Foxcroft Equipment & Service, Co. Inc.
Model FX-1
Mini Gas Detector
Instruction Manual

Warning!
Please Read Carefully and Save.

The FX-1 Mini Gas Detector includes an instruction manual that contains important information about its operation. Purchasers who install this toxic gas detection system for use by others must leave this instruction manual or a copy with the user.

Table of Contents

IMPORTANT SAFETY INFORMATION

Please read and observe the following:

All functions of this gas detection system must be verified on a regular basis.

HELPFUL IDENTIFIERS

In addition to information on installation and operation, this instruction manual may contain WARNINGS pertaining to user safety, CAUTIONS regarding possible instrument malfunction, and NOTES on important, useful operating guidelines.

WARNING: A warning looks like this. It warns you of the potential for personal injury

CAUTION: A caution looks like this. It alerts you to the possibility of instrument malfunction or damage.

NOTE: *A note looks like this. It alerts you to important operating information.*

Introduction

General Information

Instrument Description and Capability

The Foxcroft FX-1 Mini Gas Detector is designed to have the simplicity of a typical smoke detector. It utilizes the same sensor as our more advanced detectors, which are designed to rapidly detect and warn of hazardous toxic gas concentrations or low oxygen levels, but comes in a smaller package that is easy to install and simple to use.

Put an FX-1 in every place necessary to protect personnel. Place it in the proper location according to which type of gas the air is being monitored for.

Plug the power pack into a 115VAC outlet.

The “Cell Failure” green LED will blink when you first plug the detector into an AC outlet. It will go out in approximately 15 minutes. The “Danger” alarm may also sound. If this should happen, simply press the reset button to silence the alarm. In some cases a clicking sound may occur. This is normal and it will usually stop in a minute or two.

To test the detector press the reset button and hold it in for 10 seconds. The following things should occur during testing:

The “Confirm” red LED should illuminate
The “Danger” alarm LED should blink
The alarm will give a quick chirp.

The detector may also be tested by waving a flashlight at the “RESET” mark on the control panel.

WARNING: If the alarm buzzer sounds a loud pulsating sound and you are not testing the toxic gas detector, it has sensed a gas leak. The alarm buzzer is warning of a possibly serious situation and it requires your immediate attention.

WARNING: If the FX-1 is altered in any way, the warranty will be void (e.g., drilling additional holes in the enclosure to mount conduits, changing operating range of the gas sensor and altering the gas alarm trip points).

Dimensions

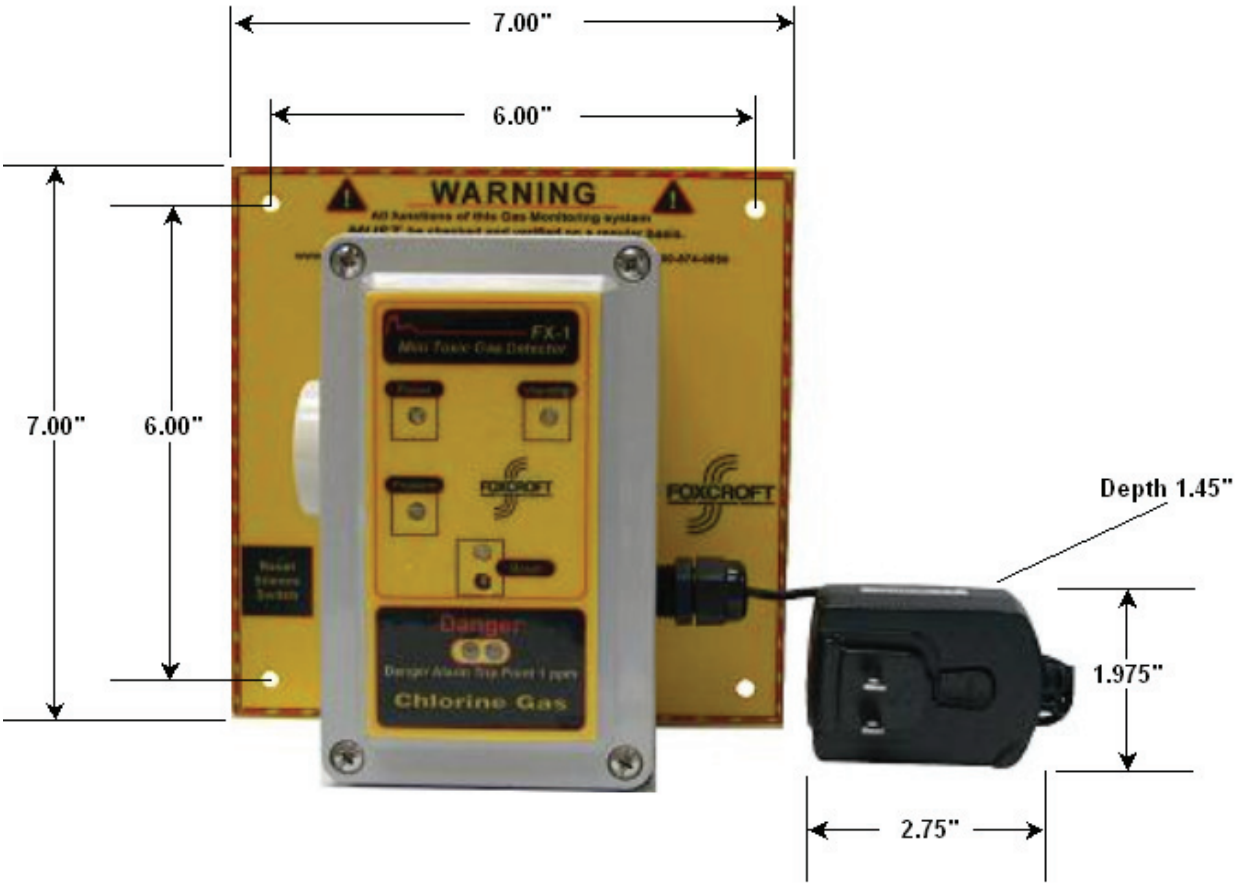

Figure 1

WARNING: All functions of the FX-1 must be checked and verified on a regular basis. Even the ability for the gas sensor to sense toxic gas or low oxygen levels must be verified on a regular basis. It is recommended that the gas sensor be tested by means of a certified gas standard at least once every six months.

WARNING: Never disconnect an AC powered gas detector to stop nuisance alarms. The source of the problem must be corrected.

General Limitations

The FX-1 Mini Toxic Gas Detector will not work without AC power. AC powered gas detectors will not work if the power source is cut off for any reason. Some examples are a power failure at the power station, an open fuse or circuit breaker, corrosion of the electrical system that destroys the wires, a failure of an electrical switching device. **If there are any concerns about the limitations of AC power, a battery backup should be installed.**

The Green LED Digital Display should be clearly illuminated at all times. This indicates the AC power is turned on.

The FX-1 will not sense toxic gas or oxygen if the gas which it is monitoring for does not reach the sensing chamber.

The FX-1 may not sense toxic leaks or low oxygen levels in another room or another floor of the building (e.g., an outside mounted gas detector may not sense a toxic gas leak inside a building; therefore, place a gas detector wherever it is needed to protect your personnel).

FX-1 may not be heard or seen. The loudness of the alarm in the FX-1 Toxic Gas Detector meets (or exceeds) current standards. However, if the FX-1 is placed in a closed room, it may not be seen or heard by personnel, especially if the door does not have a window to see the visual alarm. Even normal noise such as traffic, motors running, radios, and air conditioners may prevent personnel from hearing the audible alarm. **FX-1 Toxic Gas Detectors may not be heard or seen by persons who are hard of hearing or visually impaired.** It is recommended that the remote warning device be installed to alert personnel before entering a room. Several detectors are recommended both outside the building or in any room that contain personnel, where toxic gas or low oxygen levels can develop.

The FX-1 is not foolproof. Like all other electronic devices, FX-1 Toxic Gas Detectors have limitations. Detectors cannot be expected to sense a dangerous toxic gas leak or low oxygen levels if the cavity is blocked by debris or the detector is carelessly tampered with by personnel.

