Diffusion Transmitter

Instruction Manual
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Thermo SCIENTIFIC

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Notices are used in this operator's manual to alert you to hazardous conditions to person or instrument and to notify you of additional information. This operator's manual uses the following notices.

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Notifies you of potential danger that can result in personal injury or death.

CAUTION

Notifies you of potential damage to equipment.

NOTE

Notifies you of additional or critical information.

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Chapter
1

INTRODUCTION

Overview

The Diffusion Transmitter is a series of oxygen and toxic gas transmitters.

Description

The Diffusion Transmitter assembly is comprised of a gas sensor, a temperature compensation board, and an amplifier/transmitter electronic assembly all enclosed in a weather resistant aluminum enclosure.

Target Gases

Table 1-1 lists the target gas and detection ranges for the Diffusion Transmitter.

Table 1-1 Target Gases and Detection Ranges

Target Gas	Detection Range
Ammonia	0 to 100 ppm
Arsine	0 to 1 ppm
Carbon Monoxide	0 to 500 ppm
Chlorine	0 to 10 ppm
Chlorine Dioxide	0 to 2 ppm
Diborane	0 to 1 ppm
Fluorine	0 to 10 ppm
Hydrogen Chloride	0 to 30 ppm
Hydrogen Cyanide	0 to 50 ppm
Hydrogen Fluoride	0 to 10 ppm
Hydrogen Sulfide	0 to 100 ppm
Nitric Oxide	0 to 100 ppm
Nitrogen Dioxide	0 to 20 ppm
Oxygen	0-30% vol
Ozone	0 to 1 ppm
Phosphine	0 to 1 ppm
Silane	0 to 20 ppm
Sulfur Dioxide	0 to 20 ppm

Specification

Table 1-2 lists the Diffusion Transmitter performance, electrical and environmental specifications.

Table 1-2 Specifications

Amplifier Outputs	4 to 20 mA analog signal (to controller) 100 to 500 mV analog test signals (at test jacks)
Sampling Method	Diffusion
Accuracy	± 10% detection range
Repeatability	± 5% detection range
Housing	Copper-free aluminum
Dimensions	8.2 in. (18.5 cm) H x 4.9 in. (12.4 cm) W x 4.0 in. (10.1 cm) D
Response Time	90% in less than 60 seconds (except HCl & HF) 90% in less than 70 seconds(HCl) 90% in less than 90 seconds (HF)
Weight	3.5 lbs (1.6 kg)
Area Classification	Designed to comply with requirements for Class I, Division 2 hazardous locations
Power Source	12 to 28V DC
Temperature Range	- 4°F (-20°C) to 113°F (45°C)
Standard Accessories	Manual (this document)
Optional Accessories	Calibration kits, gas cylinders

Chapter 2

INSTALLATION

Mounting the Transmitter

WARNING

Perform all installation procedures in a fresh air environment (known to be free of combustible and toxic gases and of normal oxygen content). The transmitter is not in operation as a gas monitoring system until the start-up procedure is complete.

CAUTION

Mount the enclosure with the detector pointing down (preferred) or horizontal if vertical is not practical to the application.

1. Select a mounting area that is representative of the monitoring environment. Choose an area where the transmitter is not likely to be accidentally bumped or disturbed.
2. Secure the enclosure to a vertical surface using 3/16– inch bolts or screws through the mounting lugs (refer to Figure 2-1).

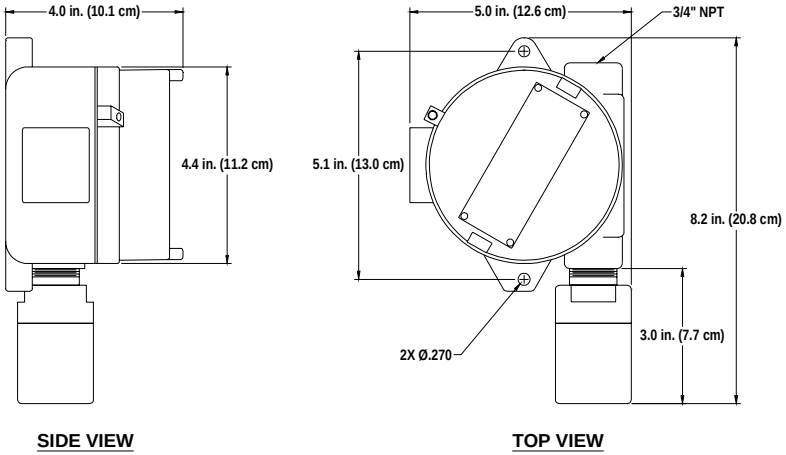

Figure 2-1 Outline and Mounting Dimensions

Wiring the Transmitter

Use a two-conductor, shielded cable, or run the wiring within metal conduit to reduce Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI).

Use 18 AWG wire or larger. The two-way wire and receiver resistance must not exceed 200 ohms for 12 volts systems or 600 ohms for 24 volts systems.

WARNING

Make sure all power to the controller is turned off during all wiring procedures.

CAUTION

Do not run transmitter and ac power wiring through the same conduit.

1. Remove the enclosure cover.
2. If you are using shielded cable, screw a cable bushing into the top conduit hub of the enclosure, then route the cable through the bushing. Do not ground the shield at the enclosure. If you are using metal conduit, screw the end of the conduit directly into the top conduit hub of the enclosure.
3. Confirm that the detector is plugged into the sensor connection at the amplifier.
4. Guide a two-conductor, shielded cable or two wires in conduit through the top conduit hub of the enclosure and connect the wires to the amplifier terminal strip (see Appendix B).
5. Connect the wires to the receiver or controller terminal strip (see Appendix B).

