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THIS INSTRUMENT IS DESIGNED TO DETECT ONE OR MORE OF THE FOLLOWING:

FLAMMABLE VAPORS, OXYGEN CONTENT, AND/OR TOXIC GAS AND TO GIVE WARNING BEFORE THEY REACH HARMFUL CONDITIONS. IN ORDER TO ENSURE THAT IT WILL WARN OF DANGEROUS CONCENTRATIONS, IT IS ESSENTIAL THAT THE INSTRUCTIONS IN THIS MANUAL, PARTICULARLY THOSE CONCERNING START UP, OPERATION, CALIBRATION, AND MAINTENANCE, BE READ, UNDERSTOOD, AND FOLLOWED.

WARNING

This instrument is designed to detect one or more of the following:

FLAMMABLE VAPORS, OXYGEN CONTENT, AND/OR TOXIC GAS AND TO GIVE WARNING BEFORE THEY REACH HARMFUL CONDITIONS. IN ORDER TO ENSURE THAT IT WILL WARN OF DANGEROUS CONCENTRATIONS, IT IS ESSENTIAL THAT THE INSTRUCTIONS IN THIS MANUAL, PARTICULARLY THOSE CONCERNING START UP, OPERATION, CALIBRATION, AND MAINTENANCE, BE READ, UNDERSTOOD, AND FOLLOWED.

NOTATION CONVENTIONS

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.

WARNING

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

CAUTION

Notifies you of potential damage to equipment.

NOTE

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You may send the unit, prepaid, to: **Thermo GasTech, 8407 Central Ave., Newark, CA 94560-3431, Attn.: Service Department**. Enclose the copy of the RMA (Return Material Authorization) that was previously faxed to you. Pack the instrument and all its accessories (preferably in its original packing) and any special instructions.

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INTRODUCTION

Overview

The FX-SMT is a series of single-point combustible gas, oxygen, or toxic gas monitors. The oxygen and toxic gas models each include two versions:

- **FX-SMT**: Suitable for Class I, Division 1, Groups B, C, and D hazardous locations.
- **FX-SMTn**: Suitable for non-hazardous locations only.

**NOTE**

Unless otherwise specified, all references to the “FX-SMT” apply to both versions.

The FX-SMT displays the current gas reading and transmits a 4 to 20 mA signal output that is proportional to the range of detection. The FX-SMT warns you of hazardous gas concentration conditions with visual alarms at two preset alarm levels. Alarm outputs for low alarm, high alarm, and fail conditions are also available (combustible gas version only).
Target Gases

Table 1-1 lists detection ranges and default alarm points for the FX-SMT gas monitor.

<table>
<thead>
<tr>
<th>Target Gas</th>
<th>Detection Range</th>
<th>Low Alarm</th>
<th>High Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocarbons</td>
<td>0 to 100% LEL or 0-5000 ppm or 0-5.00%</td>
<td>10% LEL 500 ppm</td>
<td>0.5% 2.5% 50% LEL 1000 ppm</td>
</tr>
<tr>
<td>Oxygen</td>
<td>0 to 30.0% O&lt;sub&gt;2&lt;/sub&gt;</td>
<td>19.5% O&lt;sub&gt;2&lt;/sub&gt; 23.5% O&lt;sub&gt;2&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Ammonia</td>
<td>0 to 100 ppm</td>
<td>25 ppm</td>
<td>35 ppm</td>
</tr>
<tr>
<td>Arsine</td>
<td>0 to 1.00 ppm</td>
<td>0.05 ppm</td>
<td>0.1 ppm</td>
</tr>
<tr>
<td>Diborane</td>
<td>0 to 1.00 ppm</td>
<td>0.1 ppm</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>0 to 500 ppm</td>
<td>25 ppm</td>
<td>200 ppm</td>
</tr>
<tr>
<td>Chlorine</td>
<td>0 to 10.0 ppm</td>
<td>0.5 ppm</td>
<td>1.0 ppm</td>
</tr>
<tr>
<td>Chlorine dioxide</td>
<td>0 to 2.00 ppm</td>
<td>0.1 ppm</td>
<td>0.3 ppm</td>
</tr>
<tr>
<td>Fluorine</td>
<td>0 to 10.0 ppm</td>
<td>1 ppm</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>0 to 30.0 ppm</td>
<td>5 ppm</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>0 to 50.0 ppm</td>
<td>4.7 ppm</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Hydrogen fluoride</td>
<td>0 to 10.0 ppm</td>
<td>3 ppm</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>0 to 100 ppm</td>
<td>10 ppm</td>
<td>15 ppm</td>
</tr>
<tr>
<td>Nitric oxide</td>
<td>0 to 100 ppm</td>
<td>25 ppm</td>
<td>75 ppm</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>0 to 20.0 ppm</td>
<td>3 ppm</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Ozone</td>
<td>0 to 1.00 ppm</td>
<td>0.1 ppm</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Phosphine</td>
<td>0 to 1.00 ppm</td>
<td>0.3 ppm</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Silane</td>
<td>0 to 50.0 ppm</td>
<td>5 ppm</td>
<td>15 ppm</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>0 to 20.0 ppm</td>
<td>2 ppm</td>
<td>5 ppm</td>
</tr>
</tbody>
</table>
Introduction

Specifications

Table 1-2 lists the FX-SMT’s performance, physical, electrical, and environmental specifications.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Output</td>
<td>4 to 20 mA</td>
</tr>
<tr>
<td>Alarm Delay Setting</td>
<td>3 seconds(^1)</td>
</tr>
<tr>
<td>Sampling Method</td>
<td>Diffusion</td>
</tr>
<tr>
<td>Linearity</td>
<td>± 5% of detection range</td>
</tr>
<tr>
<td>Repeatability</td>
<td>± 3% of detection range</td>
</tr>
<tr>
<td>Housing</td>
<td>Copper-free aluminum</td>
</tr>
<tr>
<td>Dimensions</td>
<td>FX-SMT (toxic/oxygen versions)</td>
</tr>
<tr>
<td></td>
<td>12.75 in. (32.4 cm) H x 5.5 in. (14.0 cm) W x 4.53 in. D (11.5 cm)</td>
</tr>
<tr>
<td></td>
<td>FX-SMT (combustible version)</td>
</tr>
<tr>
<td></td>
<td>7.5 in. (19.1 cm) H x 5.5 in. (14.0 cm) W x 4.53 in. D (11.5 cm)</td>
</tr>
<tr>
<td></td>
<td>FX-SMTn (toxic/oxygen versions)</td>
</tr>
<tr>
<td></td>
<td>8.5 in. (21.6 cm) H x 5.5 in. (14.0 cm) W x 4.53 in. D (11.5 cm)</td>
</tr>
<tr>
<td>Weight (approximate)</td>
<td>5 lbs. (2.3 kg)</td>
</tr>
<tr>
<td>Enclosure Rating</td>
<td>NEMA 3, 4, 7, and 9 (SMT versions only)(^2)</td>
</tr>
<tr>
<td>Area Classification</td>
<td>Class I, Division 1, Groups B, C, and D environments (SMT versions only)(^2,(^3)</td>
</tr>
<tr>
<td>Power Source</td>
<td>10 to 28 VDC</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-4°F (-20°C) to 113°F (45°C)</td>
</tr>
<tr>
<td>Humidity Range</td>
<td>0 to 95% RH (non-condensing)</td>
</tr>
</tbody>
</table>