The FX-1 has a limited life. This equipment contains many parts. Just as with any other device any one of these parts could fail at any time. Therefore, you must test your detector on a regular basis. Be sure to have it repaired or replaced when it fails to test properly. In no case should the detector be used for more than 10 years. All functions of this detector must be checked and verified on a regular basis. Even the ability of the sensor must be verified by means of a certified gas standard at least 2 times a year.

Life and Replacement: Most sensors are designed for a minimum life span of 2 years and are warranted for 1 year from date of shipment. Life expectancy can be as high as 10 years. Oxygen sensors have a life span of 2 years and are warranted for a period of 1 year from the date of shipment. To verify expiration date, see serial number data tag or the data sheet provided.

Range and Alarm Trip Point Chart

Standard Range (ppm or %)
Optional Ranges and Alarm Trip Points may be available.

Refer to the Serial Number label inside the remote unit for the type of gas being monitored, or the labeling on the sensor itself.

Gas	Standard Range	Warning Trip Point	Danger Trip Point
Chlorine (Cl_2)	**0-10 ppm**	**0.5 ppm**	**0.3 ppm**
Sulfur Dioxide (SO_2)	**0-10 ppm**	**1.0 ppm**	**3.0 ppm**
Carbon Monoxide (CO)	**0-500 ppm**	**35 ppm**	**50 ppm**
Hydrogen (H_2)	**0-200 ppm**	**35 ppm**	**50 ppm**
Hydrogen Sulfide (H_2S)	**0-10 ppm**	**1.0 ppm**	**3.0 ppm**
Nitric Oxide (NO)	**0-50 ppm**	**15 ppm**	**25 ppm**
Nitrogen Dioxide (NO_2)	**0-10 ppm**	**1.0 ppm**	**3.0 ppm**
Oxygen (O_2)	**0-25%**	**18%**	**16%**
Ammonia (NH_3)	**0-100 ppm**	**35 ppm**	**50 ppm**
Hydrogen Cyanide (HCn)	**0-10 ppm**	**1.0 ppm**	**3.0 ppm**
Ozone (O_3)	**0-2 ppm**	**0.05 ppm**	**0.1 ppm**
Hydrogen Chloride (HCl)	**0-10 ppm**	**1.0 ppm**	**3.0 ppm**
Chlorine Dioxide (ClO_2)	**0-1 ppm**	**0.1 ppm**	**0.3 ppm**

**Consult factory for precautions

Specifications

Sensor input	One sensor
Warranty	1 year (remote electronics only); Sensor warranty varies depending on gas type - see individual toxic gas specifications sheets.
Range and alarm trip Points	See page 9 for specific gas trip levels and ranges.
Response time	Less than 8 seconds to full alarm
Accuracy (ppm @ 20°C)	0.1 percent
Resolution	0.1ppm
Operating temperature range	-15°C to 40°C (5°F to 104°F)
Operating humidity	15% to 90% (non-condensing)
Drift	Less than 2% per month
Auxiliary relay contacts	Danger - DPST 10A @ 125 VAC latching relay
Auxiliary ouputs	Warning 12 VDC, 600 ohms minimum Cell failure 12 VDC, 600 ohms minimum Power failure 12 VDC, 600 ohms minimum
Power	Remote transformer 110 VAC, 50/60 Hz (standard) 220 VAC, 50/60 Hz (optional) Hard wire module (optional) 90-264 VAC, 47-63 Hz, 25 W (optional)

Installation

Unpacking

After unpacking, it is recommended to save the shipping carton and packing materials if the instrument must be stored or re-shipped. Inspect the equipment and packing materials for signs of shipping damage. If there is any evidence of damage, notify the transit carrier immediately.

The shipping container consists of the following:

1 FX-1 Mini Toxic Gas Detector

1 Instruction Manual

Serial Number

The FX-1 Single Channel Toxic Gas Detector has two serial number labels, one on the inside of the enclosure and one on the outside of the enclosure. The enclosure indicates the chlorine residual range. Should technical assistance be required, refer to the serial number to identify your system.

Installation (Mechanical)

Mechanical Installation

Sensor Location

Proper placement of the sensor is essential to the operation of the FX- 1 Mini Toxic Gas Detector. Depending on its location, the FX-1 will either sound a rapid alarm of hazardous leaks or low oxygen levels, or may delay or fail to warn of hazardous conditions.

Correct installation of the sensor depends mostly on what type of gas the detector is monitoring the air for. If the gas is heavier than air, then the sensor should be placed closer to the floor. If the gas is lighter than air, the sensor should be placed further from the floor.

- Never mount the FX-1 in direct sunlight or direct light.

- Do not install in very dusty or dirty areas. Dust and dirt can build up on the sensing chamber, making it overly sensitive. Dirt can block openings to the sensing chamber and keep the gas detector from sensing toxic gas or low oxygen levels.

- Do not install in areas of wash down. The toxic gas detector should not be washed with water or mounted in areas where water is used for cleaning.

- Do not install near fresh air vents, or very drafty areas. Take into account ventilation air flow patterns. If installing in an outdoor area, the sensor should generally be placed downwind of the source. More than one system may be needed to efficiently protect some outdoor locations.

- Do not install in insect-infested areas. If insects enter a sensing chamber, they may cause a nuisance alarm. They can also block the sensing chamber and prevent toxic gas or oxygen from entering the chamber.

- Outdoor areas may require more than one FX-1 for protection.

Physical Installation

Installation of the FX-1 consists of physically mounting the unit to the wall, plugging the AC power back into an AC receptacle, and wiring the output alarm contact connections.

Layout

Figure 2

WARNING: The toxic gas detector cannot efficiently monitor the air if the sensing chamber is blocked in any way.

Installation (Typical)

