Armstrong Monitoring AMC-SIR Infrared Refrigerant Sensor Transmitter Instruction Manual

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Contents

WARRANTY

The AMC-SIR Refrigerant Gas sensor/transmitter is warranted against defects in material and workmanship for a period of one year from date of delivery. 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 sole opinion of AMC. Any equipment deemed to be defective by the user should be returned to The Armstrong Monitoring Corporation for evaluation (see product return below). Site visits by Armstrong personnel, to evaluate/repair equipment, are not covered by this warranty. AMC is not liable for auxiliary interfaced equipment, nor for incidental or 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.

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 incidental or 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. FOLLOW PROPER INSTALLATION PRACTICES AS MAY BE REFERENCED/DICTATED IN OR BY LOCAL, PROVINCIAL, OR STATE BYLAWS AND/OR CODES.

PRODUCT RETURN

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

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.

PRODUCT INFORMATION

Manual Coverage

This manual released in 2016 only covers the new Sensor 2 shown below. Sensor 1 is covered in earlier manuals that specify SIR_manual_rev_X as the filename on the front page. The filename specified for this manual on the front page is 3305405F.

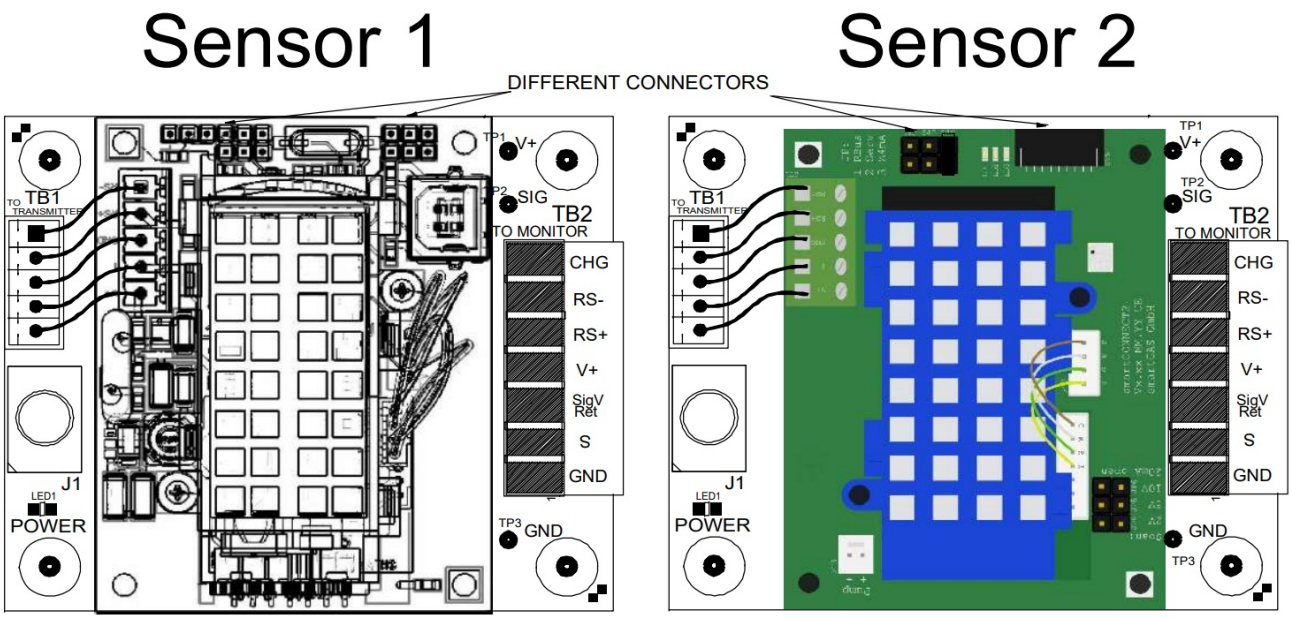


Figure 2-2-1 AMC-SIR Refrigerant Gas sensor 2 vs sensor 1

SENSOR/TRANSMITTER MODULE

Sensor/transmitter unit order number. ……
Sensor/transmitter serial number……..
Power Supply Requirement…….. 14 to 28VDC
Current Requirement…….. 70mA average, 140mA max
Operating Temperature …… -20° to +40° C
Relative Humidity …….. 0 to 95% RH, non-condensing
Signal Linearity…… Linear to the concentration of gas

FACTORY CALIBRATION

Gas Type……..……
Zero Gas, at 4mA signal……..……..……
Gas Concentration at 20mA signal
Calibration Adapter Part Number…… AMC-FL1
Calibration Kit Part Number…… AMC-C1-FL

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

For re-calibration extended warranty program information please call 1-800-465-5777.

PRODUCT DESCRIPTION

The AMC-SIR Refrigerant Gas sensor/transmitter unit is designed to provide continuous, reliable surveillance of surrounding air for the target gas listed in the Factory Calibration (Section 2.3). Based on the physical measurement method of infrared absorption, it provides the best technique for reliable, precise measurements and selectivity.

The AMC-SIR Refrigerant Gas sensor/transmitter provides a 4-20mA current output proportional to the Gas Concentration.

Two versions of the AMC-SIR, the AMC-SIR and the AMC-SIR-ERS, are available with broadband sensors. These products are calibrated with the refrigerant gas R134a, and can be used to detect a range of different target refrigerant gases using a known scaling factor. If the SIR is installed with the AMC-1AREF Monitor then the alarm level and display settings are adjusted in the factory based on the target gas scaling factor. Refer to the Monitor User Manual for details.

The AMC-SIR can be used to detect the following gases

- R134a
- R123
- R22
- R23
- R32
- R407c
- R407f
- R410a
- R455a
- R507a

The AMC-SIR-ERS can be used to detect the following gases

- R1233zd
- R1234yf
- R1234ze
- R125
- R404a
- R407a
- R438a
- R448a
- R449a
- R452a
- R513a
- R514a

Each sensor/transmitter unit is factory calibrated and is ready for field installation and operation.

OVERVIEW

INSTALLATION AND OPERATION

The following sections provide guidelines for installation; location and mounting, wiring, and cable selection.

LOCATION AND MOUNTING

Mount the AMC-SIR Refrigerant Gas sensor/transmitter on a solid, non-vibrating surface or structure in an area where the ambient concentration of gas is not directly affected by the presence of clean air supply, ventilation systems, or blockage by surrounding articles and sources of interference gas or contaminants. The AMC-SIR Refrigerant Gas sensor/transmitter shall be installed in an area where refrigerant from a leak is most likely to concentrate. The installer is required to provide the necessary mounting hardware for the unit. There is a 7/8” conduit hole for the installation wiring located on the bottom of the enclosure, refer to Fig. 4-1.