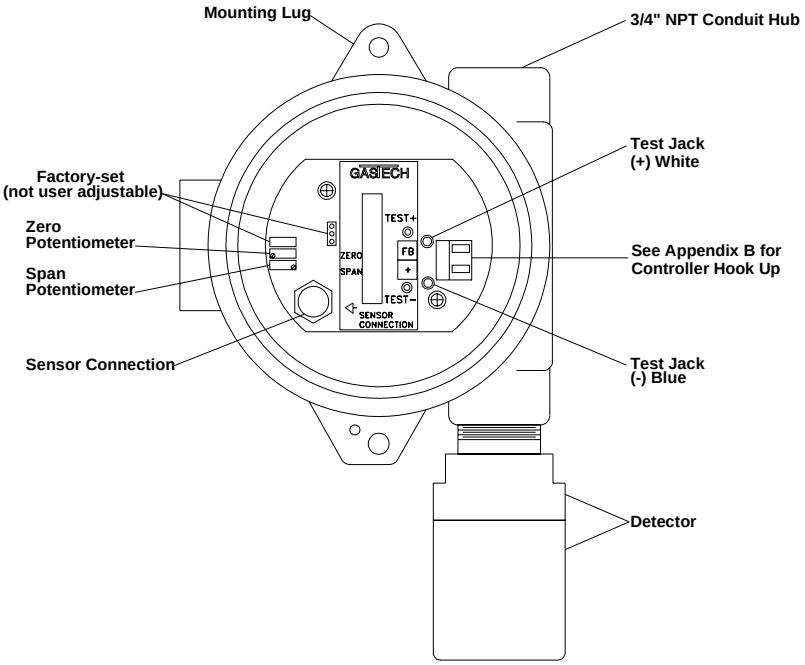

Figure 2-2 Component Location

6. Ground the shielded cable or metal conduit at the controller, receiver or power supply.

CAUTION

Always ground the cable or conduit at the controller and never at the transmitter.

Chapter 3

START UP & OPERATION

Complete the following procedure to place the controller and the transmitter into normal operation.

Preparing for Start Up

1. Complete the mounting and wiring procedures described in the Installation chapter of this manual.
2. Connect incoming power to the controller as described in the receiver or controller manual.

NOTE

Allow the sensor to stabilize for 1 hour after power is introduced before calibrating.

Setting the Channel Parameters at the Controller

When you install the transmitter, set the parameters for that channel at the controller. For instructions on setting the channel parameters at the controller, see the receiver or controller manual.

Setting the Fresh Air Signal

WARNING

If you suspect the presence of target gas during the start-up procedure, use the calibration kit described in the calibration chapter and the zero-emission air cylinder to introduce fresh air to the detector and confirm an accurate zero setting (span setting for oxygen monitoring systems).

1. Confirm that the receiver, controller or DC power source are on.
2. Remove the enclosure cover.

WARNING

In locations classified as hazardous (National Electric Code Article 500) and with power on, the area must be certified gas-free before you open the detector housing. Consult prevailing national, local and corporate requirements for certification.

NOTE

Some controllers have a feature that enables you to disable the alarm LEDs, buzzer, and relays during the calibration procedures, response tests, and so on. Refer to the controller manual for information. Make sure you re-enable full alarm functionality after the calibration procedure is complete.

3. Select the millivolt (mV) range on the multimeter. Plug the positive multimeter lead into the white (+) test jack; plug the negative lead into the blue (–) test jack.
4. Confirm a reading of 100 mV (toxic) or 379 mV (oxygen) on the multimeter. Adjust the potentiometer on the amplifier if necessary.
   - Toxic - Adjust "ZERO" pot until the multimeter reading is 100 mV
   - Oxygen - Adjust "SPAN" pot until the multimeter reading is 379 mV
5. Remove the multimeter leads from the test jacks, and secure the cover to the enclosure.

   The transmitter is now in operation.

Chapter 4

CALIBRATION

This chapter describes the optional calibration kit used for calibrating the transmitter. See Parts List, in Appendix A of this manual for ordering information.

WARNING

Accurate calibration of the transmitter is essential to ensure accurate readings of toxic gas concentrations. Incorrect calibration can impair the performance of the transmitter and place you in unnecessary danger if hazardous conditions exist.

The calibration kit contains all of the equipment you need to introduce a calibration sample to the detector. It includes the following components:

- Storage Case (safely stores the components of the calibration kit).
- Cylinder (contains a known concentration of target gas).
- Regulator (controls the flow of the sample from the cylinder to the detector)
- Test Cup (attaches to the detector and allows the calibrating sample to flow past the detector).
- Tubing (connects components of the calibration kit).

Preparing for Calibration

This section describes how to prepare the transmitter for calibration. The procedure includes step-by-step instructions for preparing the calibration kit and the transmitter.

WARNING

Calibrate the detector in a fresh air environment (environment known to be free of toxic gases).

Calibrating the Detector

This chapter describes how to prepare the gas cylinder, set the clean air base line and gas response reading for the toxic gas and oxygen transmitters.

Calculating the Calibration Gas Response Reading

The 100 to 500 mV test signal at the test jack of the transmitter amplifier is used to calibrate the transmitter. The following formula describes how to calculate the output test signal as a function of the gas concentration:

Test signal = ((gas concentration/full scale range) x 400 mV) +(100 mV)

- For example, if you are using a gas cylinder of 5 ppm chlorine to calibrate a transmitter whose full-scale range is 0-10 ppm:

  ((5 {ppm conc.}/10 {ppm full-scale conc.}) x 400 mV {range}) + (100 mV {offset}).