Example: Chlorine gas ONLY

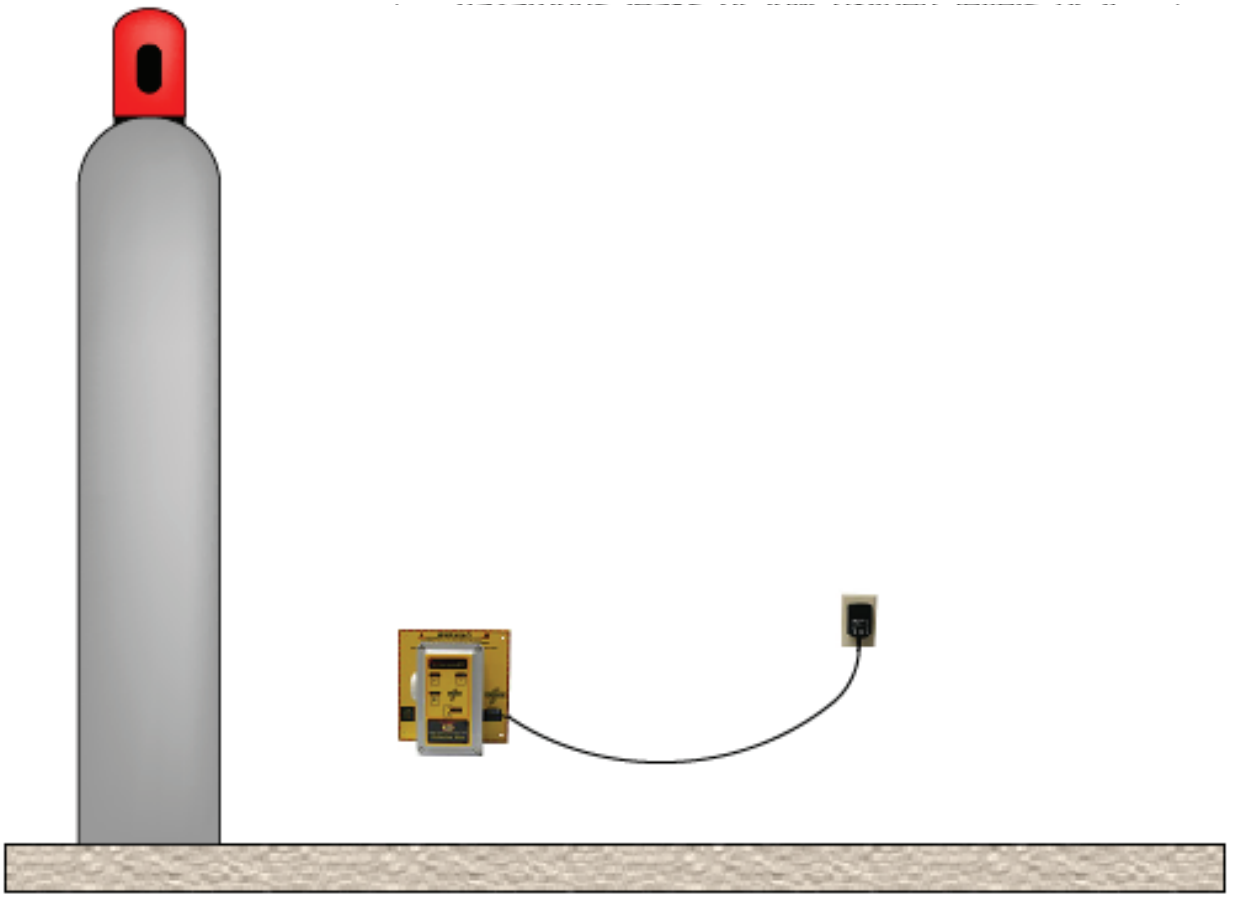

Figure 3

WARNING: Appropriate positioning of the sensor is imperative to the operation of the detector. Location will either result in rapid alarming of hazardous leaks or low oxygen levels or it can delay or fail to warn of a hazardous condition.

Physical Installation

This drawing indicates recommended locations for minimum security and a higher degree of security.

The FX-1 Mini Toxic Gas Detector will not sense a toxic gas leak or oxygen if the gas does not reach the sensing chamber.

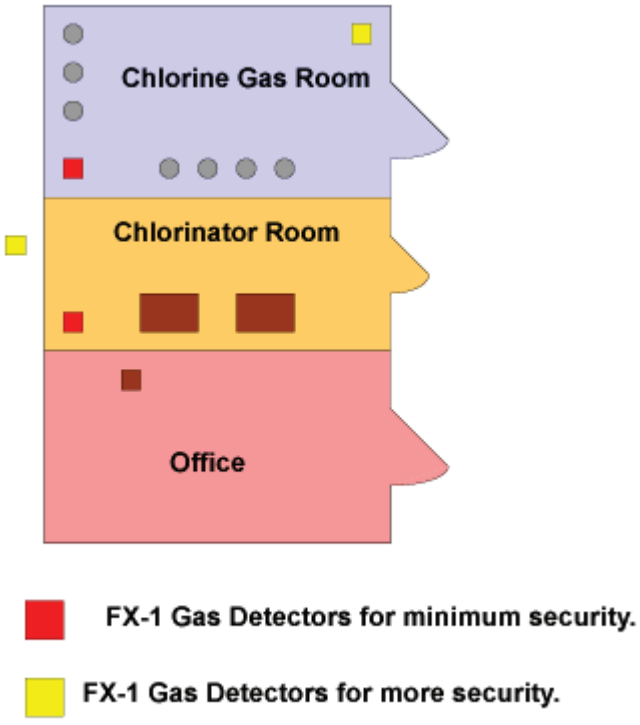

Figure 4

Underground vault installation

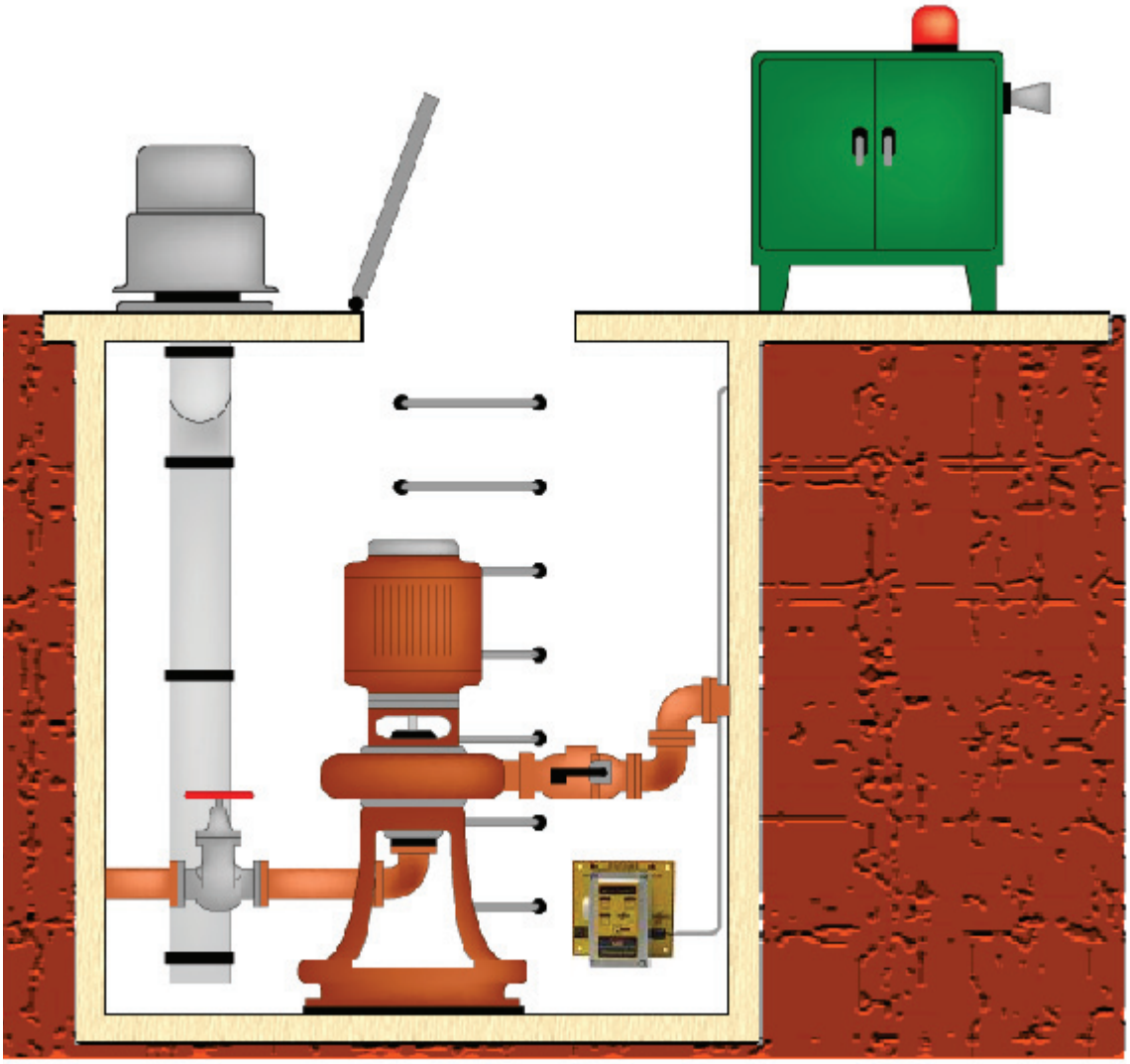

Figure 5

WARNING: Appropriate positioning of the sensor is imperative to the operation of the detector. Location will either result in rapid alarming of hazardous leaks or low oxygen levels or it can delay or fail to warn of a hazardous condition.