MOUNTING

1. Remove cover and mounting bracket with transmitter.
2. Mount housing using defined mounting holes. See Figure 4-1or Figure 4-2.
3. Drill holes for conduit and then install conduit. See Warning below.
4. Reattach cover and bracket.

Warning:

Conduit should enter the housing from the bottom to ensure best protection against ingress of condensation.

Conduit entry from the top from the top of the housing is Not Recommended. However, if conduit entry through the top is the only available option, a Condensation Drip Shield is provided to help protect the electronics from water ingress due to condensation from the EMT conduit. If conduit entry is through the top of the housing, a drain hole must be drilled into the bottom side of the housing to allow the condensation to exit the housing. Any water damage related to conduit entry from the top will not be covered under warranty.

Mount enclosure with the sensor located as shown in Error! Reference source not found.(upright). This will ensure correct orientation. DO NOT mount sensor on its back (facing up) with power as this can affect precision of the sensor.

WALL MOUNTING

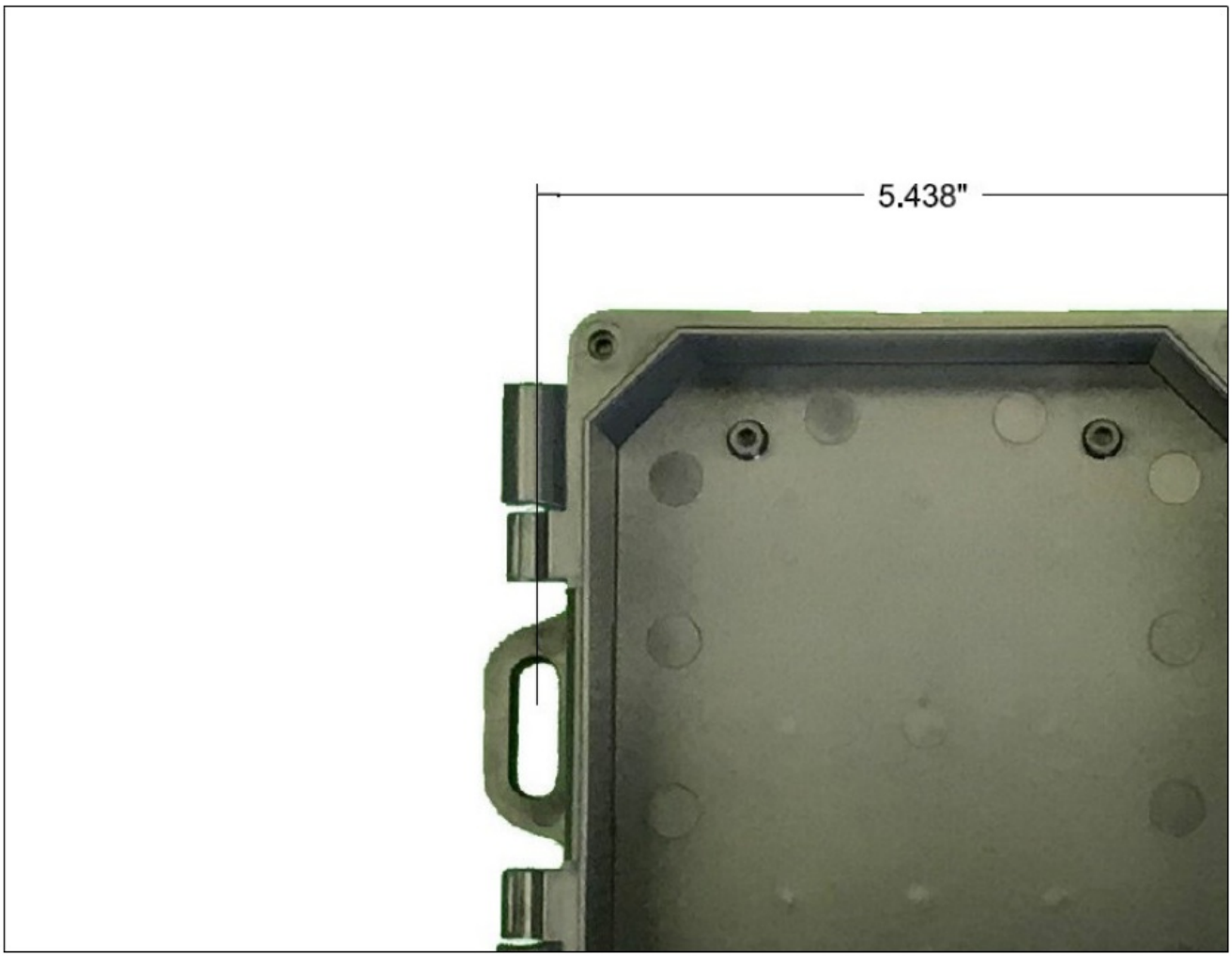


Figure 4-1 Standard Enclosure Mounting and Orientation

POLE MOUNTING

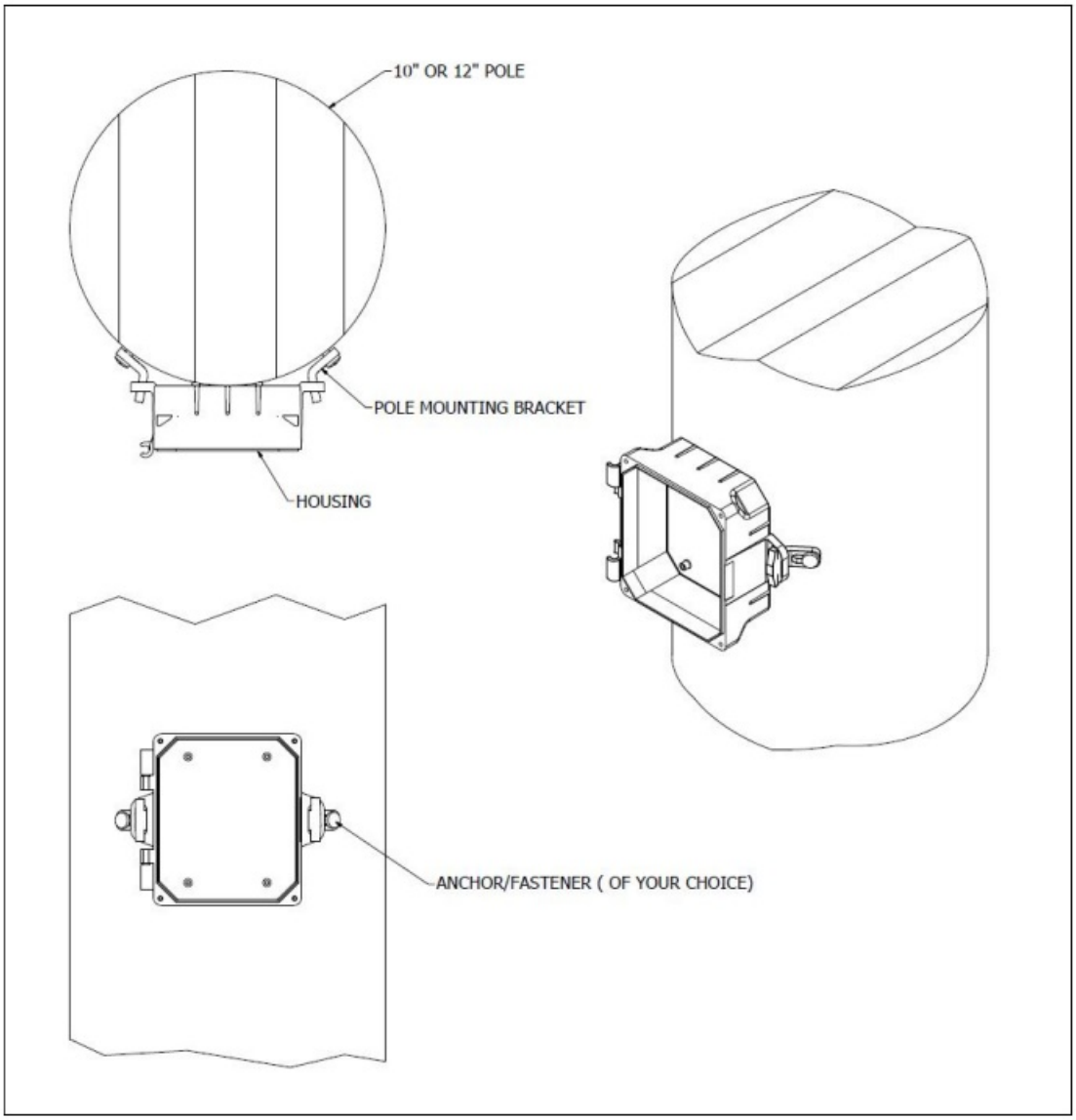


Figure 4-2 Pole Mounting

Warning:

Choose appropriate conduit hardware as to not interfere with internal components.

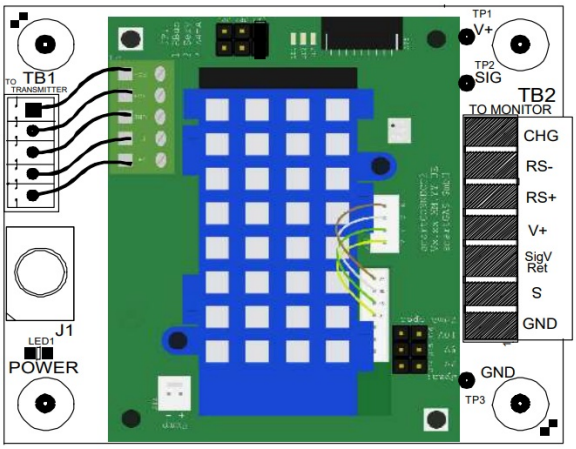
WIRING