  = (5/10 x 400 mV) + (100 mV) = 300 mV gas signal setting on multimeter.

- For oxygen, the measurement range is 0-30% by volume and the recommended calibration gas is clean air, which contains 20.9% oxygen, so the calculation is:

  ((20.9/30) x 400) + (100) = 378.7 (or 379) mV.

For user convenience, graphs of signal versus gas concentration are shown in Appendix C of this manual for each gas range.

Preparing the Gas Cylinder

NOTE

When performing the following steps, use gas samples of known concentration. Cylinders of known concentration are available from **Thermo** GasTech (see Parts List in Appendix A). Specify gas and concentration when ordering gas cylinders.

1. Verify the regulator flow control valve is closed, then carefully screw the regulator onto the cylinder.
2. Verify that all tubing connections are tight and secure.
3. Slide the test cup over the end of the detector, then secure the cup to the detector.

Calibrating the Toxic Gas Detector

1. Verify the absence of toxic gas or any atmosphere other than clean air at the calibration site, by ventilation with clean air or by testing with a portable gas analyzer.
2. Remove the enclosure cover.
3. Set the multimeter to 0-500 DC mV range. Plug the positive multimeter lead into the white (+) test jack and the negative lead into the blue (-) test jack of the amplifier.
4. Confirm that the multimeter shows a reading of 100 mV. If the reading is other than 100 mV adjust the ZERO potentiometer on the amplifier so that it does so. Leave the multimeter probes connected to the test jacks for setting the toxic gas response.

NOTE

For Cl_2 , ClO_2 , F_2 , HF, NO_2 and O_3 transmitters, turn the zero control counter-clockwise to increase reading, for all other gases turn it clockwise to increase reading.

SETTING THE TOXIC GAS RESPONSE READING

1. Set the multimeter to 0-500 DC mV range. Plug the positive multimeter lead into white (+) test jack and the negative lead into the blue (-) test jack.
2. Attach the flow regulator to the gas cylinder and assure that the gauge shows pressure greater then 0.
3. Attach the test cup to the detector and secure it with the thumbscrew.
4. Open the flow control valve and observe that the multimeter reading begins to respond after a few seconds.
5. After the reading stabilizes (normally 1 to 2 minutes), confirm a reading of SPAN pot on the amplifier until the multimeter reads the value calculated at the beginning of this section or adjust the SPAN potentiometer on the amplifier so that it does so.

NOTE

For Cl_2 , ClO_2 , F_2 , HF, NO_2 and O_3 transmitters, turn the span control counter-clockwise to increase reading, for all other gases turn it clockwise to increase reading.

CAUTION

If the reading on the multimeter has not stabilized after 2 minutes, see the Troubleshooting section of this manual for slow response.

6. Turn off the gas flow by closing the flow control valve on the regulator, remove the regulator from the gas cylinder and remove the test cup from the detector.
7. Observe that the multimeter reading returns to 100 mV as the gas is replaced by diffusion of surrounding air. If the reading has not recovered in 2 to 3 minutes, confirm that there is no target gas present, repeat the steps in "Setting the Zero Signal", then repeat this calibration procedure.
8. Remove the multimeter test probes and screw the cover back on the enclosure.

The toxic gas transmitter is now in normal operation.

Calibrating the Oxygen Level Detector

Setting the Oxygen Zero Reading

1. Attach the regulator to the cylinder of 100% nitrogen gas.
2. Attach the test cup to the regulator outlet fitting.
3. Slide the test cup over the detector and secure it in place with the thumbscrew.
4. Open the flow control knob on the regulator.
5. Verify that the regulator gauge shows a pressure greater than 0.
6. Set the multimeter to read in the range of 100 to 500 DC mV, insert the positive (+) test probe into the white test jack on the amplifier and the negative (-) probe into the blue test jack.
7. Observe the millivolt reading on the multimeter, which should approach 100 mV as the zero gas (nitrogen) enters the detector and displaces the residual atmosphere.
8. When the multimeter reading has stabilized, it should indicate 100 mV. If not, set to read 100 mV, using the ZERO potentiometer.
9. Close the flow control knob and remove the regulator from the gas cylinder.
10. Remove the test cup from the detector and observe that the multimeter mV reading returns to a reading of 379 mV (the clean air reading). If the reading is other than 379 mV, go to the following section “Setting the Oxygen Response Reading”.
11. Leave the multimeter leads connected to the amplifier test jacks.

Setting the Oxygen Response Reading

For calibration of oxygen transmitters, the recommended calibration gas is clean fresh air, if its purity can be assured by ventilation or by test with a portable oxygen indicator. If this is impractical, a cylinder of certified ZERO AIR should be used. For clean fresh air, the calibration setting should be 379 mV at the test jacks (equivalent to 15.1 mA in signal loop), to correspond with the 20.9% oxygen present in clean air. For ZERO AIR, calculate the proper span setting for the analyzed oxygen content (if other than 20.9%) from the formula or from the chart in Appendix C of this manual, then proceed as follows:

1. If you can assure that the atmosphere surrounding the detector is free of contamination, go directly to step 5, otherwise connect the flow regulator to a cylinder of certified ZERO AIR.

NOTE

The ZERO AIR cylinder is not included in the standard calibration kit, as clean air is most often readily available to the detector by normal methods of ventilation. It may be ordered separately (81-0076) and uses the same regulator (81-1003) as the nitrogen cylinder.