Automobile Emission Testing Stations

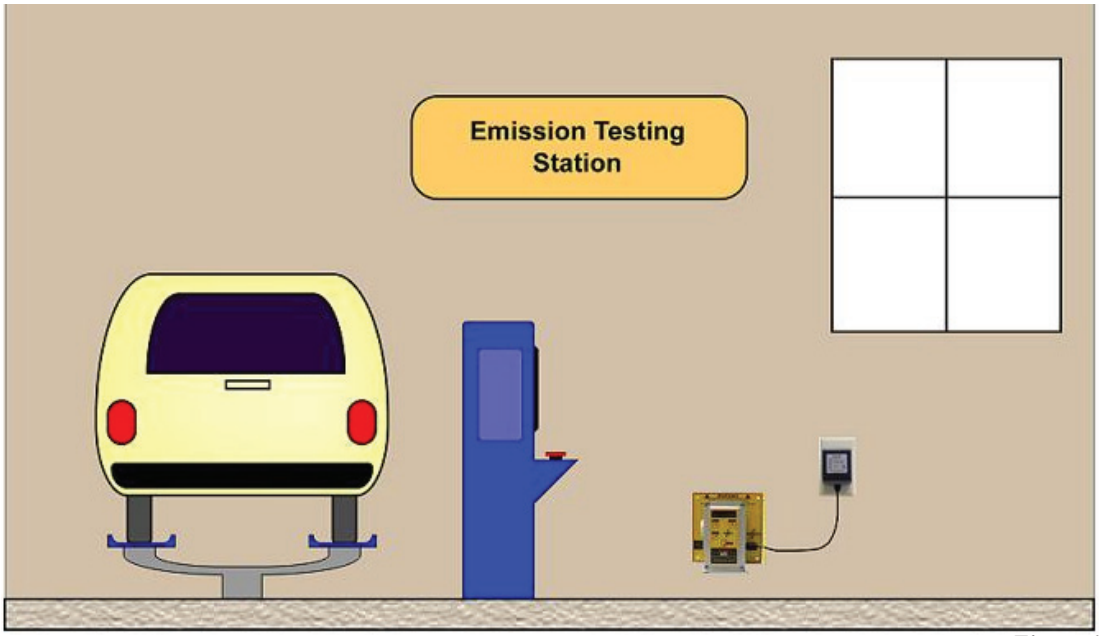

Figure 6

Large Container Room

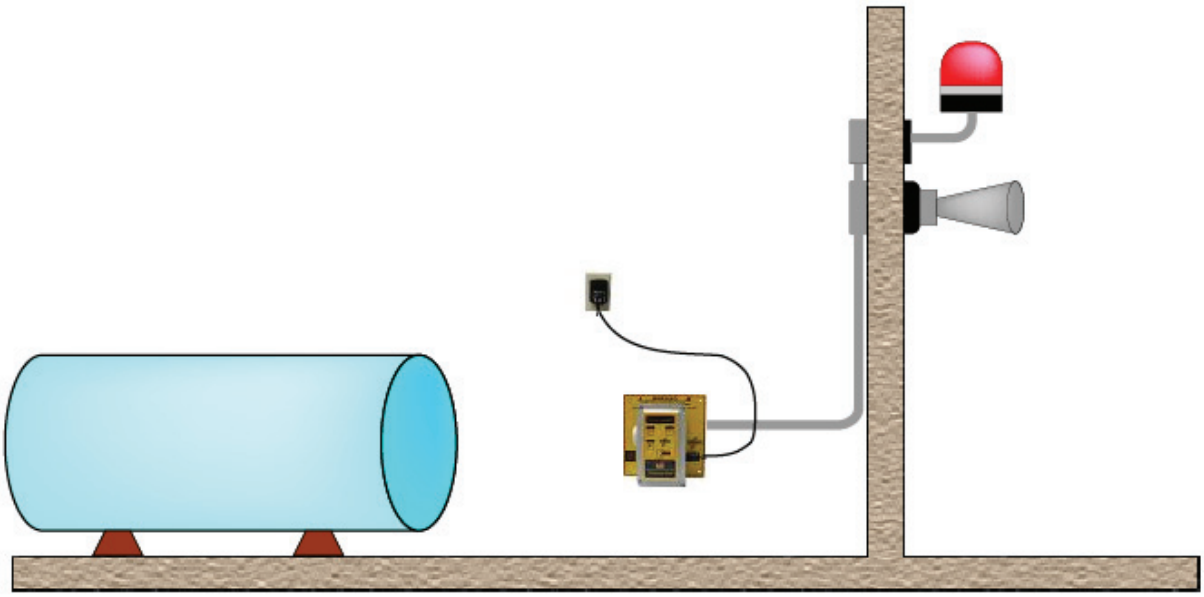

Figure 7

Installation (Electrical)

Wiring

The FX-1 Mini Toxic Gas Detector should be wired to its own AC power source which is uninterrupted. A battery backup is recommended where AC power may be interrupted.

The FX-1 will not work without AC power.

All electrical connections are made to a terminal strip located on the power supply card. The power supply card is located in the main cavity of the enclosure.

1. The four (4) corner screws are held in place by O-rings. They will keep the screws in place.

2. Be careful not to pull the cover out too far.

3. The cards are attached together by a ribbon cable. The ribbon cable may be disconnected from the power supply card. Be careful not to bend the pins on the connector.

4. A conduit hole is provided for output device connections.

5. Replace the front cover/control panel when wiring is complete.

If the ribbon cable was removed, be very careful when reconnecting, be sure pins are lined up properly and polarity is observed.

Danger Alarm Relays

One (1) latching relay is provided for the Danger Alarm Trip Point. This relay has a maximum rating of 10A @ 125VAC. The danger relay must be manually reset by pressing the local reset button.

Do Not Over Load Relays
10 amp Maximum, @ 125 VAC

Circuit Board Damage will occur if relays are over loaded.

The danger alarm relay is associated with the Danger Alarm LED. When the alarm is energized, the relay will hold until it is manually reset using the 'reset' functions.

Relay/Output Selections

1. **Danger** - Please refer to page 9 for danger alarm trip point. To unlatch this relay, it must be manually reset.

2. **Warning** - Please refer to page 9 for danger alarm trip point. When the trip level falls below the trip point, the output will automatically reset. No relay is provided. Output 12 VDC @ 600 ohms minimum.

3. **Power Failure** - Provides a 12 VDC output, indicating AC power is applied to the unit. No relay is provided. Output 12 VDC @ 600 ohms minimum.

4. **Cell Failure** - Provides a 12 VDC output, indicating a signal voltage problem with the sensor. No relay is provided. 12 VDC @ 600 ohms minimum.

Recommended Auxiliary Relays

Grainger

5ZH12	(SP - Normally Open)
5ZH14	(SPDT)
2ZH92	(DPDT - 8 pin octal base)

Radio Shack
275-218

Never exceed the rating of the relays or 12 VDC power outputs. Use only factory recommended auxiliary relays, or the FX-1 Mini Toxic Gas Detector may malfunction.

Refer to page 9 for alarm trip points and gas ranges.

AC Power Supply Installation

Plug the provided AC transformer into any standard 115 VAC, 50/60 Hz outlet.
Never plug the AC power transformer into an extension cord.

Figure 8

See battery backup instruction book for additional information and wiring.

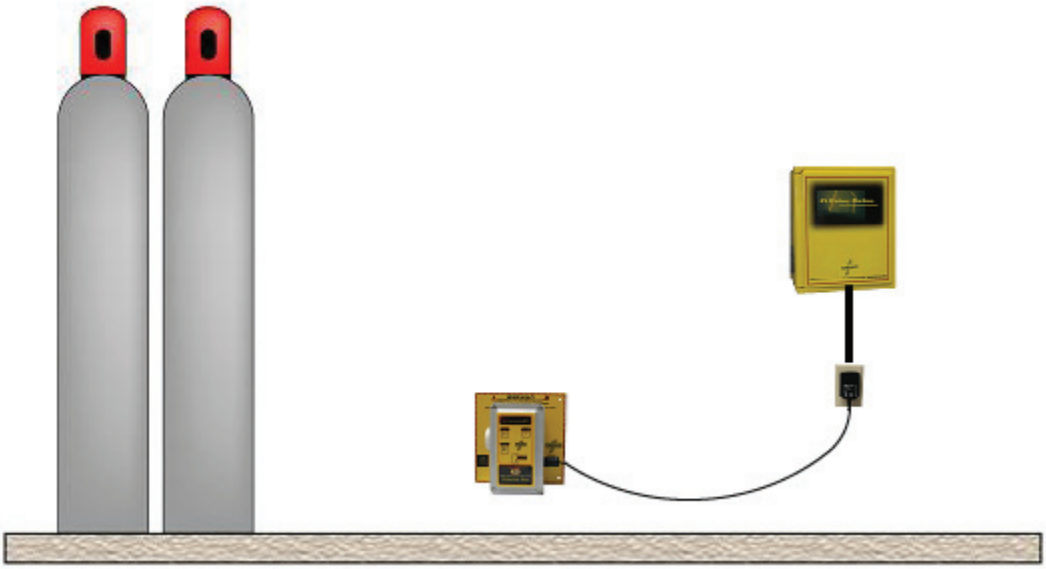

Figure 9

A battery backup system is recommended where AC power is likely to be interrupted. Always test the unit after a power outage or surge, however brief.