The AMC-SIR Refrigerant Gas sensor/transmitter was designed to operate with a power supply voltage range of 14V to 28VDC. It can be interconnected to a suitable Armstrong monitor panel or be powered from a stable 14-28VDC power source, with its 4-20mA signal interconnected to a suitable measuring device.

For best signal transmission and maximum noise rejection, it is recommended to run the three conductor shielded installation cable through steel conduit (the cable shield must be chassis grounded at the monitor or power supply).

MONITOR AND POWER SUPPLY WIRING

All field wiring connections for the AMC-SIR Refrigerant Gas sensor/transmitter are made via TB2. Figure 4-2 shows the wiring layout of the AMC-SIR Refrigerant Gas sensor/transmitter.



CHG	LANDING POINT FOR CABLE SHIELD
RS-	INVERTED SIGNAL LINE FOR THE INTEGRATED RS485 INTERFACE
RS+	NON - INVERTED SIGNAL LINE FOR THE INTEGRATED RS485 INTERFACE
V+	POWER SUPPLY CONNECTION 14 - 28VDC
SigV Ret	
S	SIGNAL OUTPUT CONFIGURED FOR 4-20mA
GND	COMMON GROUND

Figure 4-2 AMC-SIR Refrigerant Gas sensor/transmitter layout

THE ANALOG INTERFACE

The analog interface of the AMC-SIR Refrigerant Gas sensor/transmitter offers a linearized 4- 20mA analog current signal; proportional to the concentration of gas measured. This signal is interpreted by the interconnected monitor.

Alternatively, the AMC-SIR Refrigerant Gas sensor/transmitter can also be used independently, with its 4-20mA output connected to a suitable measuring device.

The standard configuration for output current is 4-20mA with the JP3 jumper installed. (Condition as delivered) See Fig 4-3.