\(^1\) Default setting, but adjustable in Setup program.
\(^2\) The SMTn versions for oxygen and toxic gas detection do not include the components necessary for location in Class I, Division 1 hazardous locations.
\(^3\) The hydrocarbon version is suitable for Class I, Division 1, Group A, B, C, and D locations.
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 FX-SMT is not in operation as a gas monitoring system until the start-up procedure is complete.

Mounting the FX-SMT

1. Select the mounting area. When you select the mounting area, consider the following:
   • Is the display screen visible?
   • Is there enough room to:
     – mount the housing? (see Figures 2-1 or 2-2)
     – remove the housing cover?
     – make wiring connections through the top conduit hub?
     – attach the test cup to the detector during the calibration procedure?
   • Is the mounting location representative of the monitoring environment? Light gases rise to the ceiling; heavy gases settle near the floor.

2. Secure the housing to the vertical surface with a 1/4 in. bolt or screw through each mounting lug (see Figures 2-1 or 2-2).
Figure 2-1 FX-SMT Outline and Mounting Dimensions

Figure 2-2 FX-SMTn Outline and Mounting Dimensions
Wiring the Combustible Gas Model

**WARNING**

Make connections at the FX-SMT terminal strip before you plug in or turn on the DC power. Before making any wiring adjustments, always verify that the DC power source is not live.

1. Unscrew the cover from the FX-SMT housing.

2. Remove the display assembly by grasping it and gently pulling up. (Make sure the ribbon cable remains connected to the display assembly and main board.)

3. Verify that the detector leads are connected to the sensor terminal strip as shown in Figure 2-3. The 3-point sensor terminal strip is attached to the sensor board, above the main board.

**WARNING**

Follow electrical codes for installing electrical conduit and wiring for hazardous locations. (Refer to NFPA 70, article 501.)

Seal conduit to prevent intrusion of moisture of conduit into the FX-SMT housing.

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

4. Run three conductors through the top conduit hub of the FX-SMT housing.

**NOTE**

To reduce Radio Frequency Interference (RFI) and Electro-magnetic Interference (EMI), use shielded cable or run wiring within metal conduit. Always ground the cable or conduit at the receiver or controller and not at the FX-SMT.

5. Connect the conductors to the power/signal terminal strip (TB1) on the main board as shown in Figures 2-3 and 2-4.
6. Install a 1-amp fuse at the power source end.

**CAUTION**

The FX-SMT does not have internal fuses or over current protection. Supply a one-amp fuse at the power source for each FX-SMT detector circuit.
Wiring the Toxic Gas/Oxygen Models

**WARNING**
Make connections at the FX-SMT terminal strip before you plug in or turn on the DC power. Before making any wiring adjustments, always verify that the DC power source is not live.

1. Unscrew the cover from the FX-SMT housing.
2. Remove the display assembly by grasping it and gently pulling up. (Make sure the ribbon cable remains connected to the display assembly and main board.)

**WARNING**
Follow electrical codes for installing electrical conduit and wiring for hazardous locations. (Refer to NFPA 70, article 501.)

Seal conduit to prevent intrusion of moisture of conduit into the FX-SMT housing.

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

3. Run two conductors through the top conduit hub of the FX-SMT housing.

**NOTE**
To reduce Radio Frequency Interference (RFI) and Electro-magnetic Interference (EMI), use shielded cable or wiring within metal conduit. Always ground the cable/conduit at the receiver/controller and not at the FX-SMT.

4. Connect the conductors to the power/signal terminal strip (TB1) on the main board as shown in Figures 2-5 and 2-6.
The toxic gas/oxygen models are loop-powered with the power and 4 to 20 mA signal in the same loop. Terminal 3 is not used for these models and must be left unconnected.

5. Install a 1-amp fuse at the power source end.

CAUTION
The FX-SMT does not have internal fuses or over current protection. Supply a 1-amp fuse at the power source for each FX-SMT detector circuit.
Wiring the FX-SMT to the Local Alarm Relay Module (Combustible Gas Model Only)

**WARNING**
Make connections at the local alarm relay module before you plug in or turn on the DC power. Before making any wiring adjustments, always verify that the DC power source is not live.

1. At the FX-SMT, verify that the detector leads are connected to the sensor terminal strip as shown in Figure 2-4.
2. Wire the local alarm relay module to the FX-SMT's power terminal strip as shown in Appendix C.

Starting Up the FX-SMT

**NOTE**
The display screens illustrated in this section are intended as examples only any may appear slightly different than your FX-SMT model.

1. Complete the mounting and wiring procedures described earlier in this chapter.
2. Verify that all wiring connections are correct and secure.
3. Plug in or turn on the incoming DC power at the power source end.

If the display screen is blank, the FX-SMT is not receiving power. Check the DC power connections at the power source and at the FX-SMT’s main board, then begin the start-up procedure again.

The following message displays.

```
GasTech  VXX.XX
```

The FX-SMT counts down from 30 seconds,

```
Warm Up 30 secs.
```

then the normal screen displays.

```
HC Up 0 % LEL
```

**NOTE**
Although the normal screen displays, the FX-SMT may require up to one hour to warm up and for the display reading to stabilize.
**Operation**

**Overview**

This chapter describes the FX-SMT gas monitor in normal operation, alarms and how to respond to them. The section at the end of this chapter describes how to enter the Setup program and update FX-SMT parameters.

**Normal Operation**

Normal operation is defined as any time the start-up procedure is complete and the FX-SMT is not indicating a low alarm, high alarm, or fail condition.

**Display Reading**

While in normal operation, the FX-SMT monitors the environment and displays the current gas concentration in %LEL (combustible gas model), PPM (toxic gas model), or % volume (oxygen model). The combustible gas model may also be configured to display in ppm or % volume.