2. Attach the flow regulator to the cylinder of ZERO AIR and the test cup to the detector.
3. Set the multimeter to read in the range of 100 to 500 mV and insert the positive test probe into the white test jack on the amplifier and the negative probe into the blue test jack.
4. Open the flow control knob on the regulator (verify that the gauge shows a pressure greater than 0) and observe the reading on the multimeter.
5. After the reading stabilizes (normally 1 to 2 minutes), confirm a reading of 379 mV (or calculated value for cylinder oxygen content if different from 20.9%) on the multimeter. If necessary, adjust the SPAN potentiometer on the amplifier until the multimeter reads correctly.
6. If you used ZERO AIR from a cylinder and test cup, remove the test cup from the detector and observe that the multimeter reading returns to a reading of 379 mV (the clean air reading). Complete recovery may take up to 2 minutes.
7. Remove the multimeter probes from the amplifier test jacks and reinstall the enclosure cover.

The oxygen transmitter is now in normal operation.

Chapter 5

MAINTENANCE

WARNING

Perform all maintenance activities in a non-hazardous environment.

Preventive Maintenance

This schedule describes daily, monthly, and quarterly procedures to ensure the performance and durability of the transmitter.

Daily

Confirm that the receiver or controller is on and functioning properly.

Monthly

NOTE

Some controllers have a feature that enables you to disable the alarm LEDs, buzzer, and relays during the calibration procedures, response tests, and so on. Refer to the controller manual for information. Be sure you re-enable full alarm functionality after the calibration or response test procedure is complete.

To test the visual, audible, and relay alarm indications during the response test, use a concentration of gas greater than the alarm setpoints.

If you have evacuation alarms or alarms that are forwarded to the fire department, be sure to notify the appropriate people before you test the alarm.

1. Confirm that the controller display reading is approximately 0 ppm (toxic) and 21% (oxygen). If not, set the fresh air signal at the amplifier to 100 mV (toxic) or 379 mV (oxygen), as described in the Start Up & Operation chapter of this manual.
2. Assemble the calibration kit, and introduce the gas to the detector as described in the Calibration chapter of this manual.
3. After the reading stabilizes (normally 1 to 2 minutes), confirm that the display reading for the controller responds to the gas sample as the sample is introduced to the detector and is within ±10% of the desired reading. If not, perform the calibration procedure as described in the Calibration chapter of this manual.
4. Confirm that the receiver or controller alarm functions (if any) respond appropriately.
5. Turn off the calibration gas. Disassemble and store the calibration kit as described in the Calibration chapter of this manual.

Quarterly

CAUTION

Calibrate the transmitter at least once every 3 months. Some applications may require a more frequent calibration schedule.

Perform the calibration procedure as described in the Calibration chapter of this manual.

Troubleshooting

This section describes symptoms, probable causes, and suggested responses for problems you may encounter with the transmitter.

Signal Loop Failure

Symptoms:

- No signal at receiver or controller.

Probable Causes:

- Low or no power (12 to 24V DC) to system signal loop or polarity of power incorrect.
- Excessive resistance or open circuit in signal loop.
- Wiring error.
- Defective amplifier.

Suggested Response:

1. Confirm that the supply voltage to the total signal loop is at least 12V DC and that all components are properly connected.
2. Confirm that all devices in the signal loop are low impedance current (not voltage) measuring or actuated devices and that the total loop DC resistance is less than 200 ohms for 12V operation and less than 600 ohms for 24V operation.

NOTE

Some voltage operated devices may be converted to low current operation by shunting their input terminals with a low value resistor (consult factory).

3. Measure and record the voltage across the input terminals of each device in the loop assuring that the voltage across the transmitter is somewhere between 5.5 volts and the total supply voltage. Any series device that has the full supply voltage across its input terminals either has an open circuit or is a voltage operated device and cannot be used in the current loop.
4. If the total supply voltage appeared across the transmitter terminals when measured in step 3, either there is no other device in the loop or the transmitter itself is defective and must be replaced.

Fault Condition

Symptoms:

- Output signal stays at 2.0 to 2.5 milliamps and cannot be set to 4.0 mA with “ZERO” pot.

Probable Cause:

- Missing or defective sensor.
- Detector cable or sensor pins not plugged in.
- Jumper (J2) on amplifier in wrong position.

Suggested Response:

1. Unscrew the cap of the detector housing and verify that the sensor is installed and is the proper sensor for the intended target gas.
2. Unplug the sensor and inspect its contact pins and the detector housing sockets to assure that they are not bent or broken. Carefully re-plug the sensor into socket pins of temperature compensation board.
3. Be sure that the shorting jumper plug (J2) on the front of the amplifier is in the correct position for the target gas and matching detector.
   - Position "F" for ammonia, arsine, carbon monoxide, diborane, hydrogen chloride, hydrogen cyanide, hydrogen sulfide, nitric oxide, oxygen, phosphine, silane and sulfur dioxide.
   - Position "E" for chlorine, chlorine dioxide, fluorine, hydrogen fluoride, nitrogen dioxide and ozone.

Difficult or Unable to Calibrate, Slow or No Response

Symptoms:

- Unable to accurately calibrate the transmitter.
- Slow or no response to calibration gas during monthly response test.
- Transmitter requires frequent calibration.

NOTE

Under normal conditions, the transmitter requires calibration approximately once every 3 months. Some applications may require a more frequent calibration schedule.

Probable Cause:

- Sample in gas cylinder is low, exhausted or out-dated.
- Sensor is outdated or is reaching the end of its useful life.

Suggested Response:

1. Make sure the calibration cylinder has an adequate supply of fresh gas.
2. Replace the plug in senor if it is outdated or shows signs of leakage
3. If calibration difficulties continue, contact **Thermo** GasTech for further instruction.

Suspect Readings

Symptom:

- Gas reading appears inaccurate or is suspect.

Probable Cause:

- Interfering gases.