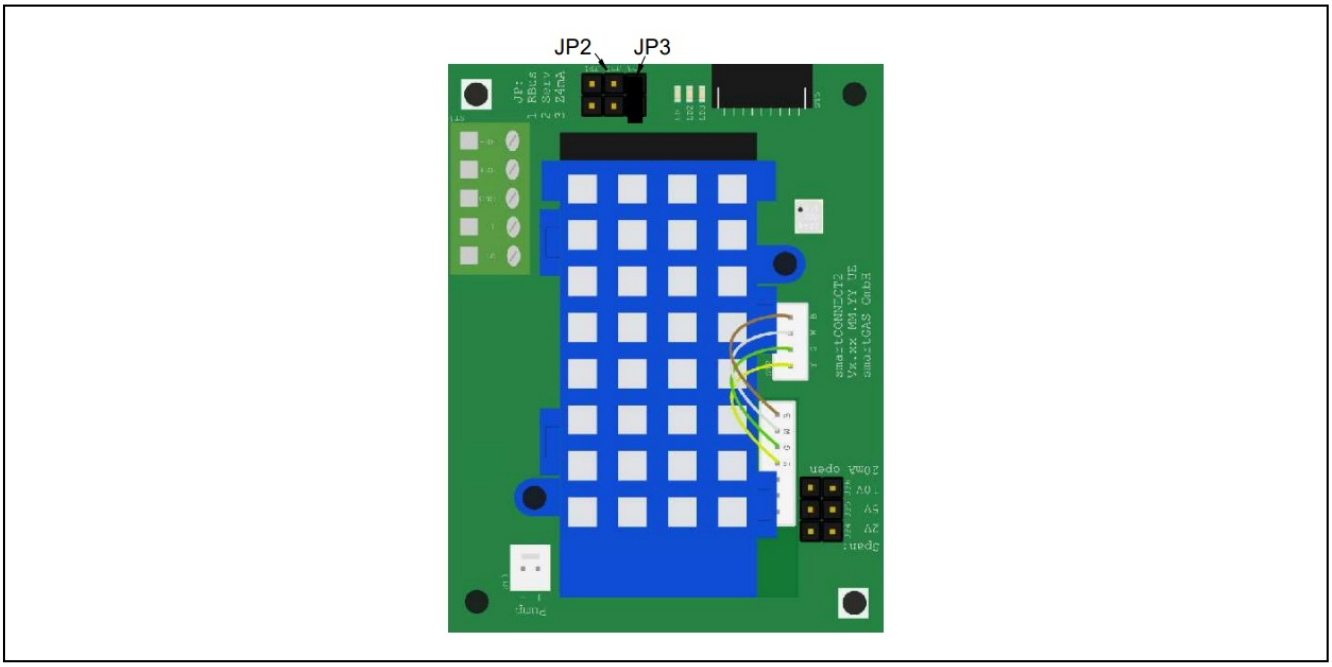


Figure 4-3 Jumper (JP3) installed

TRANSMITTER TO MONITOR WIRING

When connecting to an AMC Monitor, the AMC-SIR Refrigerant Gas sensor/transmitter is wired with a 3-conductor shielded cable. Fig. 4-4 shows the connection between the AMC-SIR Refrigerant Gas sensor/transmitter and an AMC Monitor. In this configuration, power is provided via the Monitor. When the power supply is turned on, the green (power) LED will be illuminated and the AMC-SIR Refrigerant Gas sensor/transmitter will become active. See section 4.2.1.5 for Boot-up phase after turn-on.

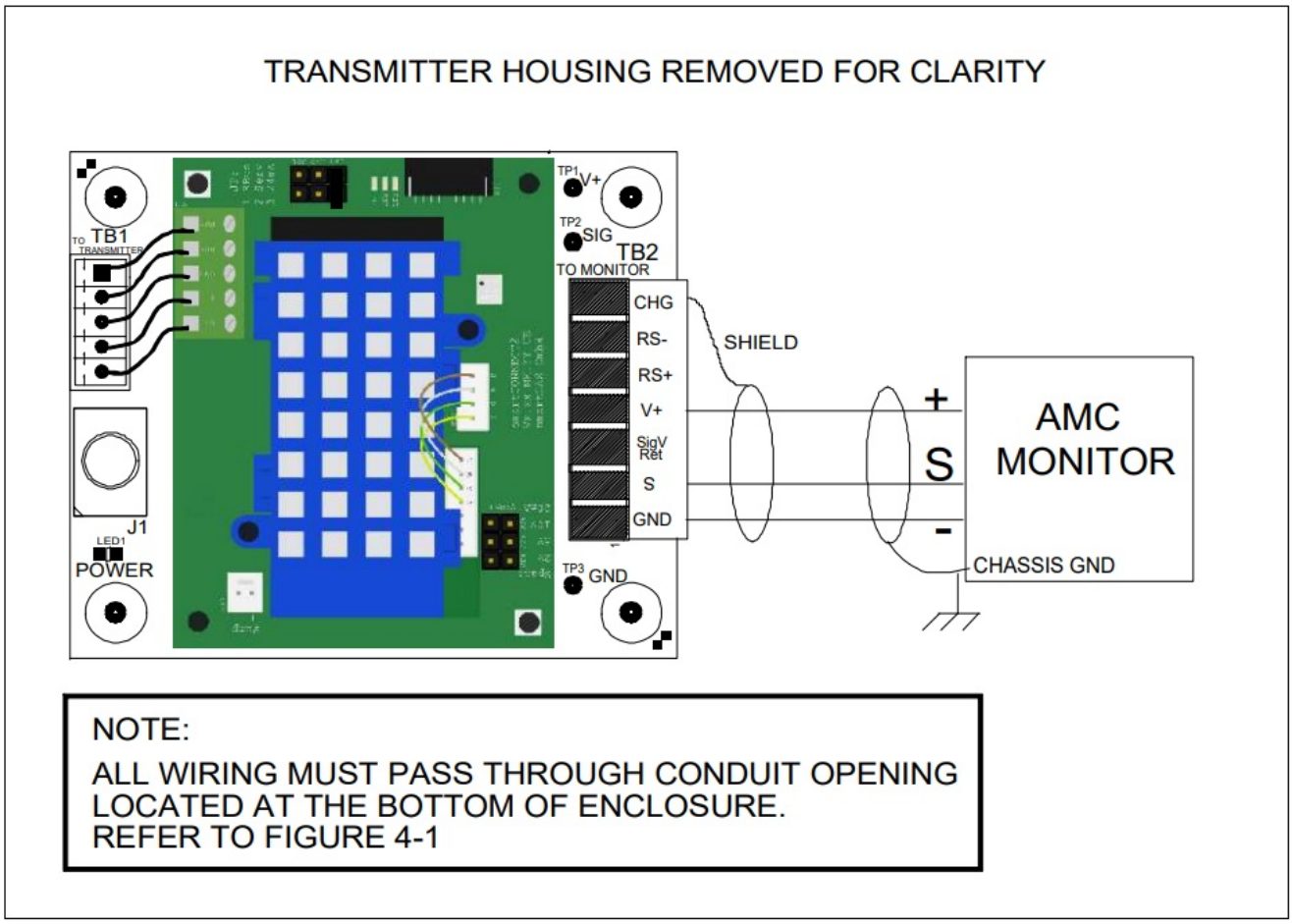


Figure 4-4 Transmitter to Monitor Wiring Diagram

TRANSMITTER CURRENT OUTPUT

When using a non AMC monitor, AMC-SIR Refrigerant Gas sensor/transmitter is connected as shown in Fig. 4-5. If necessary, the output current may be converted to a linear voltage signal in order to measure the signal. To accomplish this, a high-precision resistor must be connected to the current input of the non AMC monitor as a shunt. See Fig. 4-6.

