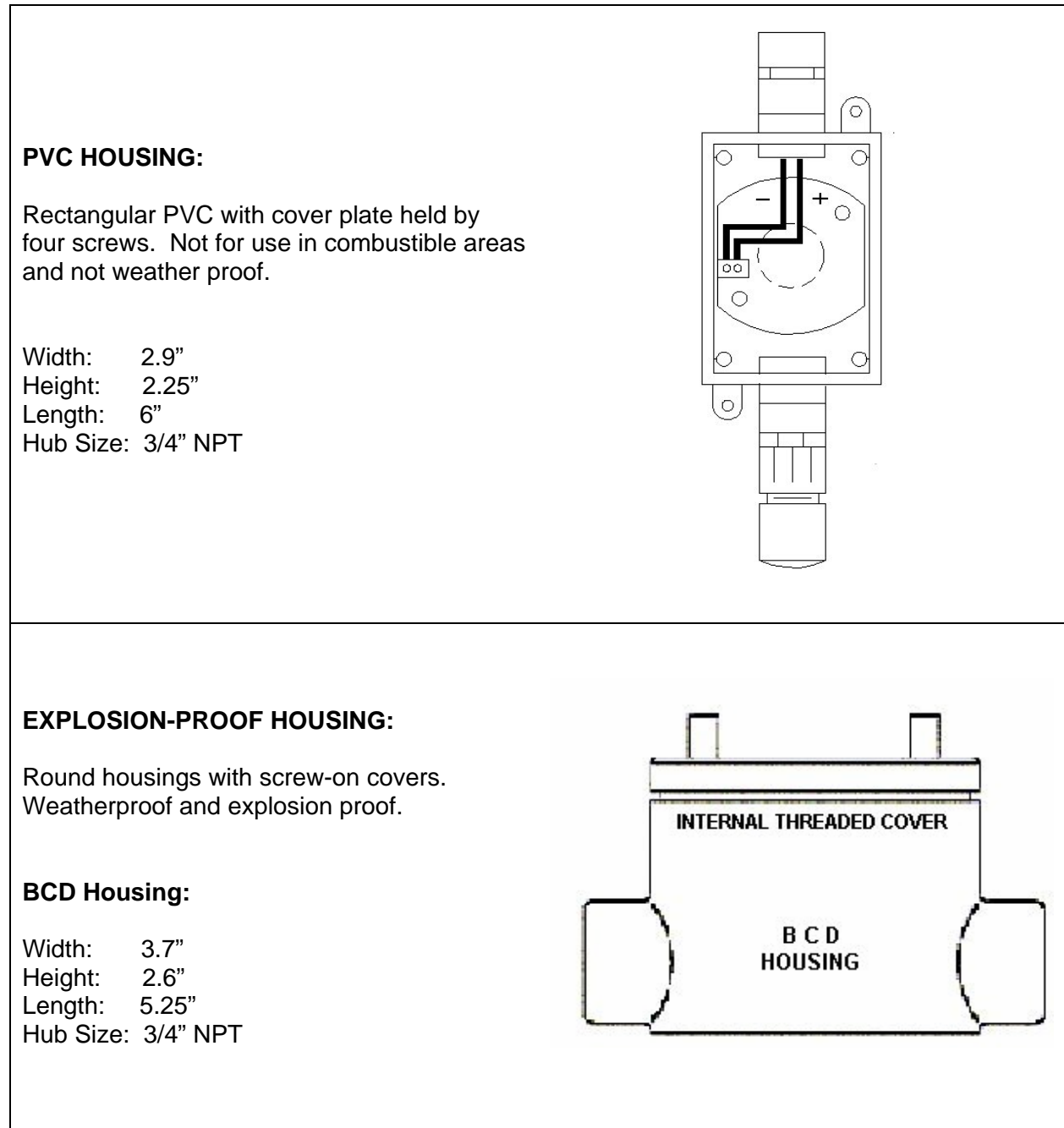


FIGURE 1: Transmitter Housing Options.

4 INSTALLATION

4.1 LOCATION AND MOUNTING

Mount the sensor/transmitter 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. (see Figure 2)

Note:

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

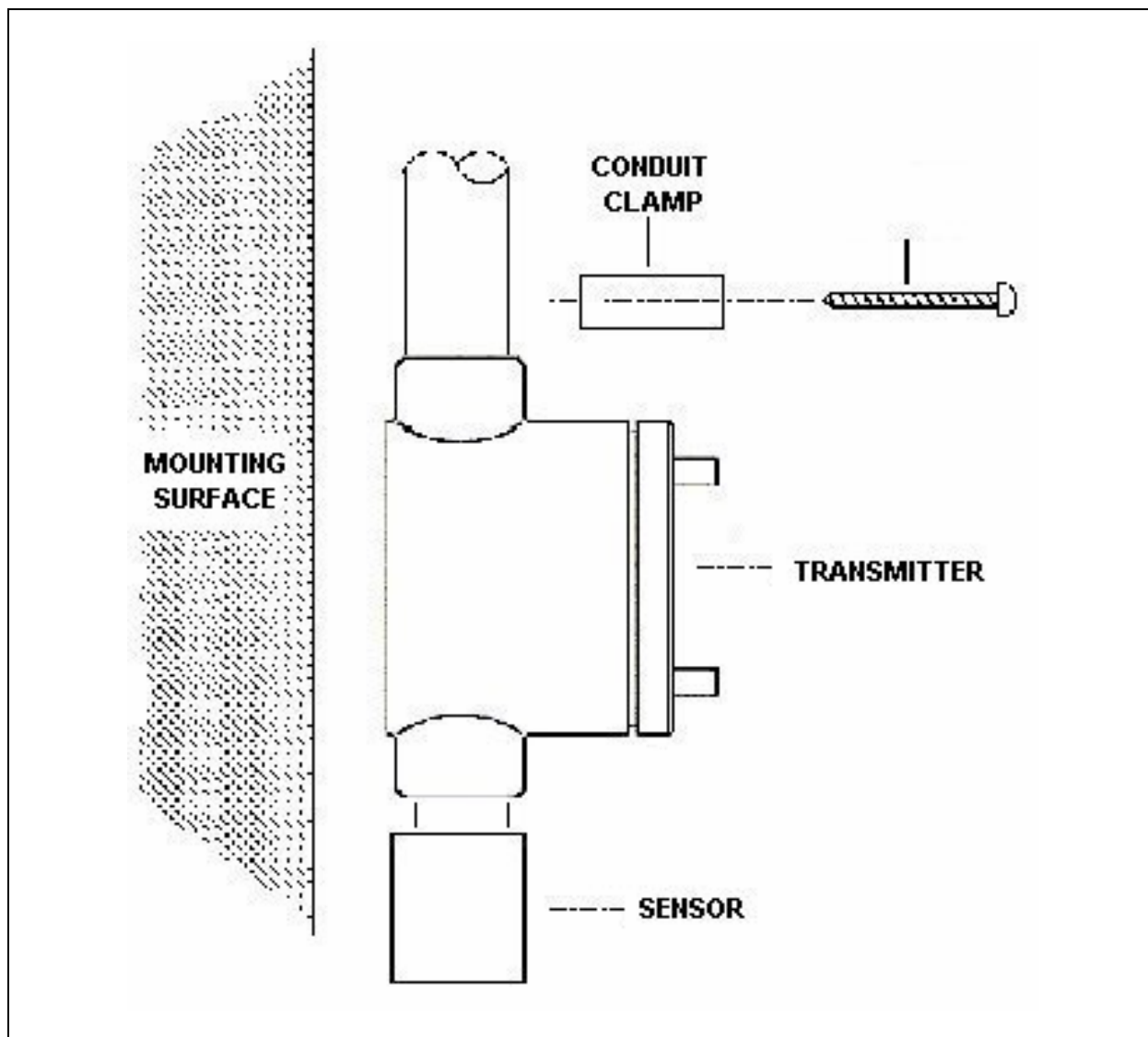


FIGURE 2: Mounting of Sensor/Transmitter (Explosion Proof Housing)



4.2 CABLE SELECTION AND WIRING

Connection should be made using 2-conductor, shielded cable. For best signal transmission and maximum noise rejection, run cable through steel conduit (cable must be grounded at the monitor or power supply). Supply voltage can be measured at the transmitter (-, +) connections at the supply source. For basic cable selection, between the source and transmitter, use a 250-ohm load resistance, use the following chart:

WIRE GAUGE	AWG	22	20	18	16
MAXIMUM DISTANCE IN FEET (METRES)	@12VDC	1000 (305)	1500 (457)	2500 (762)	3800 (1158)
	@24VDC	15000 (4573)	23000 (7010)	38000 (11582)	57000 (17373)

For applications not covered by the above chart, an example is shown below for selecting the right cable, using the graph of Figure 3 and the following formulas

Note: Some non-AMC equipment may not have the load resistance built in.

Example:

Calculations on the graph

Maximum resistance MR
Load resistance LR

Known data

Power supply 17 VDC
Load resistance 180 Ohms
Wire gauge 20 AWG
Cable length / 1 Ohm resistance 43.6 ft (13.3m) typical

Formula 1 : To determine remaining safe loop resistance.

Maximum resistance 518 Ohms
Load resistance - 180 Ohms
Remaining resistance 338 Ohms

Formula 2 : To determine maximum safe cable length allowed.

Remaining resistance 338 Ohms
Cable length (for 1 Ohm) x 43.6 Feet
Maximum safe cable length 14,736 Feet

Note:

If maximum safe cable length is insufficient, increase the power supply voltage and/or reduce the load resistance.