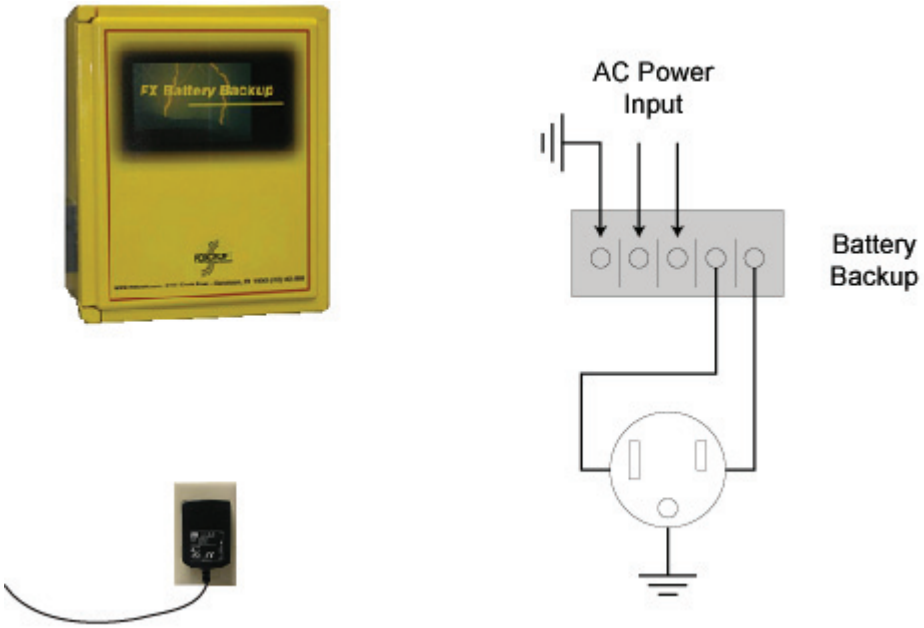

Figure 10

Relay and Voltage Outputs

Power Supply Card

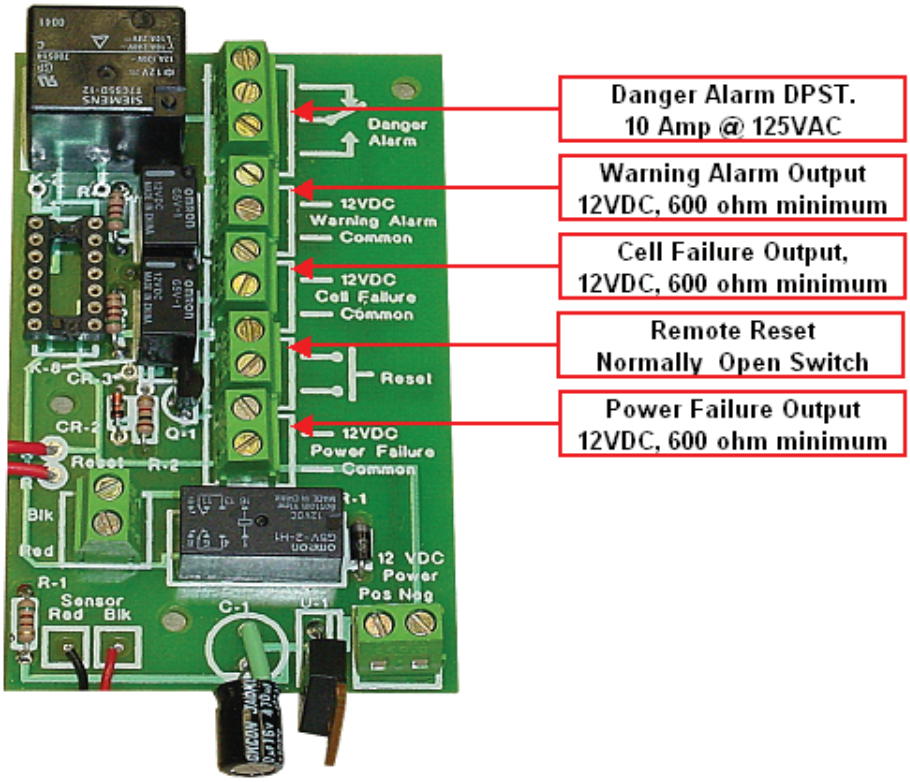

Figure 11

Typical Audible Alarm and Visual Lamp Wiring

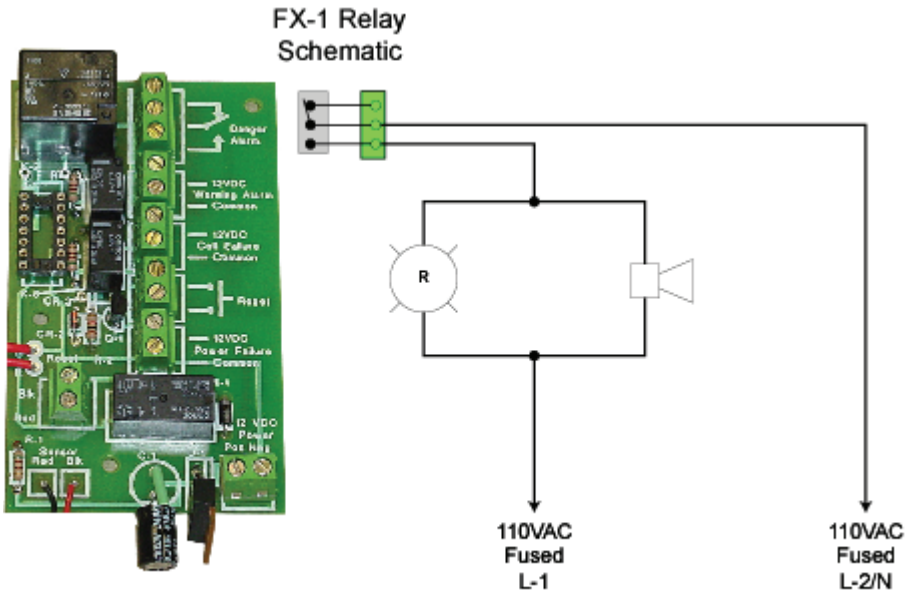

Figure 12

This drawing demonstrates how to reset the FX-1 from an off-site remote location.