Suggested Response:

1. Investigate the possibility of actual presence of target gas or other reactive gases which could possibly impersonate target gas.
2. If the suspect readings continue, contact **Thermo** GasTech for further instruction.

Replacing the Sensor

You can replace the sensor without replacing the entire detector assembly. In most cases, the plug-in sensor will need replacement rather than the entire detector assembly.

1. Turn off all incoming power at the power source.
2. Unscrew the bottom half of the detector housing.
3. Unplug the sensor from the PC board.
4. Remove the replacement sensor from its container, and if installed remove the spring placed between the pins marked "R" (reference) and "S" (sensing).

CAUTION

Do not remove the spring until you are ready to perform the start-up procedure. The detector will take longer to stabilize if the spring is removed before start-up.

5. Plug the new sensor into the PC board in the top half of the detector housing.
6. Screw the bottom half of the detector housing onto the top half.
7. Turn the power on.
8. Perform the calibration procedure described in the Calibration chapter of this manual. You can zero the detector right away, but for best results, let the detector stabilize for 1 hour before calibrating.

Replacing the Detector

WARNING

In locations classified as hazardous (National Electric Code Article 500) and with power on, the area must be certified gas-free before you open the detector housing. Consult prevailing national, local and corporate requirements for certification.

1. Turn off or unplug all incoming power at the power source.
2. Unscrew and remove the cover from the enclosure.
3. Disconnect the detector cable from the amplifier.
4. Unscrew the detector assembly from the conduit hub of the enclosure, and pull the connector out through the hub.
5. If the sensor is operational, unscrew the bottom half of the detector housing. Unplug the sensor from the PC board.

   If you are replacing the entire detector assembly (including the sensor) remove the replacement sensor from its container, and if installed remove the spring placed between the pins marked "R" (reference) and "S" (sensing).

CAUTION

Do not remove the spring until you are ready to perform the start-up procedure. The detector will take longer to stabilize if the spring is removed before start up.

6. Plug the sensor into the PC board in the detector housing.
7. Screw the bottom half of the detector housing onto the top half and guide the connector of the replacement detector through the conduit hub of the enclosure, and screw the detector into the enclosure.
8. Plug the detector into the amplifier.
9. Restore power at the power source.
10. Perform the calibration procedure described in the Calibration chapter of this manual. You can zero the detector right away, but for best results, let the detector stabilize for 1 hour before calibrating.

Replacing the Amplifier

1. Turn off all incoming power at the power source.
2. Unscrew and remove the cover from the enclosure.
3. Disconnect the detector from the amplifier.
4. Disconnect the wires from the remote amplifier terminal strip. Leave the wires connected to the controller terminal strip.
5. Remove the two screws that secure the amplifier to the housing and remove amplifier.
6. Place the new amplifier in the enclosure so the holes in the enclosure line up.
7. Secure the amplifier to the enclosure.
8. Connect the wires from the controller terminal strip to the amplifier terminal strip.
9. Connect the detector plug to the amplifier socket.
10. Turn the power on.
11. Perform the calibration procedure described in the Calibration chapter of this manual. You can zero the detector right away, but for best results, let the detector stabilize for 1 hour before calibrating.

Returning for Repair

Before you remove the transmitter from the monitoring area, first contact a **Thermo** GasTech representative.

The **Thermo** GasTech representative may guide you through certain diagnostic procedures with the transmitter in place. If you cannot correct the malfunction, the representative will assist you in returning the transmitter for repair.

Appendix A

PARTS LIST

Table A-1 lists part numbers for the Diffusion Transmitter replacement parts and accessories.

Table A-1 Parts List

Part No.	Description
25-0104	Housing Cover
57-7210	Amplifier, AsH_3, B_2H_6, CO, HCN, H_2S, NH_3, O_2, PH_3, SiH_4, SO_2
57-7210-01	Amplifier, Cl_2, ClO_2, F_2, HF, NO_2, O_3
57-7210-02	Amplifier, HCl, NO
65-1061	Sensor, oxygen (O_2)
65-2420-02	Sensor, sulfur dioxide (SO_2)
65-2425-01	Sensor, carbon monoxide (CO)
65-2425-02	Sensor, hydrogen sulfide (H_2S)
65-2431-01	Sensor, chlorine (Cl_2), fluorine (F_2)
65-2431-02	Sensor, hydrogen cyanide (HCN)
65-2431-03	Sensor, nitric oxide (NO)
65-2431-04	Sensor, hydrogen chloride (HCl)
65-2431-05	Sensor, hydrogen fluoride (HF)
65-2431-07	Sensor, ammonia (NH_3)
65-2431-08	Sensor, arsine (AsH_3), diborane (B_2H_6), phosphine (PH_3), silane (SiH_4)
65-2431-09	Sensor, ozone (O_3)
65-2431-10	Sensor, nitric dioxide (NO_2)
65-2431-11	Sensor, chlorine dioxide (ClO_2)
71-0090	Diffusion Transmitter Operator's Manual
81-0065	Cylinder, CO-in-air (100 ppm)
81-0076	Cylinder, zero-emission air

Table A-1 Parts List (Continued)