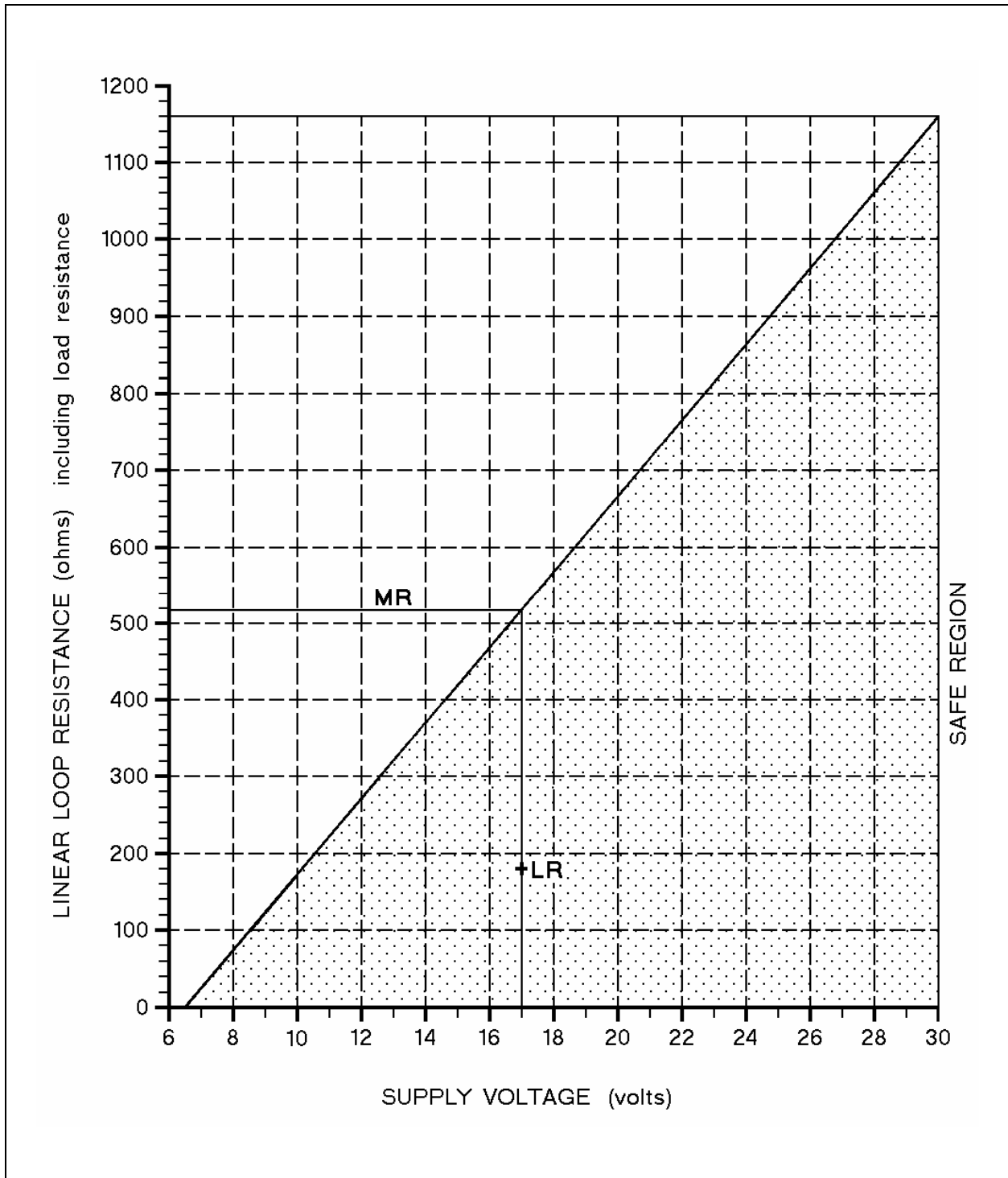


FIGURE 3: Cable selection graph

4.2.1 TRANSMITTER TO MONITOR WIRING

The transmitter output (-, +) terminals connect to the (SIG, +) 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.