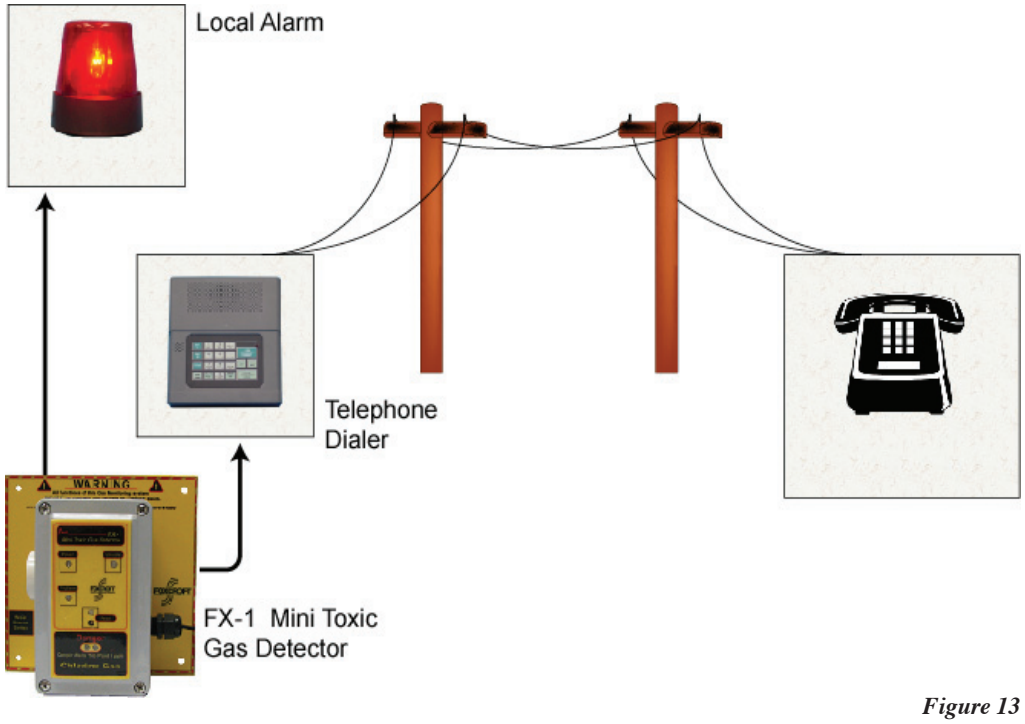

Figure 13

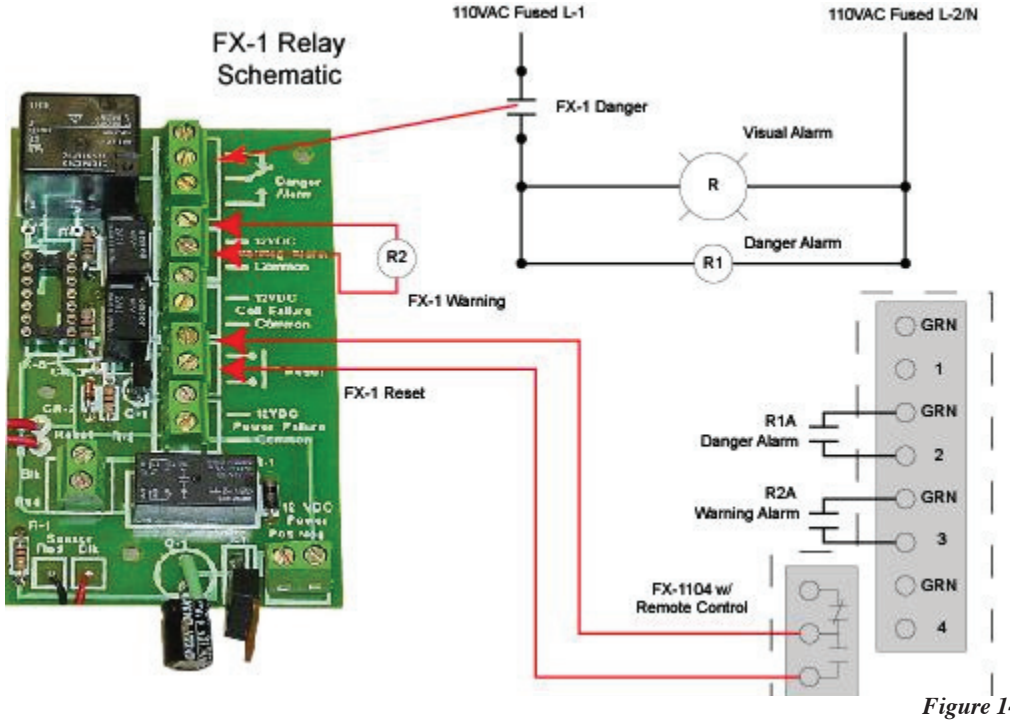

Figure 14

Typical Exhaust Fan Wiring

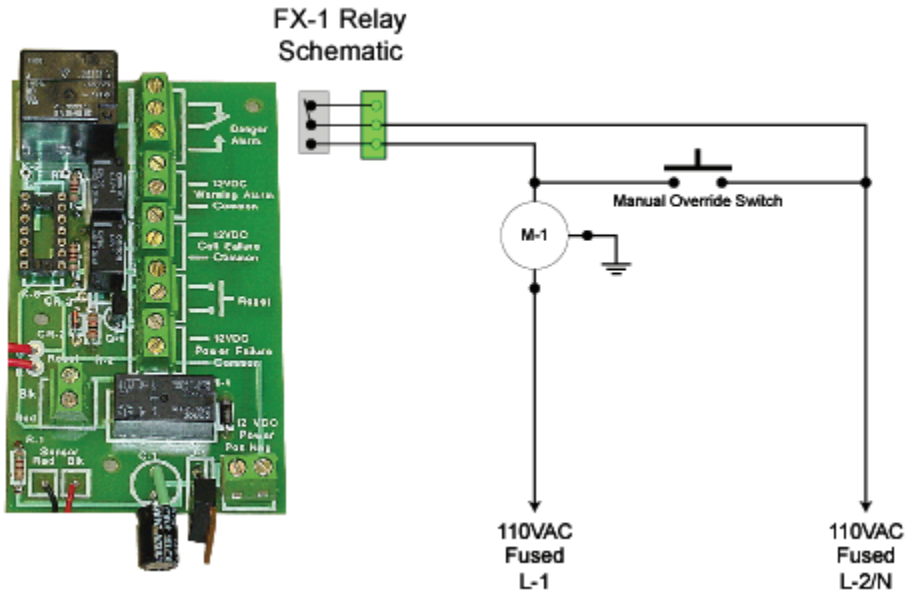

Figure 15

Adding an Auxiliary Relay to Output Voltage Terminal

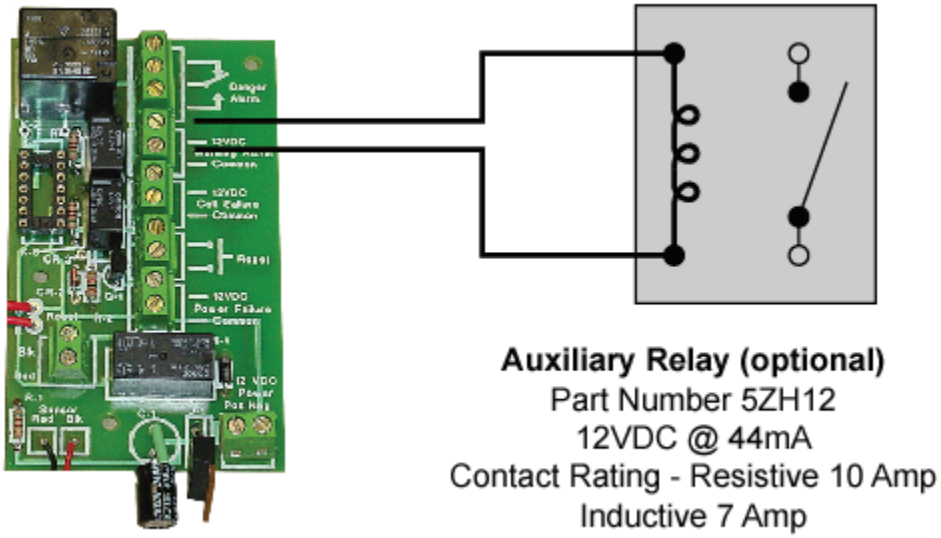

Figure 16

Hard Wired AC Power Supply

The FX-1 Gas Detector can be hard wired to a fixed mounted AC power supply. A battery backup system is recommended where AC power is likely to be interrupted.

The FX-1 will not work without AC power.

Use a maximum 14 gauge stranded wire only.

The fixed mounted AC power supply must be grounded by an earth ground.