Part No.	Description
81-0078	Cylinder, 100% nitrogen (N_2)
81-0151	Cylinder, H_2S-in-N_2 (25 ppm)
81-0170	Cylinder, SO_2-in-N_2 (5 ppm)
81-0175	Cylinder, NO-in-N_2 (25 ppm)
81-0180	Cylinder, NO_2-in-N_2 (5 ppm)
81-0190	Cylinder, Cl_2-in-N_2 (5 ppm)[1]
81-0191	Cylinder, NH_3-in-air (25 ppm)
81-0192	Cylinder, HCN-in-N_2 (10 ppm)
81-0193	Cylinder, PH_3-in-N_2 (0.5 ppm)[2]
81-0194	Cylinder, HCl-in-N_2 (10 ppm)
81-1003	Regulator, CO, O_2
81-1051-01	Regulator, toxic gases (except Cl_2 & HCl)
81-1062	Regulator, Cl_2, HCl
81-1121	Test cup, (toxic gas/oxygen models)
81-6412-01	Calibration kit, H_2S (25 ppm)
81-6412-02	Calibration kit, Cl_2 (5 ppm)[1]
81-6412-03	Calibration kit, HCl (10 ppm)
81-6412-04	Calibration kit, HCN (10 ppm)
81-6412-05	Calibration kit, NH_3 (25 ppm)
81-6412-06	Calibration kit, PH_3 (0.5 ppm)[2]
81-6412-07	Calibration kit, NO (25 ppm)
81-6412-08	Calibration kit, NO_2 (5 ppm)
81-6412-09	Calibration kit, SO_2 (5 ppm)
81-6413-08	Calibration kit, O_2 (100% N_2)
81-6413-09	Calibration kit, CO (100 ppm)

1. Appropriate also for fluorine (F_2) sensors
2 Appropriate also for arsine (AsH_3), diborane (B_2H_6), and silane (SiH_4) sensors.

Appendix
B

EXTERNAL WIRING

Appendix B shows the Remote Diffusion Transmitter external wiring instructions.