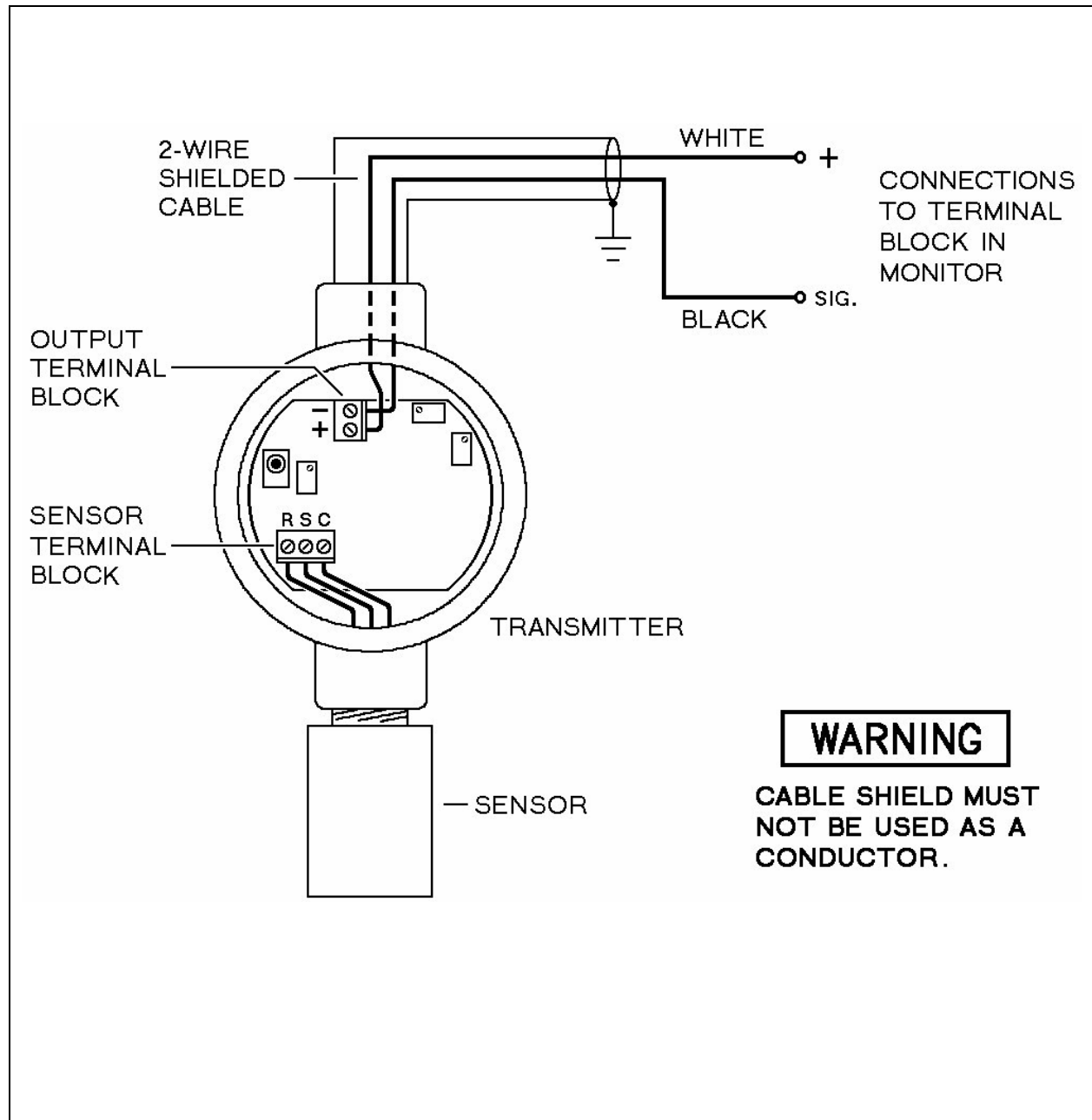


FIGURE 4: Transmitter to monitor wiring layout.

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

All Armstrong sensor/transmitters can be connected to computers or data loggers through analog-to-digital converters or to non-AMC monitors. The transmitter output (-, +) terminals connect to a filtered 12 to 30 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 transmitter negative (-) output terminal and the power supply negative (-) or common terminal, as shown in Figure 5.