**Signal Output**

While in normal operation, the range of the signal output from the FX-SMT’s power/signal terminal strip is 4 to 20 mA. The range is directly proportional to the range of detection for the target gas. Use the following formula to determine the target gas concentration from the signal output reading.

\[
\text{Concentration} = \frac{\text{mA} - 4}{16} \times (\text{fullscale concentration})
\]

**Example**

Range: 0 to 100% LEL
Output: 12 mA

\[
\begin{align*}
12 \ - \ 4 &= 8 \\
8 / 16 &= 0.5 \\
0.5 \times 100 &= 50\% \text{LEL}
\end{align*}
\]

**Note**

The LEL model of the FX-SMT may respond to combustible gases other than the target gas, and the readings produced may be higher or lower than the actual gas concentration.
FX-SMT Operator’s Manual

Alarm Indications

NOTE
The low and high alarm points and alarm delay setting are adjustable in the Setup program.

Low Alarm Condition
When the display reading reaches the preset low alarm point, the FX-SMT recognizes a low alarm condition.
If the condition exists for a longer period of time than the low alarm delay setting, the right side of the display screen alternates between the current gas reading and the message Low Alarm. For the combustible gas model, the backlight will also alternate from on to off, and the alarm LED will flash.

High Alarm Condition
When the display reading reaches the preset high alarm point, the FX-SMT recognizes a high alarm condition.
If the condition exists for a longer period of time than the high alarm delay setting, the right side of the display screen alternates between the current gas reading and the message High Alarm. For the combustible gas model, the backlight will also alternate from on to off, and the alarm LED will flash.

Fail Condition
The FX-SMT recognizes a fail condition if one or more of the following conditions exist:
- The wiring from the detector to the sensor terminal strip is incorrect or disconnected.
- The detector is malfunctioning.
In fail condition, the signal output is 3.5 mA.
Responding to Alarm Indications

Low Alarm Condition

1. Follow the established procedure for a low level combustible or toxic gas condition or a decreasing oxygen content condition. If a procedure is not in place, establish one that is appropriate for your application.

NOTE

The Alarm Latch setting is adjustable in the Setup program. The default setting is Off.

2. If the Alarm Latch setting is Off: When the reading falls below the low alarm point for a period of time longer than the alarm reset delay, the FX-SMT automatically resets the low alarm circuit.

   If the Alarm Latch setting is On: You must manually reset the low alarm circuit. Place the magnetic wand against the dome cover, and swipe it from right to left over the magnetic sensor located just above the display screen.

   If the condition has cleared, Reset displays and the low alarm circuit is reset. If the condition has not cleared, Reset Failed displays and the low alarm indications continue.

High Alarm Condition

1. Follow the established procedure for a high level combustible or toxic gas condition or an increasing oxygen content condition. If a procedure is not in place, establish one that is appropriate for your application.

2. If the Alarm Latch setting is off: When the reading falls below the high alarm point for a period of time longer than the alarm reset delay, the FX-SMT automatically resets the high alarm circuit.

   If the Alarm Latch setting is on: You must manually reset the high alarm circuit. Place the magnetic wand against the dome cover, and swipe it from right to left over the magnetic sensor located just above the display screen.

   If the condition has cleared, Reset displays and the high alarm circuit is reset. If the condition has not cleared, Reset Failed displays and the high alarm indications continue.

Fail Condition

1. Recalibrate the FX-SMT as described in Chapter 4, Calibration.

2. If the fail condition continues, contact Thermo GasTech for further instruction.
Storing New Parameters

You can display, adjust, and store the following parameters in the Setup program.

- Range (display only)
- Calibration gas value
- Low alarm point
- High alarm point
- Alarm delay
- Calibration time limit (days)
- Low/High alarm latch (on/off)
- Relay drive output (normally energized/de-energized)
- Low alarm activation (rise/fall)
- High alarm activation (rise/fall)
- Fault alarm latch (on/off)
- Calibration reminder (on/off)
- Gas display units (display only for toxic gas/oxygen)
- Detector voltage adjust (combustible gas model only)
- Air value (display only)
- Span value (display only)

Making Adjustments and Saving in the Setup Program

- To save current settings (including settings you updated during the current session), press the ENTER or RUN/SETUP button until the Saving... message displays. If you press RUN/SETUP, the FX-SMT returns to the normal screen after saving is complete.
- To adjust a setting, press and hold the RUN/SETUP button, then press the UP or DOWN button. Pressing and holding the UP or DOWN button will produce a faster scroll rate.
- To proceed to the next screen, press the UP button until the next screen displays.
- To return to the previous screen, press the DOWN button until the previous screen displays.
- To return to the normal screen, press and hold the RUN/SETUP button until the normal screen displays.
Operating the Setup Program

**NOTE**

The display screens illustrated in this section are intended as examples only and may appear slightly different than your FX-SMT model.

Perform the following procedure to enter the Setup program and display or adjust the parameters.

**ENTERING THE SETUP PROGRAM**

1. Unscrew the cover from the FX-SMT housing.

**WARNING**

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

2. Press and hold the RUN/SETUP button for four seconds to enter the Setup program.

   The signal output of the FX-SMT is 3.5 mA when it is in the Setup program.

**NOTE**

The FX-SMT automatically returns to RUN mode 5 minutes from the last time you pressed one of the adjustment buttons.

**DISPLAYING THE FULL SCALE SETTING**

The FX-SMT displays **Configuration**. After two seconds, the Full Scale screen displays.

```
Full Scale  100
```

This screen displays the maximum end of the FX-SMT’s detection range. You cannot adjust this setting.
DISPLAYING/ADJUSTING THE CALIBRATION VALUE

3. From the Full Scale screen, press the UP button until the Calibration Value screen displays.

![Cal Gas 50]

This screen displays the value to which the FX-SMT adjusts the response setting during the Non-intrusive (external) or Internal Calibration programs.

**WARNING**

This setting must match the concentration of the calibration sample.

DISPLAYING/ADJUSTING THE LOW ALARM POINT

4. From the Calibration Value screen, press the UP button until the Low Alarm screen displays.

![Low Alarm 10]

This screen displays the reading at which the FX-SMT recognizes a low alarm condition.

DISPLAYING/ADJUSTING THE HIGH ALARM POINT

5. From the Low Alarm screen, press the UP button until the High Alarm screen displays.

![High Alarm 50]

This screen displays the reading at which the FX-SMT recognizes a high alarm condition.

DISPLAYING/ADJUSTING THE ALARM DELAY SETTING

6. From the High Alarm screen, press the UP button until the Alarm Delay screen displays.

![Alarm Delay 3]

This screen displays the period of time (in seconds) that the FX-SMT delays indication of an alarm once the FX-SMT recognizes the condition.