The resultant voltage drop across the resistor then linearly reflects the concentration value of the measured gas. Depending on the operating current setting, the following values for the output voltage can be established:

- 4-20mA 0.4V – 2.0V with a 100 Ω load resistor
- 4-20mA 1.0V – 5.0V with a 250 Ω load resistor
- 4-20mA 2.0V – 10.0V with a 500 Ω load resistor

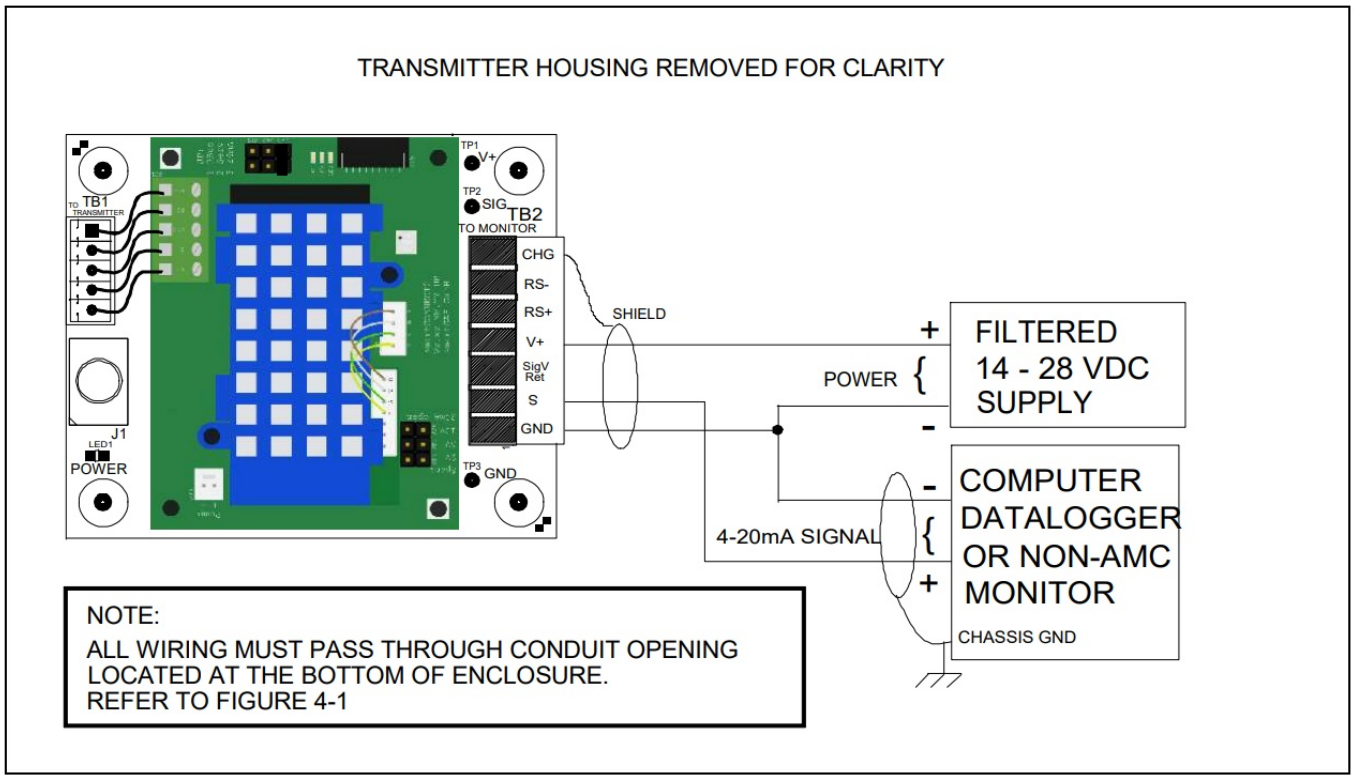


Figure 4-5 Transmitter to Non-AMC Monitor Wiring Diagram

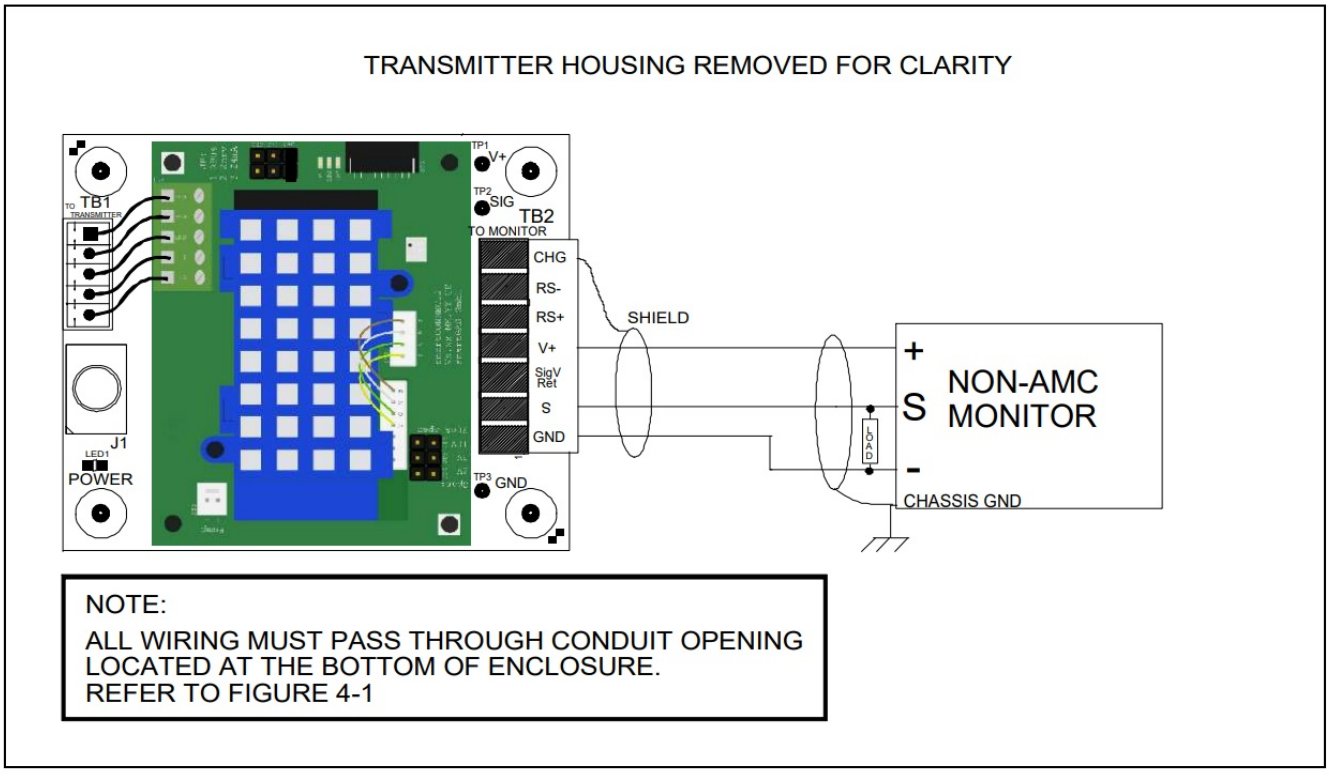


Figure 4-6 Transmitter to Non-AMC Monitor with shunt resistor

Caution:

Maximum load resistance is 500 ohms @ 24VDC, 300 ohms @ 14VDC. Special consideration is required to provide the transmitter with enough supply voltage as lowering the supply voltage reduces the maximum load allowable. See section 4.3 for appropriate cable lengths to accommodate required supply voltages.

SENSOR/TRANSMITTER COMMUNICATION FAILURE

If the sensor malfunctions, this state is indicated as follows at the current output:

- 4-20mA operation → output current is frozen at 3.5mA.

Depending on the operating mode and the downstream evaluation, such a state can then be used for fault detection purposes. When the defect is fixed, the AMC-SIR Refrigerant Gas sensor/transmitter automatically begins its normal boot-up phase and then switches back to normal mode, as described in section 4.2.1.5.

BOOT-UP PHASE AFTER TURN-ON

After the power supply and the desired interface have been connected to the AMC-SIR Refrigerant Gas sensor/transmitter, the sensor starts with a boot phase. This lasts less than 2 minutes and serves to check all internal components and routines. During the boot phase, the following states can occur depending on the selected operating mode:

- **4-20mA output:** Initial output current is approx. 3.2mA, increasing to 4mA after about 2 minutes, in a gas-free environment.

  The sensor signal can fluctuate during the warm-up period.

When the boot phase is finished, and when all test routines have properly finished, the AMCSIR Refrigerant Gas sensor/transmitter automatically switches to normal operating mode and provides a signal output proportional to the gas concentration.

Caution:

The AMC-SIR Refrigerant Gas sensor/transmitter must be in operation for 60 minutes to achieve full stabilization.

CABLE SELECTION

The following section details the cable selection needed to ensure proper operation of the AMCSIR Refrigerant Gas sensor/transmitter.

The figure below is an aid for cable selection. A 3-conductor shielded cable is employed for interconnection. All AMC Monitors typically output 24VDC with the exception of the 1A Monitor which will vary from 19-24VDC depending on the load, so choose cable accordingly. When using just AMC-SIR transmitters with a 1A Monitor the voltage will be over 20VDC.

There are three variables that determine the maximum cable length; wire gauge, power supply voltage, and load resistance. A minimum operating voltage of 14VDC is required at the sensor/transmitter. Wire gauge can range from 20 to 16 AWG.

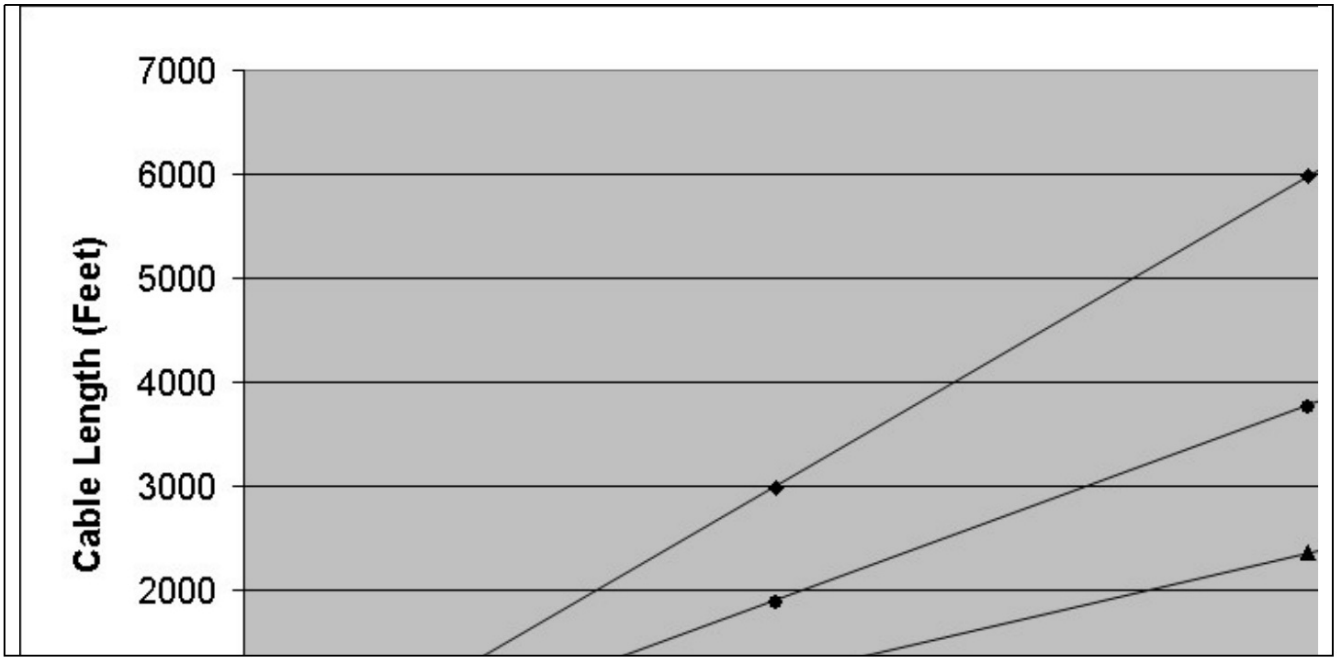


Figure 4-7 Wire Cable Selection Graph

CALIBRATION

This section describes the calibration procedure for the AMC-SIR Refrigerant Gas sensor/transmitter.