Location and mounting of fixed mounted AC power supply

The fixed mounted AC power supply should be placed in such a way that it is easily accessible for service. Two conduit holes are provided, one at each end of the NEMA 4X enclosure. A terminal strip at each end of the fixed mounted AC power supply is provided, one for incoming 115 VAC power and the other for outgoing 15 VDC power to the FX-1. The AC power supply should be no more than 100 feet away.

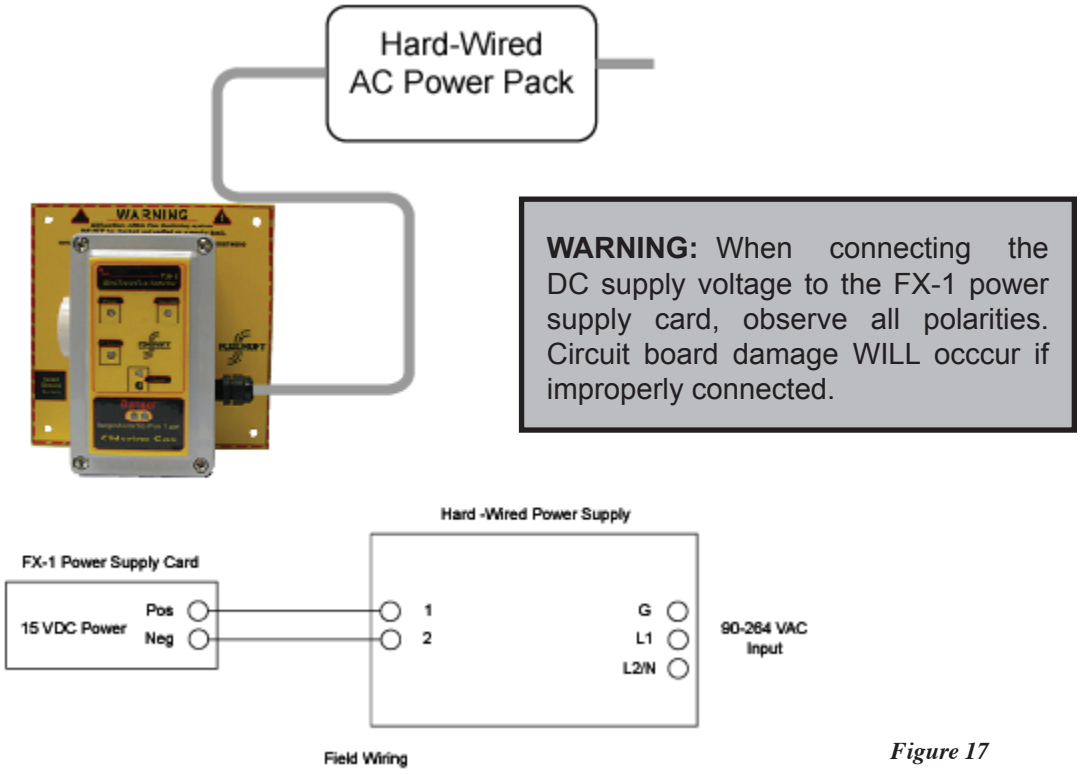

Figure 17

Installation (Internal Wiring)

Remote Reset Switch
Normally open switch

A remote reset switch terminal is provided. This permits the detector to be reset from a remote location. A normally opened switch must be used. The switch is not provided, but is available optionally.

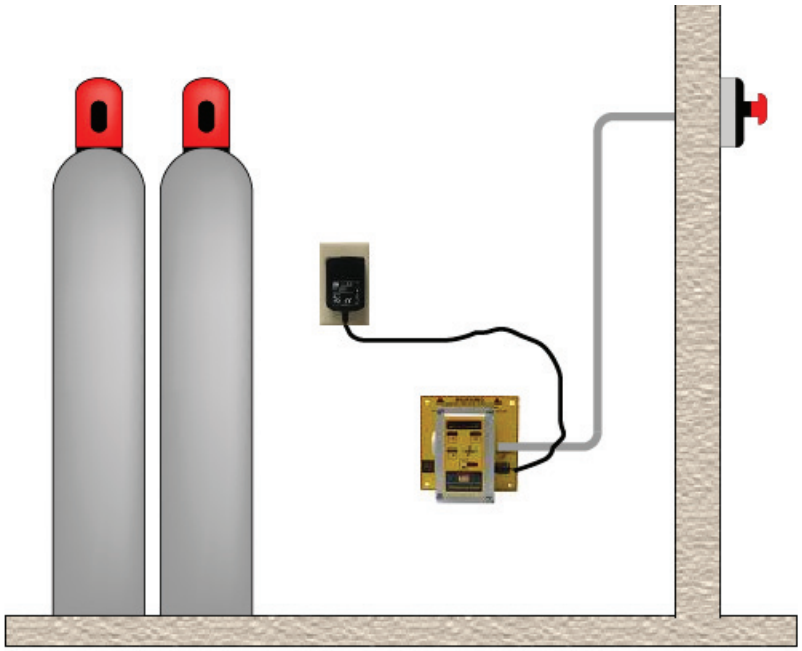

Figure 18

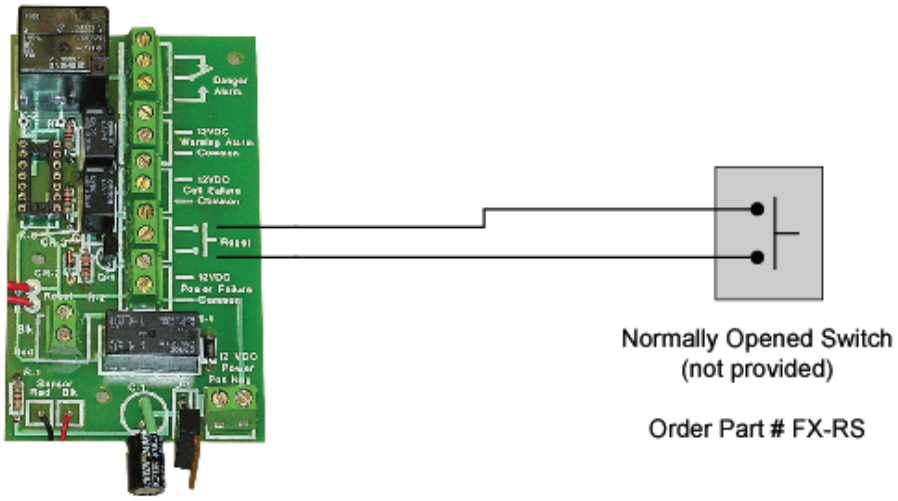

Figure 19

Audible Alarm Output Buzzer
Never connect an audible alarm to the piezo output terminal. This connection is only for the factory buzzer provided.

AC Power Pack Transformer
ONLY use the AC power pack transformer that is provided with the detector. This transformer provides the proper voltage/ current to the detector. Using an AC power pack transformer other than the one provided will cause the detector to malfunction.

Figure 20

The Danger Alarm relay associated with the “Danger Alarm” LED is normally a latching relay. When the alarm is energized, the relay will hold in until it is manually reset using the “Reset” button on the side of the monitor or by waving a flashlight at the “Reset” label on the control panel.

WARNING: Never plug the AC power transformer into an extension cord. Plug it directly into a wall AC outlet.