**WARNING**

The alarm circuits are inactive for the length of the alarm delay setting and will not warn you of possible hazardous gas conditions.
Operation

DISPLAYING/ADJUSTING THE CALIBRATION INTERVAL

7. From the Alarm Delay screen, press the UP button until the Calibration Interval screen displays.

Cal Time 30

This screen displays the time (in days) between required calibration. The minimum setting is 0; the maximum setting is 100. For example, if the setting is 30, on the 30th day from the last calibration, the FX-SMT begins periodically displaying the Cal Reminder message during normal operation.

The calibration reminder feature is turned on or off from the Calibration Reminder screen, which displays later in the Setup program.

DISPLAYING/ADJUSTING ALARM LATCHING

8. From the Calibration Interval screen, press the UP button until the Alarm Latching screen displays.

Latching Off

This screen determines how alarm circuits are reset once an alarm condition passes.

With alarm latching Off, the FX-SMT automatically resets its alarm circuits. With alarm latching On, you must manually reset the alarm circuit (see “Responding to Alarm Indications”).

DISPLAYING/ADJUSTING RELAY ACTIVATION

9. From the Alarm Latching screen, press the UP button until the Relay screen displays.

Relay Norm Open

This screen determines whether the drive circuit for the external relays is normally de-energized (Norm Open) or normally energized (Norm Close).

DISPLAYING/ADJUSTING LOW ALARM ACTIVATION

10. From the Relay screen, press the UP button until the Low Alarm Activation screen displays.

Low Alarm Rise

This screen determines if the FX-SMT recognizes a low alarm condition when the gas reading rises above (Rise) or falls below (Fall) the low alarm point.

NOTE

The default setting for the oxygen model is Fall.
FX-SMT Operator’s Manual

Displaying/Adjusting High Alarm Activation

11. From the Low Alarm Activation screen, press the UP button until the High Alarm Activation screen displays.

High Alarm Rise

This screen determines if the FX-SMT recognizes a high alarm condition when the gas reading rises above (Rise) or falls below (Fall) the high alarm point.

Displaying/Adjusting Fault Latching

12. From the High Alarm Activation screen, press the UP button until the Fault Latching screen displays.

Fault Latch Off

This screen determines how the fault circuit is reset once a fault condition passes. With fault latching Off, the FX-SMT automatically resets its fault circuit. With fault latching On, you must manually reset the fault circuit (see “Responding to Alarm Indications”).

Displaying/Adjusting Calibration Reminder

13. From the Fault Latching screen, press the UP button until the Calibration Reminder screen displays.

Cal Reminder Off

This screen turns the calibration reminder feature on or off. The default setting is Off. If the setting is On, the FX-SMT periodically displays the Cal Reminder message if calibration is due. If the setting is Off, the FX-SMT does not display a calibration reminder regardless of the setting displayed on the Calibration Interval screen earlier in the Setup program.
**Operation**

**DISPLAYING/ADJUSTING DISPLAY UNITS**

14. From the Calibration Reminder screen, press the UP button until the Display Units screen displays.

<table>
<thead>
<tr>
<th>Units</th>
<th>% LEL</th>
</tr>
</thead>
</table>

This screen indicates the unit of measure that the FX-SMT displays on the normal screen. For the toxic gas and oxygen models, you cannot adjust this setting.

For the combustible gas model, the gas reading units can be displayed as ppm (parts per million), % VOL (% by volume), or % LEL (lower explosive limit).

**WARNING**

If the units are changed, the SMT will require recalibration (see Chapter 4). The alarm settings will automatically be reset to the values shown in Table 1-1.

**DISPLAYING/ADJUSTING SENSOR VOLTAGE (COMBUSTIBLE GAS MODEL ONLY)**

15. From the Display Units screen, press the UP button until the “Adj. Up or Down” screen displays (see below). The screen will then scroll automatically to the HC Volts screen. The HC sensor voltage is factory set, and does not require routine adjustment. It should only be adjusted if the sensor is mounted remote from the SMT housing. The adjustment should be made so that the voltage at the sensor (measured at Red and Green leads) is 6.0 volts.

**WARNING**

Improper adjustment of the HC sensor voltage can cause the sensor to become unresponsive to combustible gases, and may also damage the sensor.

<table>
<thead>
<tr>
<th>Adj. Up or Down</th>
<th>HC Volts</th>
</tr>
</thead>
</table>
DISPLAYING DIAGNOSTIC AND FACTORY-SET SCREENS

16. From the HC Volts screen, press the UP button to display the following screens. These screens are for diagnostic or factory-setting purposes and are not intended for user adjustment.

.air # # # #
.span # # # #

EXITING THE SETUP PROGRAM

17. Press the RUN/SETUP button until the Saving... message or normal screen displays.

The Saving... message only displays if you made changes in the Setup program.

18. Screw the cover onto the FX-SMT housing.
Two calibration procedures are available for the FX-SMT gas monitor.

- **Non-intrusive calibration** is an external procedure that allows you to calibrate the FX-SMT without removing the housing cover. You can avoid de-classifying hazardous environments if you perform the non-intrusive calibration procedure. This chapter describes the non-intrusive calibration procedure.

- The **internal calibration** procedure allows you to calibrate the FX-SMT if the magnetic wand is not available or to adjust the value of the calibration gas setting. Appendix B, Internal Calibration, describes the internal calibration procedure.

---

**WARNING**

Accurate calibration of the FX-SMT is essential to ensure accurate readings of the target gas. Incorrect calibration can impair the FX-SMT’s performance and place you in unnecessary danger if hazardous conditions exist.

---

**Calibration Kit**

The calibration kit contains all of the equipment you need to introduce a calibration gas 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 the 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

1. Verify that the nominal concentration of the cylinder matches the calibration value in the Setup program.

The calibration value is factory-set to match the nominal concentration of the cylinders supplied by Thermo GasTech, but you can adjust this setting in the Setup or Internal Calibration program. Table 4-1 indicates the factory-set calibration value for the FX-SMT’s common target gases.

Table 4-1  Factory-set Calibration Values

<table>
<thead>
<tr>
<th>Target Gas</th>
<th>Calibration Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane (CH₄)</td>
<td>50%LEL</td>
</tr>
<tr>
<td>Hexane (C₆H₁₄)</td>
<td>40%LEL</td>
</tr>
<tr>
<td>Hydrogen (H₂)</td>
<td>50%LEL</td>
</tr>
<tr>
<td>Propane (C₃H₈)</td>
<td>45%LEL</td>
</tr>
<tr>
<td>Carbon monoxide (CO)</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Hydrogen sulfide (H₂S)</td>
<td>25 ppm</td>
</tr>
<tr>
<td>Oxygen (O₂)</td>
<td>0.0%</td>
</tr>
<tr>
<td>Ammonia (NH₃)</td>
<td>25 ppm</td>
</tr>
<tr>
<td>Arsine (AsH₃)</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Chlorine (Cl₂)</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Chlorine Dioxide (ClO₂)</td>
<td>1.0 ppm</td>
</tr>
<tr>
<td>Diborane (B₂H₆)</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Hydrogen Chloride (HCl)</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Hydrogen Cyanide (HCN)</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Nitric Oxide (NO)</td>
<td>25 ppm</td>
</tr>
<tr>
<td>Nitrogen Dioxide (NO₂)</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Ozone (O₃)</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Silane (SiH₄)</td>
<td>5.0 ppm</td>
</tr>
<tr>
<td>Sulfur Dioxide (SO₂)</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Phosphine (PH₃)</td>
<td>0.5 ppm</td>
</tr>
</tbody>
</table>
2. Verify that the flow control valve on the regulator is closed, then carefully screw the regulator onto the cylinder.