Each AMC-SIR Refrigerant Gas sensor/transmitter is factory calibrated and should be ready for operation after installation and a 60 minute stabilization time.

Verification of calibration is recommended two times per year. For highly demanding applications, more frequent checks are recommended.

Caution:

- Only qualified personnel should perform the actual calibration.
- Users new to gas calibration are advised to consult with Armstrong Monitoring
- For the AMC-SIR calibrate with 1000ppm R134a only.
- For the AMC-SIR-ERS calibrate with 2000ppm R134a only.

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

On Site Calibration equipment required

For qualified personnel, the following is a recommended list of calibration equipment required.

- A digital multi-meter with ranges of 20.0mA or greater.

- A calibration jack plug type test lead for the above meter (provided by AMC)
- Zero & Span gases for use with a 0.5lpm flow regulator (contact AMC for information)
- Cal Adapter, P/N: AMC-FL1 or AMC-C1-FL1 for calibration kit

CALIBRATION PROCEDURE

The transmitter is equipped with a remote calibration feature allowing for one-man calibration at the transmitter location. The transmitter output is measured using a digital multimeter set to mA scale, with a cal jack plug connected to the cal jack (J1), see Fig 5-1. When using the cal jack, signal to the monitor is interrupted and will instead be shown in mA on the multimeter connected to the cal jack (J1). The analog output range corresponding to the Factory Calibration (Section 2.3) is 4-20mA.

Warning:

The calibration procedure will cause signal loss to the monitor. Appropriate precautions may be required.

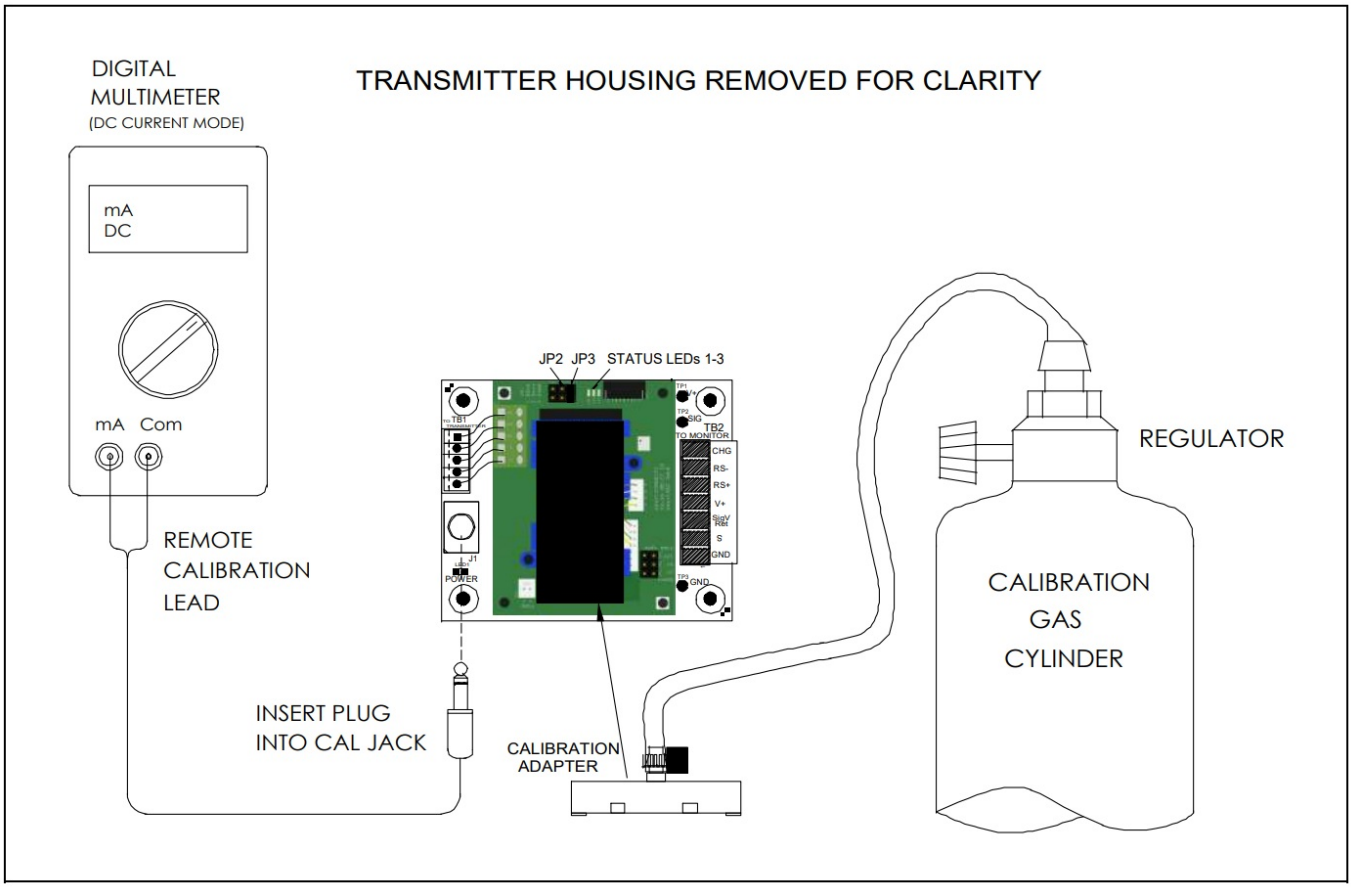


Figure 5-1 Cal Meter Setup

Caution:

The AMC-SIR Refrigerant Gas sensor/transmitter must be in operation for 60 minutes before calibration can be performed! Unless otherwise specified for the application, it is recommended that the sensors be tested a minimum of twice a year and calibrated when necessary.

ZERO VERIFICATION

The zero point should be checked with zero gas. Gas should be applied at 0.5lpm using the AMC-FL1 calibration adapter, as shown in Figure 5-1.Once the sensor has been completely purged, the output measured at the cal

jack should be between 3.9 – 4.1mA. If the measured value is:

- Within this expected range proceed to Span Verification.
- Greater than 4.8mA or less than 3.2mA, then an on site calibration will be required with Armstrong Monitoring to recalibrate the sensor.
- Slight zero deviations on the other hand can be re-adjusted using the Zero Recalibration Procedure below

Caution:

Only use pure zero gas consisting of nitrogen or air.