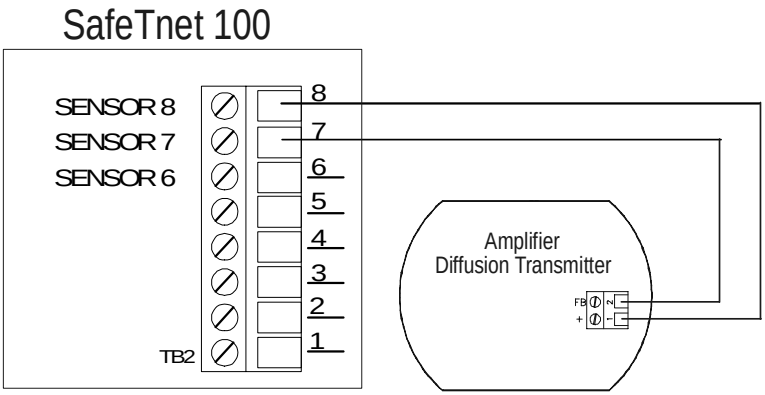

Figure B-1 SafeTnet 100 External Wiring

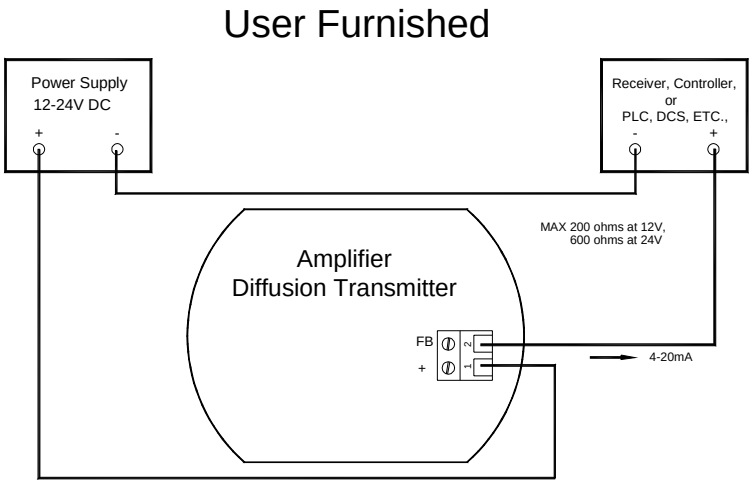

Figure B-2 User furnished External Wiring

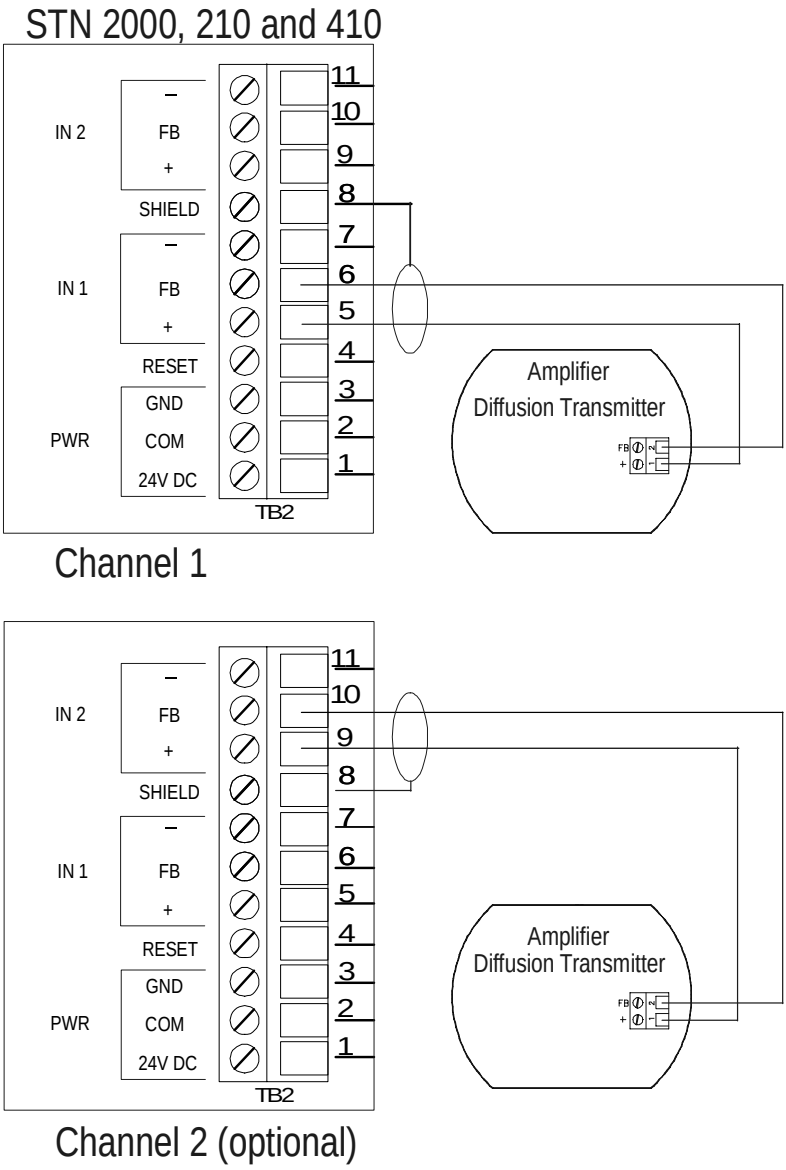

Figure B-3 SafeTnet 2000, 210 and 410 External Wiring

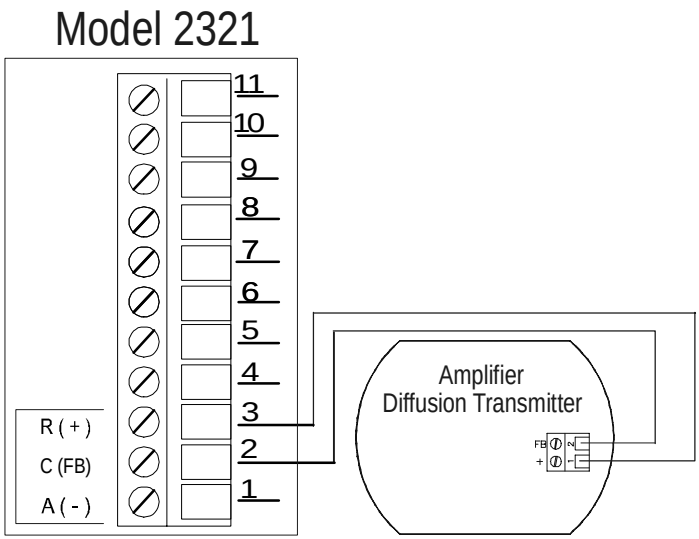

Figure B-4 Model 2321 External Wiring

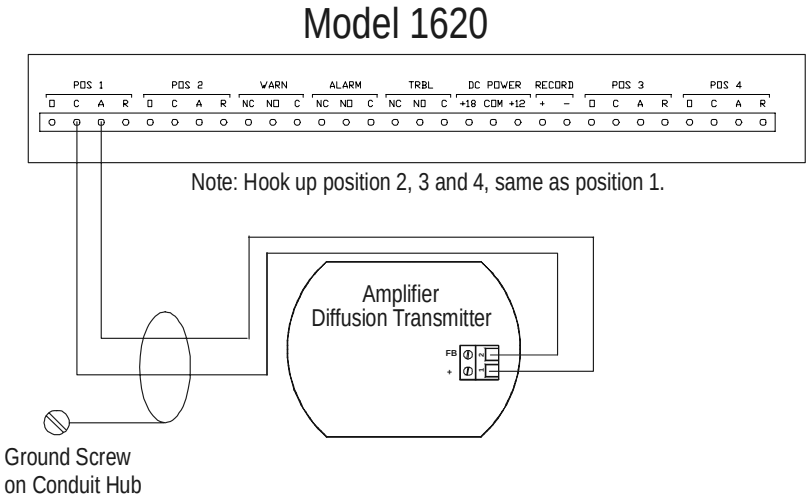

Figure B-5 Model 1620 External Wiring

Appendix
C

CALIBRATION RESPONSE CHARTS

Appendix C shows the Remote Diffusion Transmitter calibration response charts.