**NOTE**
If possible, calibrate the FX-SMT with the same gas as the target gas.

3. Attach the sample tubing over the male end of the regulator. Verify that the connection is tight and secure.

4. Slide the test cup over the detector, then secure the cup to the detector.

5. Use the sample tubing to connect the regulator to the test cup.

6. Verify that all tubing connections are tight and secure.

**Non-Intrusive Calibration**

**WARNING**
The FX-SMT is not an active gas monitor during the calibration procedure. The signal output is 3.5 mA while the FX-SMT is in Calibration mode.

Verify that the calibrating environment is suitable for maintenance activity before you begin the calibration procedure.

1. Assemble the calibration kit.

2. Verify that the FX-SMT is in RUN mode. If the FX-SMT is in SETUP mode, wait until it automatically returns to RUN mode (maximum of 5 minutes).

3. Verify that the FX-SMT is in a “fresh air” environment (environment known to be free of the target gas and of normal oxygen content).

**NOTE**
If you cannot verify the absence of the target gas in the calibrating environment, you will need a zero-emission air cylinder to introduce a gas-free sample to the detector (see Appendix A, Parts List.) The zero-emission air cylinder is not part of the standard calibration kit.

4. A magnetic wand is used to access and step through the Calibration program. Locate the magnetic sensor, which is mounted to the display panel. It is the black cylinder located just above the display screen.
5. Place the magnet end of the wand against the housing window directly above the right hand edge of the magnetic sensor, and slide the magnet from right to left across the sensor.

**NOTE**

The FX-SMT automatically returns to RUN mode if you do not operate the magnetic sensor within 5 minutes after entering the Calibration program.

The display screens illustrated in this section are intended as examples only, and may appear slightly different than your FX-SMT model.

The FX-SMT displays the following screen when it enters the Calibration program.

```
Calibration
```

6. Make sure the FX-SMT is in a known gas-free environment before performing the next step. If you are unsure of the environment, prepare to use a zero-emission air cylinder.

7. Swipe the wand across the magnetic sensor from right to left again. The Air screen displays.

```
Air 0
```

8. If in a known gas-free environment, swipe the magnetic wand from right to left across the magnetic sensor.

   If you are unsure of the calibrating environment, attach a zero emission air cylinder and the test cup, and open the flow control valve on the regulator.

9. When the reading on the right side of the display screen stabilizes (about one minute), swipe the wand across the magnetic sensor from right to left to set the air reading.

   The FX-SMT displays a confirmation message.

```
Pass
```

10. If the **Pass** message displays, continue to the next step by swiping the magnet across the magnetic sensor from right to left again.

   If the **Failed** message displays, verify that the sensor is in a known gas-free environment or that a proper zero-emission air cylinder was used. If this is the case, replace the sensor (see Chapter 5, Maintenance), and repeat the calibration procedure.
11. The Span screen displays.

NOTE
If not already attached, screw the regulator onto the cylinder, attach the test cup to the detector, and connect the regulator to the test cup with the sample tubing.

12. Open the flow control valve on the regulator, and allow the reading to stabilize (1 to 2 minutes).

13. Swipe the magnet across the magnetic sensor from right to left. The FX-SMT displays one of the messages in the table 4-2. Follow the instructions in the table.

Table 4-2  Response Setting Messages

<table>
<thead>
<tr>
<th>Display</th>
<th>Status</th>
<th>What’s Next?</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>The FX-SMT accepts the response setting.</td>
<td>The FX-SMT automatically continues the program.</td>
</tr>
<tr>
<td>FAILED</td>
<td>The FX-SMT rejects the response setting.</td>
<td>Turn off the flow of the calibrating gas, then repeat the calibration procedure. If the FX-SMT rejects the response reading on the second attempt, see the troubleshooting guide.</td>
</tr>
</tbody>
</table>

14. If Pass displays, calibration is complete. Close the regulator and remove the test cup from the detector.

15. The FX-SMT returns to the normal screen after a one-minute delay. During this delay, the display screen flashes. When the display screen stops flashing, the FX-SMT is in normal operating mode.

16. Disassemble the calibration kit.

NOTE
The alarm indication and relay outputs are active as soon as the FX-SMT returns to normal operation mode. If the display reading is above the low or high alarm point, the FX-SMT recognizes the applicable gas alarm condition.
**WARNING**

If possible, perform all maintenance activities in a non-hazardous environment.

---

**Preventive Maintenance**

This schedule describes procedures to ensure the performance and durability of the FX-SMT gas monitor.

**Daily**

1. Verify that the display is on. If the display is off, see the Troubleshooting table.
2. Investigate significant changes in the display reading and signal output.

**Monthly**

Calibrate the FX-SMT as described in Chapter 4, Calibration, or Appendix B, Internal Calibration.

**Troubleshooting**

The following troubleshooting guide describes symptoms, probable causes, and recommended actions for problems you may encounter with the FX-SMT gas monitor.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Symptom(s)</th>
<th>Probable Cause(s)</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail Condition</td>
<td>• The FAIL message is displayed.</td>
<td>• Incorrect detector wiring</td>
<td>1. Respond as described in “Responding to Alarm Indications”.</td>
</tr>
<tr>
<td></td>
<td>• The signal output is 3.5 mA.</td>
<td>• Detector failure</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Microprocessor failure</td>
<td></td>
</tr>
<tr>
<td>No Power</td>
<td>• The display screen is blank.</td>
<td>• Incomplete or incorrect power circuit.</td>
<td>1. Verify correct connections at the power source.</td>
</tr>
<tr>
<td></td>
<td>• The signal output is 0.0 mA.</td>
<td>• Display board is disconnected.</td>
<td>2. Verify that the display board is connected to the main board by the ribbon cable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Verify correct connections at the FX-SMT’s power/signal terminal strip.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. If power failure continues, contact Thermo GasTech for further instruction.</td>
</tr>
<tr>
<td>Calibration Failure</td>
<td>• The display screen indicates FAIL when you confirm a zero or response setting during the calibration procedure.</td>
<td>• Sample in test cylinder is low or exhausted</td>
<td>1. Verify that you are using a correct test cylinder and that it has an adequate supply of the test sample.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Detector failure</td>
<td>2. Repeat the calibration procedure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. If calibration difficulties continue, replace the detector, then calibrate the new detector.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. If calibration failure continues, contact Thermo GasTech for further instruction.</td>
</tr>
</tbody>
</table>
### Table 5-1 Troubleshooting