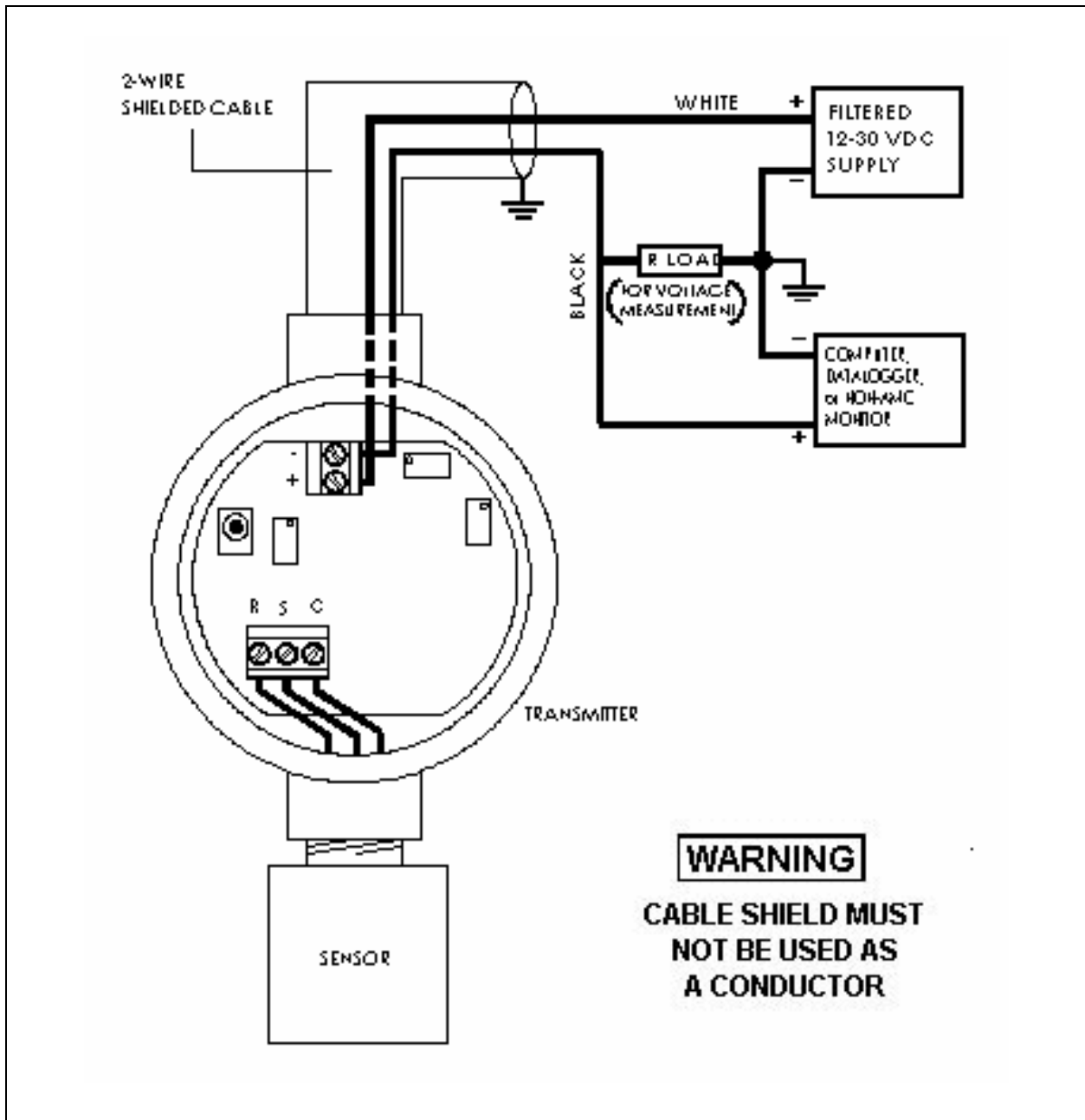


FIGURE 5: Interfacing to a computer, datalogger or non-AMC monitor.



5 OPERATION AND CALIBRATION

5.1 OPERATION

The AMC-210 series sensor/transmitter is factory calibrated for the gas listed in Product Information (section 2) 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 recommended after a stabilization period of 10 minutes.

Following stabilization, the sensor/transmitter should be sending (in a Zero Gas 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.

Although the electrochemical sensors are very selective, there are some interference gases, which can also cause a response from the sensor. These gases are listed on the detailed Specifications sheet pertaining to the sensor in use.

5.2 CALIBRATION

The transmitter is equipped with a remote calibration feature allowing one-man calibration at the sensor/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. Verification of calibration should be done at least once every 6 months. For safety reasons and highly demanding applications, monthly verification is recommended.

Factory/on-site calibration services, customer training and/or calibration adapter are available. Specify the sensor/transmitter Part Number & Serial Number listed in section **2.1 SENSOR/TRANSMITTER** and refer to section **2.2 FACTORY CALIBRATION** for Gas Type and calibration adapter when ordering any of the above.

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 options:

1. Pre-calibrated sensor/transmitters to replace expired units.
2. Factory installation and calibration of new sensors in returned transmitters.
3. Replacement sensors supplied with a pre-calibrated electrical output.

For all above options, please contact the factory for details.



5.2.1 EQUIPMENT REQUIRED

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

5.2.2 TRANSMITTER CALIBRATION/VERIFICATION SET-UP PROCEDURE

Note:

When applying gas, a flow rate of 0.5 to 1 liter per minute is recommended.

As the calibration procedure may cause the monitoring equipment to give a false alarm, appropriate precautions should be taken.

To perform the following Set-Up procedure (refer to Figure 6)

- 1) Remove cover from transmitter housing.
- 2) Plug in standard test leads fully into jacks on multimeter.
- 3) Switch ON multimeter and select the DC Volts range greater than 1.00 VDC.
- 4) Apply a Zero gas sample, or with the sensor in clean air, adjust the Zero trimmer for a stabilized reading approaching of 0.000 VDC measured at the test points. This measurement ideally should lie in the range of – 0.005 to 0.000 VDC.
- 5) Unplug test leads and connect the “Remote Calibration Lead” to the multimeter.
BLACK lead to negative or common (–)
RED lead to positive (+)
- 6) Select the next range greater than 20 mA DC full scale on the multimeter.
- 7) Insert the plug end of the “Remote Calibration Lead” fully into the CAL jack on the transmitter.
- 8) Adjust the 4 mA trimmer until the multimeter reads 4.00 mA.
- 9) Apply a Span gas sample and adjust Span trimmer to 20 mA when full-scale gas concentration is used.