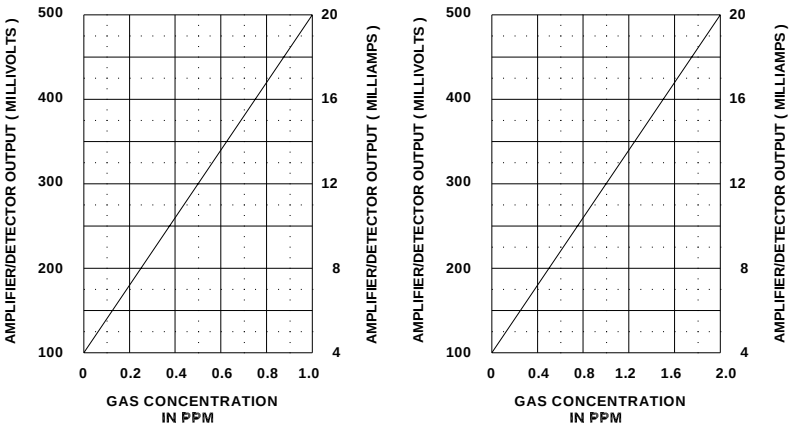

Figure C-1 Calibration Response Charts for 0-1 and 0-2 ppm

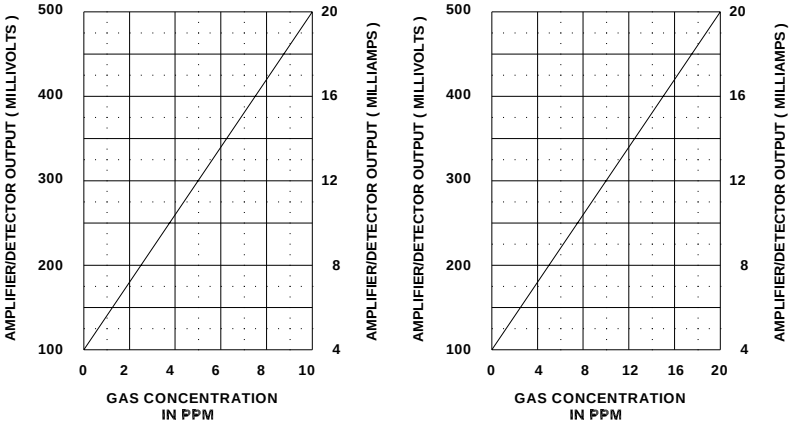

Figure C-2 Calibration Response Charts for 0-10 and 0-20 ppm

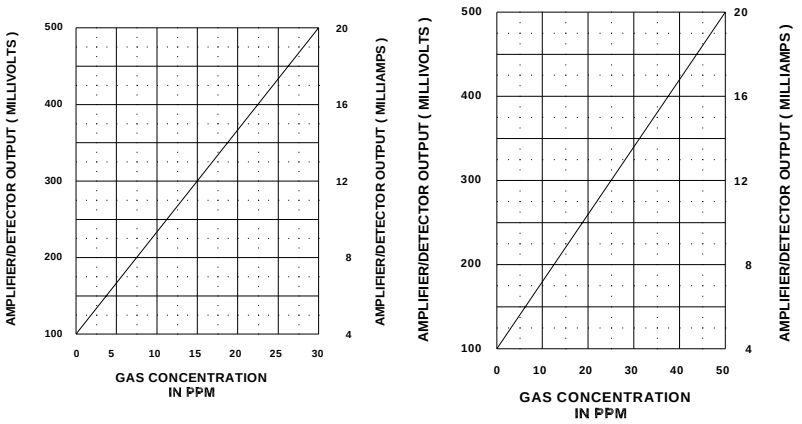

Figure C-3 Calibration Response Charts for 0-30 and 0-50 ppm

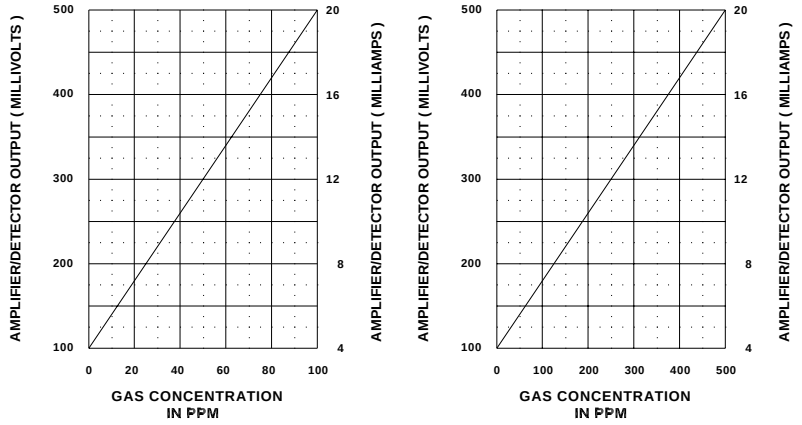

Figure C-4 Calibration Response Charts for 0-100 and 0-500 ppm

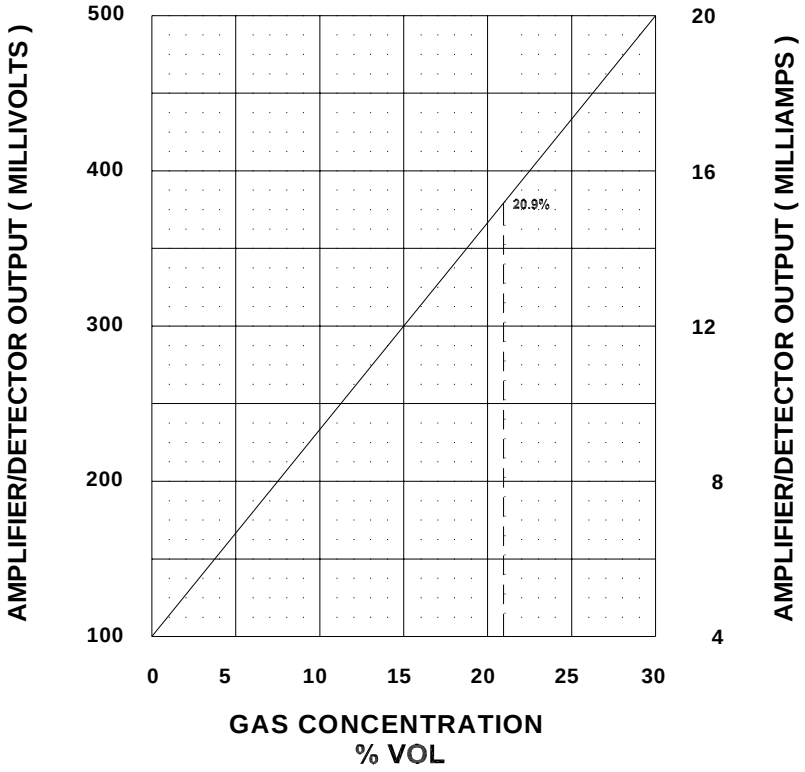

Figure C-5 Calibration Response Charts for 0-30% by volume