<table>
<thead>
<tr>
<th>Condition</th>
<th>Symptom(s)</th>
<th>Probable Cause(s)</th>
<th>Recommended Action</th>
</tr>
</thead>
</table>
| Inaccurate Signal Output     | • The signal output is inaccurate.                                           | • Incomplete or incorrect signal output circuit.                                  | 1. Verify correct connection to the receiver or controller.  
2. Verify correct connection to the FX-SMT’s sensor terminal strip.  
3. If signal output difficulties continue, contact Gas Tech for further instruction. |
| Inaccurate Display Reading   | • The display readings are inaccurate.                                      | • Inaccurate calibration  
• Detector failure                                                                   | 1. Calibrate the FX-SMT.  
2. Replace the detector, then repeat the calibration procedure.  
3. If inaccurate display readings continue, contact Thermo GasTech for further instruction. |
| Frequent Alarms              | • Frequent or false alarms, but no change in zero reading.                  | • False readings due to Radio Frequency Interference (RFI) and/or electrical noise. | 1. If the detector is installed at a remote location, verify that the detector wiring is properly shielded.  
2. Increase the low alarm and high alarm delay settings in the Setup program.  
3. If suspect alarms continue, contact Thermo GasTech for further instruction. |
Replacing the Detector

This section describes how to replace the detector for the LEL and toxic gas/oxygen models of the FX-SMT gas monitor.

Replacing the Detector (LEL Model)

1. Turn off or unplug the incoming DC power at the power source end, then remove the cover from the FX-SMT housing.

2. Remove the display assembly by grasping it and gently pulling up.

**NOTE**

Leave the display assembly connected to the main board by the ribbon cable.

3. Remove the detector leads from the sensor terminal strip.

4. Unscrew and remove the detector from the bottom conduit hub, then pull the detector leads out through the hub.

   Verify that the reducer remains installed in the bottom conduit hub as you remove the detector.

5. Guide the detector leads of the new detector through the bottom conduit hub, then screw the detector into the hub.

6. Connect the detector leads to the detector terminal strip as shown in Table 5-2.

   Table 5-2  LEL Detector Wiring Connections

<table>
<thead>
<tr>
<th>Detector Lead</th>
<th>Sensor Terminal Strip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green (reference)</td>
<td>Terminal 3</td>
</tr>
<tr>
<td>White (common)</td>
<td>Terminal 2</td>
</tr>
<tr>
<td>Red (active)</td>
<td>Terminal 1</td>
</tr>
</tbody>
</table>

6. Insert the male standoffs that extend from the bottom of the display assembly into the female standoffs that extend from the top of the main board.

7. Secure the cover onto the FX-SMT housing, then turn on or plug in the incoming power at the power source end.

8. Allow the new detector to warm up for 15 minutes, then calibrate the detector.
Replacing the Sensor (Toxic Gas/Oxygen Models)

1. Turn off or unplug the incoming DC power at the power source end.
2. Push and turn the sensor housing counterclockwise to disconnect the locking pins from the tabs in the cap.
3. Gently pull the cap off the sensor housing. There may be some resistance due to the o-ring at the top of the cap.
4. Unplug the sensor from the sensor board. Note which sockets the sensor was plugged into.
5. Plug in the new sensor, then replace the cap.
6. Turn on or plug in the incoming power at the power source end.
7. Allow the new sensor to stabilize for at least one hour, then calibrate the sensor.