Note: The Span gas sample need not be of the full-scale concentration but may be a fraction of this. Since the transmitter output range is 4 to 20 mA, a full scale concentration gas should read 20 mA after a few moments of sensor exposure. Similarly, a half scale concentration gas should read 12 mA.

5.2.3 RECALIBRATION

For full recalibration adjustments, follow the Set-Up procedure steps 1 to 9 inclusive. There are two adjustments to be made for periodic recalibration: Zero and Span.

Zero: With the sensor in Zero Gas, the transmitter output signal current should read 4 mA. This is obtained by adjusting the Zero trimmer on the transmitter for a voltage of 0.000 VDC at the test points in Figure 6. It is possible, under certain conditions that the Zero current will fall below 4 mA.

Span: While the sensor is exposed to the calibration gas sample, adjust the Span trimmer on the transmitter to set the transmitter output signal current proportional to the applied gas concentration.

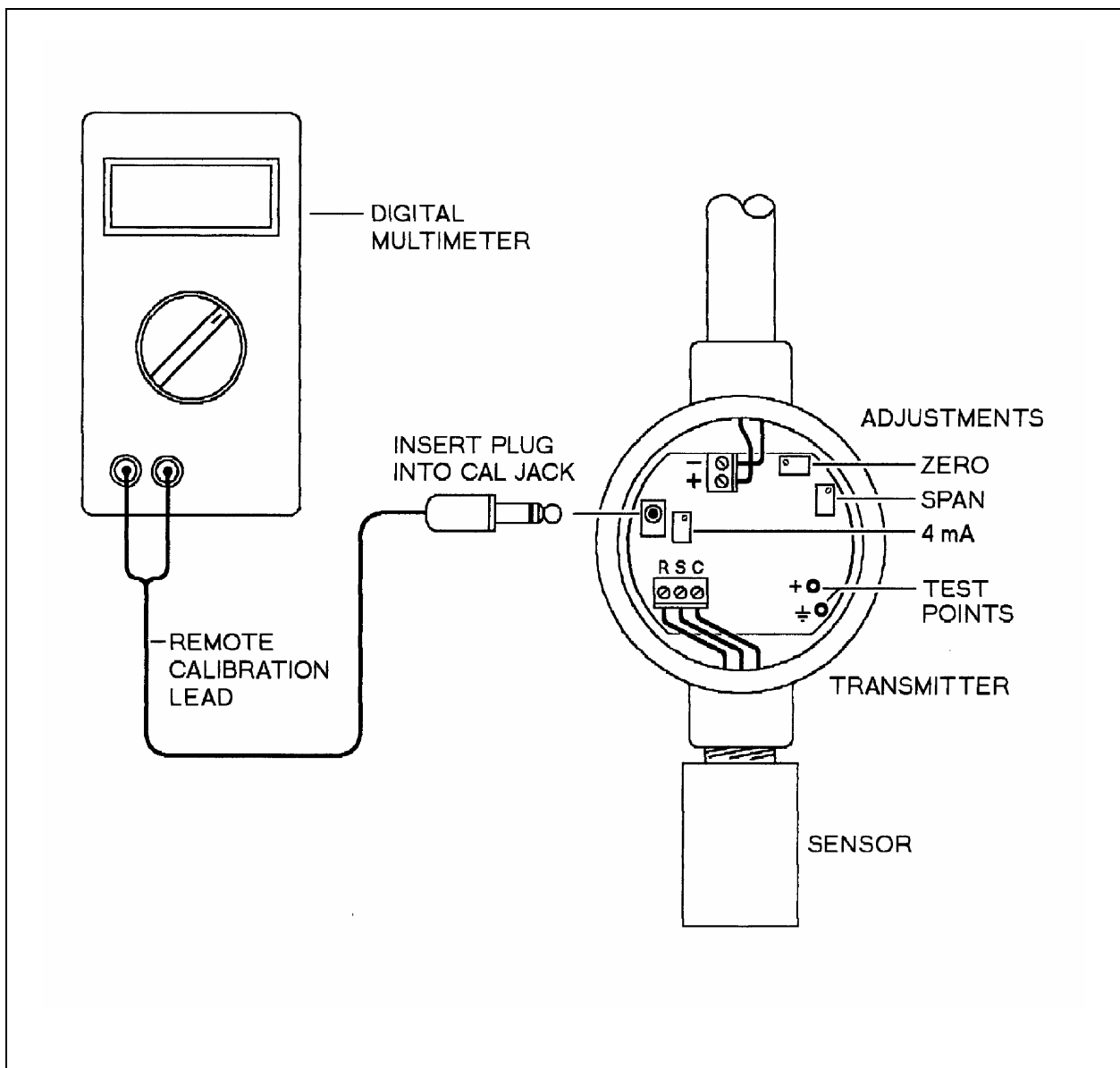


FIGURE 6: Calibration/Verification Set-up



6 PREVENTIVE MAINTENANCE

6.1 GENERAL

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

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

6.2 VERIFICATION OF OPERATION

To verify the operation of the sensor/transmitter unit, perform a test to ensure that it is still responding to gas. This test should be performed every 6 months. For more demanding applications, verification should be performed on a monthly basis.