ZERO RECALIBRATION PROCEDURE

1. Apply zero gas until sensor has been completely purged.
2. While the zero gas is still being applied, locate JP2 jumper and connect to JP2 position. Yellow Status LED flashes on then should become steady. If this Yellow LED continues to flash, contact Armstrong Monitoring for service.
3. Removing the JP2 jumper will incorporate the setting into the module. The Green Status LED's flashes 3 seconds to confirm. If a Red Status LED flashes an error has occurred and process must be repeated. The output current on the meter should now read 4mA. If 0mA current can not be achieved or the LEDs do not operate properly contact Armstrong Monitoring for service.
4. Proceed to span recalibration after successful zero calibration.

SPAN VERIFICATION

The span should be checked with a precision sample of gas, equivalent to the concentration shown in Factory Calibration (Section 2.3.) Gas should be applied at 0.5lpm using the AMC-FL1 calibration adapter, as shown in Figure 5-1.

1. Apply span gas (100% full scale) to the sensor until it is purged. The output measured at the cal jack should be 20mA. If the current measured is off by more than +/-5% then proceed to the Span Recalibration Procedure below.

SPAN RECALIBRATION PROCEDURE

1. Apply span gas until sensor purged with span gas.
2. While the span gas is still being applied, locate JP2 jumper and connect to JP2 position. Yellow Status LED flashes on then should become steady. If this Yellow LED continues to flash the calibration gas could be deficient, if not contact Armstrong Monitoring for service.
3. Removing the JP2 jumper will incorporate the setting into the module. The Green Status LED's flashes 3 seconds to confirm. If a Red Status LED flashes an error has occurred and process must be repeated. The output current on the meter should now read 20mA . +/-5%. If 20mA current can not be achieved or the LEDs do not operate properly contact Armstrong Monitoring for service.

Caution:

Only use the Full Range (20mA) gas concentration as defined in Factory Calibration (Section 2.3

MAINTENANCE

GENERAL

The AMC-SIR Refrigerant Gas sensor/transmitter unit should be brushed or wiped as required, depending on the rate of accumulation of any dust or dirt.

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

VERIFICATION OF OPERATION

Scheduled calibration is critical in maintaining proper function of gas sensor/transmitters. Verification of operation should be performed at least once every 6 months. For highly demanding applications, more frequent verification is recommended.

As mentioned, Armstrong Monitoring offers a number of different maintenance plans to suit your requirements see Section 5.

Note for AMC-SIR or AMC-SIR-ERS transmitters verification can be performed using the calibration gas (R134a) or using the target gas. If R134a gas is used then the current output from the sensors will be as expected but any displays on the 1AREF Monitor will show incorrect readings as they have been factory adjusted to the target gas scaling factor.

If the target gas is used the correct reading for the specific gas concentration will be shown on the 1AREF Monitor displays but the current output from the sensor will depend upon the sensor scaling factor per the table below.

Table 1: Sensor and Display Outputs for AMC-SIR

Gas	SIR Version	Target Gas	Scaling Factor	Sensor Current Output (mA)		1AREF Display Output	
				1000ppm R134a	1000ppm Target Gas	1000ppm R134a	1000ppm Target Gas
R134a	AMC-SIR	R134a	1	20	20	1000	1000
R123	AMC-SIR	R123	1.077	20	18.9	1074	1000
R22	AMC-SIR	R22	1.432	20	15.2	1429	1000
R23	AMC-SIR	R23	1.042	20	19.4	1039	1000
R32	AMC-SIR	R32	1.641	20	13.8	1633	1000
R407c	AMC-SIR	R407c	1.009	20	20	1000	1000

R407f	AMC-SIR	R407f	0.992	20	20	1000	1000
R410a	AMC-SIR	R410a	1.082	20	18.8	1081	1000
R455a	AMC-SIR	R455a	2.676	20	10	2667	1000
R507a	AMC-SIR	R507a	1	20	20	1000	1000
Gas	**SIR Version**	**Target Gas**	**Scaling Factor**	**2000ppm R134a**	**1000ppm Target Gas**	**2000ppm R134a**	**1000ppm Target Gas**
R1233zd	AMC-SIR-ERS	R1233zd	0.909	20	12.8	1818	1000
R1234yf	AMC-SIR-ERS	R1234yf	0.682	20	15.7	1368	1000
R1234ze	AMC-SIR-ERS	R1234ze	0.632	20	16.7	1260	1000
R125	AMC-SIR-ERS	R125	0.675	20	15.9	1345	1000
R404a	AMC-SIR-ERS	R404a	0.773	20	14.7	1495	1000
R407a	AMC-SIR-ERS	R407a	0.852	20	12.8	1818	1000
R438a	AMC-SIR-ERS	R438a	0.843	20	13.5	1684	1000
R448a	AMC-SIR-ERS	R448a	0.86	20	13.3	1720	1000
R449a	AMC-SIR-ERS	R449a	0.851	20	13.4	1702	1000
R452a	AMC-SIR-ERS	R452a	0.614	20	17	1231	1000
R513a	AMC-SIR-ERS	R513a	0.735	20	14.9	1468	1000
R514a	AMC-SIR-ERS	R514a	0.684	20	15.7	1368	1000

SENSOR/TRANSMITTER REPLACEMENT

When its signal is greatly reduced or unstable, a sensor/transmitter replacement is required; see section 2.2 for replacement sensor/transmitter P/N. Contact AMC immediately.

Warning:

DO NOT replace the sensor/transmitter board while the system is still powered up.

CUSTOMER SUPPORT

The Armstrong Monitoring Corporation
215 Colonnade Road South, Ottawa, Ontario, Canada K2E 7K3
Tel: (613) 225-9531 • Fax: (613) 225-6965 • Canada & U.S. Toll Free: 1-800-465-5777

Documents / Resources

 AMC-SIR Refrigerant Gas Sensor/Transmitter INSTRUCTION MANUAL IMPORTANT: Please read these installation and operating instructions completely and carefully before starting.	Armstrong Monitoring AMC-SIR Infrared Refrigerant Sensor Transmitter [pdf] Instruction Manual AMC-SIR Infrared Refrigerant Sensor Transmitter, AMC-SIR, Infrared Refrigerant Sensor Transmitter, Refrigerant Sensor Transmitter, Sensor Transmitter, Transmitter

References

- Armstrong Monitoring | Hazardous Gas Monitoring Specialists