Returning for Repair

Before you remove the FX-SMT from the monitoring area, first contact a Thermo GasTech representative. The Thermo GasTech representative may guide you through certain diagnostic procedures with the FX-SMT in place. If you cannot correct the malfunction, the representative will assist you in returning the FX-SMT for repair.
Table A-1 lists part numbers for the FX-SMT gas monitor’s replacement parts and accessories.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-0106</td>
<td>Housing cover</td>
</tr>
<tr>
<td>45-4533-01</td>
<td>Terminal strip, 3-position</td>
</tr>
<tr>
<td>45-4534-01</td>
<td>Terminal strip, 4-position</td>
</tr>
<tr>
<td>57-7631</td>
<td>Local alarm relay module</td>
</tr>
<tr>
<td>61-0101</td>
<td>Sensor, hydrocarbon (HC)</td>
</tr>
<tr>
<td>65-1061</td>
<td>Sensor, oxygen (O₂)</td>
</tr>
<tr>
<td>65-2420-02</td>
<td>Sensor, sulfur dioxide (SO₂)</td>
</tr>
<tr>
<td>65-2425-01</td>
<td>Sensor, carbon monoxide (CO)</td>
</tr>
<tr>
<td>65-2425-02</td>
<td>Sensor, hydrogen sulfide (H₂S)</td>
</tr>
<tr>
<td>65-2431-01</td>
<td>Sensor, chlorine (Cl₂)/fluorine (F₂)</td>
</tr>
<tr>
<td>65-2431-02</td>
<td>Sensor, hydrogen cyanide (HCN)</td>
</tr>
<tr>
<td>65-2431-03</td>
<td>Sensor, nitric oxide (NO)</td>
</tr>
<tr>
<td>65-2431-04</td>
<td>Sensor, hydrogen chloride (HCl)</td>
</tr>
<tr>
<td>65-2431-05</td>
<td>Sensor, hydrogen fluoride (HF)</td>
</tr>
<tr>
<td>65-2431-07</td>
<td>Sensor, ammonia (NH₃) (low range)</td>
</tr>
<tr>
<td>65-2431-08</td>
<td>Sensor, phosphine (PH₃)/arsine (AsH₃)/silane (SiH₄)/diborane (B₂H₆)</td>
</tr>
<tr>
<td>65-2431-09</td>
<td>Sensor, ozone (O₃)</td>
</tr>
<tr>
<td>65-2431-10</td>
<td>Sensor, nitrogen dioxide (NO₂)</td>
</tr>
<tr>
<td>65-2431-11</td>
<td>Sensor, chlorine dioxide (ClO₂)</td>
</tr>
<tr>
<td>65-2431-12</td>
<td>Sensor, ammonia (NH₃) (high range)</td>
</tr>
<tr>
<td>71-0085</td>
<td>FX-SMT Series Operator’s Manual</td>
</tr>
<tr>
<td>81-0002</td>
<td>Cylinder, hydrogen-in-air (50% LEL)</td>
</tr>
</tbody>
</table>
### Table A-1 Parts List (Continued)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>81-0004</td>
<td>Cylinder, propane-in-air (45% LEL)</td>
</tr>
<tr>
<td>81-0007</td>
<td>Cylinder, hexane-in-air (40% LEL)</td>
</tr>
<tr>
<td>81-0008</td>
<td>Cylinder, methane-in-air (2500 PPM)</td>
</tr>
<tr>
<td>81-0009</td>
<td>Cylinder, hexane-in-air (2500 PPM)</td>
</tr>
<tr>
<td>81-0010</td>
<td>Cylinder, hydrogen-in-air (2500 PPM)</td>
</tr>
<tr>
<td>81-0012</td>
<td>Cylinder, methane-in-air (50% LEL)</td>
</tr>
<tr>
<td>81-0065</td>
<td>Cylinder, CO-in-air (100 PPM)</td>
</tr>
<tr>
<td>81-0076</td>
<td>Cylinder, zero-emission air</td>
</tr>
<tr>
<td>81-0078</td>
<td>Cylinder, 100% nitrogen ($N_2$)</td>
</tr>
<tr>
<td>81-0151</td>
<td>Cylinder, H$_2$S-in-N$_2$ (25 PPM)</td>
</tr>
<tr>
<td>81-0170</td>
<td>Cylinder, SO$_2$-in-N$_2$ (5 PPM)</td>
</tr>
<tr>
<td>81-0175</td>
<td>Cylinder, NO-in-N$_2$ (25 PPM)</td>
</tr>
<tr>
<td>81-0180</td>
<td>Cylinder, NO$_2$-in-N$_2$ (5 PPM)</td>
</tr>
<tr>
<td>81-0188</td>
<td>Cylinder, SiH$_4$-in-N$_2$ (5 PPM)</td>
</tr>
<tr>
<td>81-0189</td>
<td>Cylinder, NH$_3$ in air (100 PPM)</td>
</tr>
<tr>
<td>81-0190</td>
<td>Cylinder, Cl$_2$-in-N$_2$ (5 PPM)</td>
</tr>
<tr>
<td>81-0191</td>
<td>Cylinder, NH$_3$-in-air (25 PPM)</td>
</tr>
<tr>
<td>81-0192</td>
<td>Cylinder, HCN-in-N$_2$ (10 PPM)</td>
</tr>
<tr>
<td>81-0193</td>
<td>Cylinder, PH$_3$-in-N$_2$ (0.5 PPM)</td>
</tr>
<tr>
<td>81-0194</td>
<td>Cylinder, HCl-in-N$_2$ (10 PPM)</td>
</tr>
<tr>
<td>81-1003</td>
<td>Regulator, LEL/O$_2$/CO test kit</td>
</tr>
<tr>
<td>81-1051-01</td>
<td>Regulator, toxic gases (except HCl/Cl$_2$)</td>
</tr>
<tr>
<td>81-1062</td>
<td>Regulator, Cl$_2$/HCl</td>
</tr>
<tr>
<td>81-1110</td>
<td>Test cup, (LEL model)</td>
</tr>
<tr>
<td>81-1121</td>
<td>Test cup, (toxic gas/oxygen models)</td>
</tr>
<tr>
<td>81-6412-01</td>
<td>Calibration kit, H$_2$S (25 PPM)</td>
</tr>
<tr>
<td>81-6412-02</td>
<td>Calibration kit, Cl$_2$ (5 PPM)$^1$</td>
</tr>
<tr>
<td>81-6412-03</td>
<td>Calibration kit, HCl (10 PPM)</td>
</tr>
</tbody>
</table>
Table A-1  Parts List (Continued)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>81-6412-04</td>
<td>Calibration kit, HCN (10 PPM)</td>
</tr>
<tr>
<td>81-6412-05</td>
<td>Calibration kit, NH₃ (25 PPM)</td>
</tr>
<tr>
<td>81-6412-06</td>
<td>Calibration kit, PH₃ (0.5 PPM)²</td>
</tr>
<tr>
<td>81-6412-07</td>
<td>Calibration kit, NO (25 PPM)</td>
</tr>
<tr>
<td>81-6412-08</td>
<td>Calibration kit, NO₂ (5 PPM)</td>
</tr>
<tr>
<td>81-6412-09</td>
<td>Calibration kit, SO₂ (5 PPM)</td>
</tr>
<tr>
<td>81-6412-10</td>
<td>Calibration kit, NH₃ (100 PPM)</td>
</tr>
<tr>
<td>81-6412-11</td>
<td>Calibration kit, SiH₄ (5 PPM)</td>
</tr>
<tr>
<td>81-6413-01</td>
<td>Calibration kit, methane (50% LEL)</td>
</tr>
<tr>
<td>81-6413-02</td>
<td>Calibration kit, hydrogen (50% LEL)</td>
</tr>
<tr>
<td>81-6413-03</td>
<td>Calibration kit, propane (45% LEL)</td>
</tr>
<tr>
<td>81-6413-04</td>
<td>Calibration kit, hexane (40% LEL)</td>
</tr>
<tr>
<td>81-6413-05</td>
<td>Calibration kit, methane (2500 PPM)</td>
</tr>
<tr>
<td>81-6413-06</td>
<td>Calibration kit, hexane (2500 PPM)</td>
</tr>
<tr>
<td>81-6413-07</td>
<td>Calibration kit, hydrogen (2500 PPM)</td>
</tr>
<tr>
<td>81-6413-08</td>
<td>Calibration kit, O₂ (100% N₂)</td>
</tr>
<tr>
<td>81-6413-09</td>
<td>Calibration kit, CO (100 PPM)</td>
</tr>
<tr>
<td>82-0001</td>
<td>Magnetic wand</td>
</tr>
</tbody>
</table>

¹ Appropriate also for fluorine (F₂) sensors
² Appropriate also for arsine (AsH₃) and diborane (B₂H₆) sensors.
Internal Calibration

This appendix describes the FX-SMT’s internal calibration procedure, which requires you to remove the housing cover. See Chapter 4, Calibration, to perform the non-intrusive calibration procedure.

⚠️ WARNING
Calibrate the FX-SMT in a “fresh air” environment (known to be free of gas and of normal oxygen content).

Preparing for Calibration

1. Assemble the Calibration kit.

2. Verify that the FX-SMT is in a “fresh air” environment (environment known to be free of the target gas and of normal oxygen content).

⚠️ NOTE
If you cannot verify the absence of the target gas in the calibrating environment, you will need a zero-emission air cylinder to introduce a gas-free sample to the detector (see Appendix A, Parts List.) The zero-emission air cylinder is not part of the standard calibration kit.