6.3 SENSOR REPLACEMENT

Caution:

Turn off the power supply before attempting the following.

Expected sensor life is as indicated in Section 3.1.1. The signal from the sensor will be greatly reduced when its replacement is required. The sensor should be replaced when it no longer responds to the presence of gas or has an unstable zero signal.

When the sensor needs replacing, reorder the “Sensor Part Number” listed in the Product Information (section 2). When sensors are shipped, some sensor leads may be shorted together. This is done to provide rapid stabilization of the sensor signal after installation. To wire the sensor for correct operation, first separate (cut apart) the shorted leads, if any, then connect the RED lead to the “R” terminal, then BLACK to “S” and the YELLOW to “C” of the sensor terminal block on the transmitter. See Figure 7 for the sensor replacement and wiring procedure.

Note:

Allow 10 minutes for the new sensor to stabilize before recalibration, and then follow the instructions in calibration (section 5.2) of this manual.

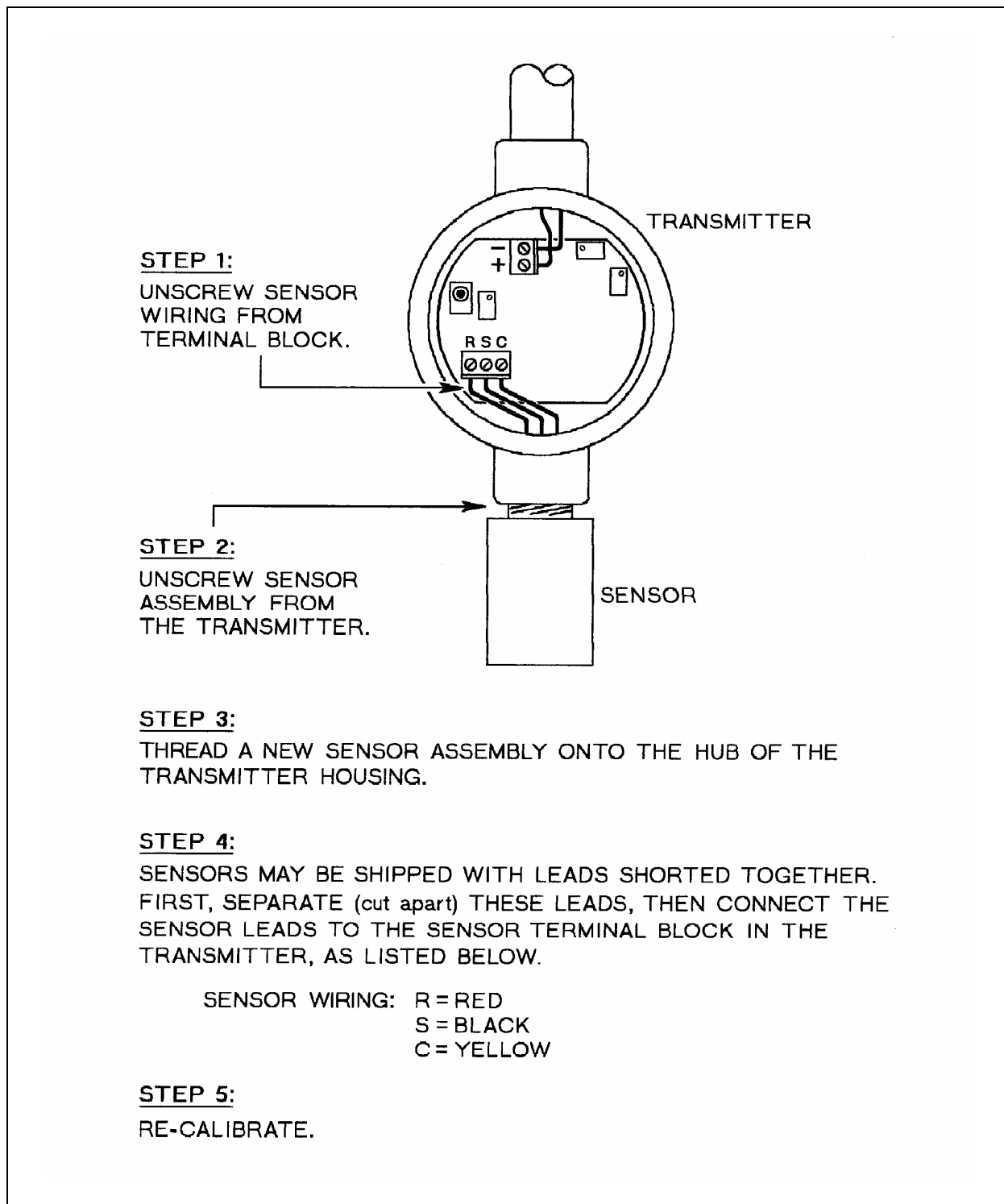


FIGURE 7: Sensor replacement and wiring procedure.