⚠️ 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 junction box cover. Consult prevailing national, local, and corporate requirements for certification.

3. Remove the cover from the FX-SMT housing.

⚠️ NOTE
The display screens illustrated in this section are intended as examples only any may appear slightly different than your FX-SMT model.
Calibrating the FX-SMT

1. Press the UP and DOWN buttons simultaneously for two seconds to enter the Calibration program. The FX-SMT displays the following screen when it enters the Calibration program,

   ![Calibration Screen](image)

   then the Air screen displays.

   ![Air Screen](image) 0

2. Make sure the FX-SMT is in a known gas-free environment before performing the next step. If you are unsure of the environment, prepare to use a zero-emission air cylinder.

3. If in a known gas-free environment, press the ENTER button and go to step 5.

   If you are unsure of the calibrating environment, attach a zero emission air cylinder and test cup, and open the flow control valve on the regulator.

4. When the reading on the right side of the display screen stabilizes (about one minute), press the ENTER button to set the air reading. The FX-SMT displays a Pass message, then the Span screen displays.

   ![Span Screen](image) 0

   If the Failed message displays, verify the sensor is in a known gas-free environment or that a proper zero-emission air cylinder was used. If this is the case, replace the sensor, and repeat the calibration procedure.

5. Open the flow control valve on the regulator, and allow the reading to stabilize (1 to 2 minutes).

6. Press the ENTER button. The FX-SMT displays one of the messages in the table B-1. Follow the instructions in the table.
7. If Pass displays, calibration is complete. Close the regulator and remove the test cup from the detector.

The FX-SMT returns to the normal screen after a one-minute delay. During this delay, the display screen flashes. When the display screen stops flashing, the FX-SMT is in normal operating mode.

8. Screw the cover onto the FX-SMT housing, and disassemble the calibration kit.

NOTE

The alarm indication and relay outputs are active as soon as the FX-SMT returns to normal operation mode. If the display reading is above the low or high alarm point, the FX-SMT recognizes the applicable gas alarm condition.
Local Alarm Relay Module

This appendix describes the local alarm relay module accessory offered for the Combustible Gas version of the FX-SMT. The local alarm relay module allows you to wire external alarm devices to the FX-SMT for alarm annunciation or process control at the point of detection.

**NOTE**
If you are installing the FX-SMT and local alarm relay module in a Class I, Division 1, Hazardous location, conduit seals are required in each conduit run entering an enclosure.

**Description**
The local alarm relay module includes the housing, relay terminal strip, power terminal strip, and relays (see Figure C-1).

![Figure C-1 Component Location, Local Alarm Relay Module](image-url)
FX-SMT Operator’s Manual

HOUSING
The housing is explosion-proof, and it is suitable for installation in Class I, Division 1, Groups B, C, and D environments. The housing has three conduit hubs (3/4 in. NPT) for wiring connections to the relay and power terminal strips.

RELAY TERMINAL STRIP
The relay terminal strip has normally-closed (NC), common (C), and normally-open (NO) terminals for fail (F), high (H), and low (L) alarm conditions. The relay terminal strip facilitates connection to external alarm or process control devices.

POWER TERMINAL STRIP
The power terminal strip has separate positive (+) and negative (–) terminals for low (L), high (H), and fail (F) alarm conditions. The power terminal strip facilitates connection to the DC power source and the FX-SMT. The FX-SMT receives DC power from the local alarm relay module.

RELAYS
The relays are from top to bottom fail (K1), high (K2), and low (K3). The applicable relay activates when the FX-SMT is in a low, high, or fail condition. Each relay is normally-energized and de-energizes when activated.

The relay contacts are isolated and are rated for 3 amps at 240 VAC and 5 amps at 24 VDC and 115 VAC (resistive).
Appendix C

Installation

To mount the local alarm relay module and make wiring connections to the local alarm relay module, complete the following procedure.

Mounting the Local Alarm Relay Module

1. Use the mounting lugs to mount the local alarm relay module to a vertical surface at the monitoring area.

   Mount the local alarm relay module as close to the FX-SMT as possible.

Wiring the Local Alarm Relay Module to the FX-SMT

CAUTION

Observe polarity when you make the wiring connections described in the following step.

2. Wire the power terminal strip (local alarm relay module) to the alarm output terminal strip (FX-SMT) as shown in the detailed table of Figure C-2.

3. Wire the external alarm device(s) to the local alarm relay module as described in the next section and shown in Figure C-3. Run the wiring through the conduit hub on the left side of the housing.

   If you are using the FX-SMT with a receiver or controller, perform steps 4 and 5. If you are using the FX-SMT as a standalone device, go to step 5.

4. Wire the receiver or controller to the FX-SMT and local alarm relay module as shown in Figure C-2.

5. Wire the DC power source to the power terminal strip (local alarm relay module) as shown in Figure C-2.
Figure C-2 Local Alarm Relay Module, General Wiring Diagram
Appendix C

Wiring the Local Alarm Relay Module to External Alarm Devices

1. Run the wiring of the external alarm device through the conduit hub on the left side of the local alarm relay module.

2. Connect the wiring to the appropriate terminals (low, high or fail) of the relay terminal strip (see Figure C-3).

Figure C-3 External Alarm Wiring, Local Alarm Relay Module

- Connect the positive or hot lead of the external alarm’s power source to C (common).
- Connect the positive or hot lead of the external alarm device to NC (normally closed) or NO (normally open).
- Connect the negative or neutral lead of the external alarm’s power source to the negative or neutral lead of the alarm device.

NOTE

The low and high relays are energized in normal operation, and de-energize when the FX-SMT is in low or high condition. NO (normally open) and NC (normally closed) describe the condition of the relay when it is de-energized.
WIRING INCOMING POWER TO THE LOCAL ALARM RELAY MODULE

**WARNING**

Make connections at the local alarm relay module before you plug in or turn on the DC power. Before making any wiring adjustments, always verify that the DC power source is not live.

1. Run two DC power wires through the top conduit hub of the local alarm relay module.

2. Connect the power wires to the top two terminals of the power terminal strip (local alarm relay module) as shown in Table C-1.

<table>
<thead>
<tr>
<th>DC Power Source</th>
<th>Power Terminal Strip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>+</td>
</tr>
<tr>
<td>Negative</td>
<td>–</td>
</tr>
</tbody>
</table>

3. Install a 1-amp fuse at the power source end.

**CAUTION**

The FX-SMT does not have internal fuses or over current protection. Supply a one-amp fuse at the power source for each FX-SMT detector circuit.

4. Complete the start-up procedure as described in Chapter 2, Installation.