7 ADDENDUM (FOR OXYGEN ONLY)

This AMC-210 Series (2-wire sensor/transmitter with external electrochemical sensor) has been modified and the following information replaces the terminal block & sensor wiring of Figures 4, 6, and 7.

The sensor/transmitter shows that the three wires changed to two wires for OXYGEN SENSOR ONLY. Terminal block & sensor wiring configuration are as shown below:

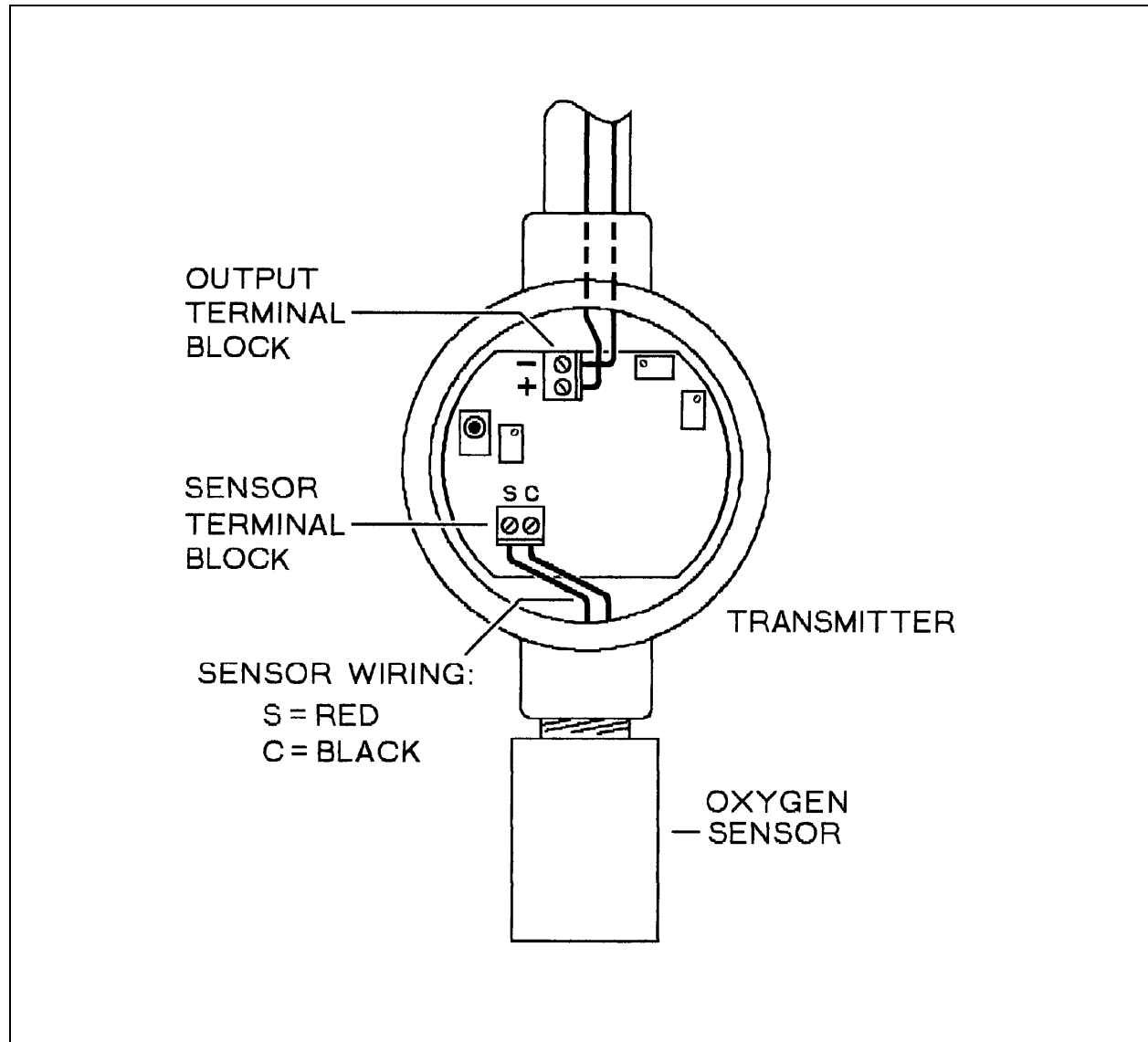


Figure 8: Transmitter wiring layout for oxygen only.