Control Panel

Layout

Figure 21

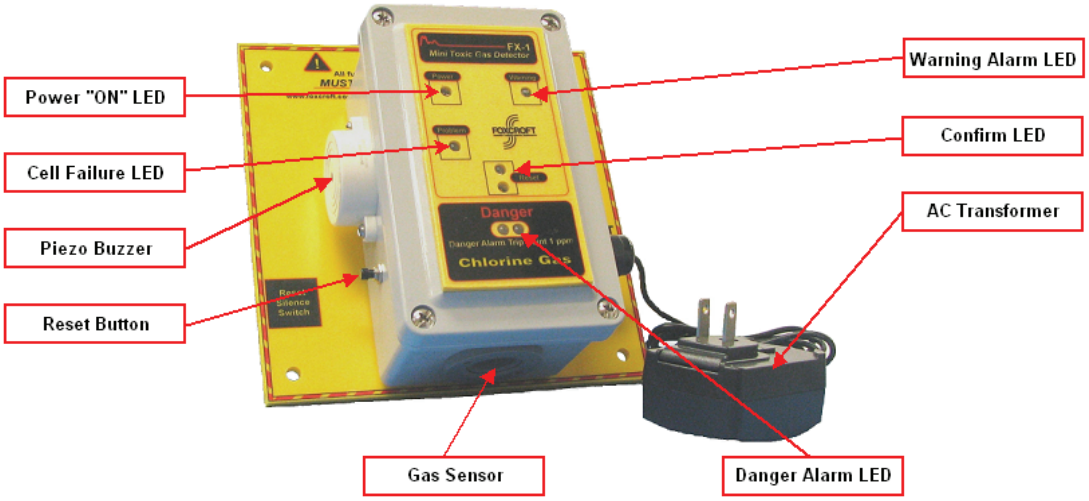

Figure 22

Descriptions

Power 'ON' LED: Green LED

Indicates AC power is turned on. **Never operate the detector if the green LED power indicator is not illuminated.**

Warning Alarm LED: Yellow LED

Please refer to page 9 for warning alarm trip point. **No relay output.** Output voltage, 12 VDC @ 600 ohms minimum. When the concentration of toxic gas falls below the trip point level, the output will automatically reset.

Cell Failure: Green blinking LED

The cell failure alarms if the sensor voltage drops below the factory calibrated voltage (1.9VDC). **Never operate the detector if the green blinking LED is illuminated.**

The cell failure indicating LED is not foolproof. Like all other electronic devices, the FX-1 contains many parts. Any of these parts could fail at anytime. Therefore, you must test your detector on a regular basis.

Be sure to have the detector repaired or replaced when it fails to test properly.

Danger Alarm: Two (2) red blinking LEDs

Refer to page 9 for danger trip point level. Alarm relay is latching and must be reset either by pressing the reset button or by using the Flashlight Reset Test feature. The danger alarm will not reset automatically.

The Danger Alarm Relay associated with the “Danger Alarm” LED is normally a latching relay. When the alarm is energized, the relay will hold in until it is manually reset by using the “RESET” functions.

Reset

Flashlight test, silence and reset system

The Flashlight Test, Silence, and Reset System can be used to silence the alarm buzzer, reset the danger relay, and electronically test the detector. A flashlight beam can be directed to the “Reset” portion of the control panel from as far away as 15 feet.

You must stand directly in front of the detector. The flashlight must have a sufficient amount of brightness (a two D-cell flashlight with fully charged to half-charged batteries or an equivalent rechargeable flashlight) so that the beam of light can clearly be seen on the detector itself. If the flashlight’s beam cannot be seen clearly, the room light must be lowered. Lower the light in the room until the beam of light can clearly be seen on the detector.

A red confirm LED will appear when the Flashlight Test, Silence, and Reset System is activated. **Never operate the detector if the confirm LED is illuminated** and you are not activating the system. The confirm LED should only be illuminated by a flashlight.

Do not install the detector in direct sunlight or light.

If the “confirm” LED is illuminated, but not illuminated by a flashlight, the detector must be moved to another wall location to eliminate the light source.

To avoid nuisance activation of the “confirm” light, a field adjustment can be made to correct the problem. Please contact the factory for instructions.

Reset Test Button

Mechanical Button

The reset test button is used to manually silence the alarm buzzer, reset the danger alarm relay and electronicaly test the detector.

Startup

Preparation

CAUTION: Remove the protective plug nose from the sensor cavity. This plug is clearly marked with a sticker. "Remove protective plug before operating". Store protective nose in a safe place. It will be required for verification and calibration of the sensor.

Operations

1. Plug the AC transformer into an uninterrupted AC power source.

2. The green 'power' LED should illuminate once power is turned on.

3. Allow the detector to warm up for a full 15 minutes.

4. The "Cell Failure" LED indicator will blink when you first apply AC power. It will go out in approximately 15 minutes.

5. The "Danger" alarm may go off during start-up. Simply press the manual reset button to reset the alarm.

6. A clicking sound may occur for a few minutes after powering the detector up. This is normal. If the clicking continues for more than 15 minutes, consult the factory.

7. Test the detector by either pressing the "Reset Test" button with your finger or by waving the beam from a flashlight at the reset mark on the detector control panel. The red "Confirm" LED will illuminate. The danger LED's will blink and the buzzer will chirp.

8. Never operate the detector if the danger alarm LED fails to operate or the buzzer fails to chirp.

9. System is now ready for operation.

Sensor Test System

Test, Silence and Reset System

The electronic “Test, Silence and Reset System” will only test the electronic functions of the detector, it will not test the sensitivity of the sensor. It is important that the sensor be tested periodically to ensure its gas sensitivity. A certified gas test method is recommended.

Important: *It is very important to maintain Weekly and Monthly Test Logs. Regular testing ensures the proper operation and life of the detector.*

Figure 23

Frequency of testing your Toxic Gas Detector

Bump Test
The Toxic Gas Sensor is designed to be used in safety critical applications. To ensure that the sensor and/or instrument in which it is used, are operating properly, it is a required that the function of the device is confirmed by exposure to target gas DAILY. Failure to carry out such tests may jeopardize the safety of people and property.

Calibration Check
The Toxic Gas Sensor is designed to be used in safety critical applications. To ensure that the sensor and/or instrument in which it is used, are operating properly, it is a required that the function of the device is confirmed by exposure to target gas MONTHLY. Failure to carry out such tests may jeopardize the safety of people and property.

Full Calibration
The Toxic Gas Sensor is designed to be used in safety critical applications. To ensure that the sensor and/or instrument in which it is used, are operating properly, it is a required that the function of the device is confirmed by exposure to target gas EVERY SIX MONTHS. Failure to carry out such tests may jeopardize the safety of people and property.

Definitions

a. Bump Test (Function Check) - A qualitative function check where a challenge gas is passed over the sensor(s) at a concentration and exposure time sufficient to activate all alarm indicators to present at least their lower alarm setting. The purpose of this check is to confirm that gas can get to the sensor(s) and that all the alarms present are functional. This is typically dependent on the response time of the sensor(s) or a minimum level of response achieved, such as 80% of gas concentration applied. Note this check is not intended to provide a measure of calibration accuracy.

b. Calibration Check - A quantitative test utilizing a known traceable concentration of test gas to demonstrate that the sensor(s) and alarms respond to the gas within manufacturer's acceptable limits. This is typically ±10-20% of the test gas concentration applied unless otherwise specified by the manufacturer, internal company policy, or a regulatory agency.

c. Full calibration – The adjustment of the sensor(s) response to match the desired value compared to a known traceable concentration of test gas. This should be done in accordance with the manufacturer's instructions.

Calibration

The FX-1 Mini Toxic Gas Detector has been factory calibrated prior to shipment. If you wish to check its calibration, a low toxic gas standard is required. The best method for this is to use a certified calibration mixture.

It is recommended that the FX-1 be verified by the use of a low level toxic gas standard at least once every six months.

Important: *It is very important to maintain Weekly and Monthly Test Logs. Regular testing ensures the proper operation and life of the detector.*

All functions of this gas detection system must be checked and verified on a regular basis.

Important: *All trimmers required in the calibration procedures are in the Gas Sensor Enclosure.*

WARNING: Do not attempt to calibrate any trimmers on the main amplifier board, which is mounted on the lid of the FX-1 detector.These trimmers are factory set.

Important: *To calibrate the gas sensor, a certified target calibration kit is required. The Calibration Gas Kit includes: one target gas cylinder, regulator, tubing and certification sheet. A separate calibration kit is required for each type of gas you monitor.*

Tools required:

- Jeweler's Screwdrivers (full calibration only)
- Calibration nose with O-Ring and caps (Provided with all gas sensors)
- Calibration Gas Kit (pictured below)
- Calibration Test Leads (full calibration only)
- Digital Voltmeter (full calibration only, optional)

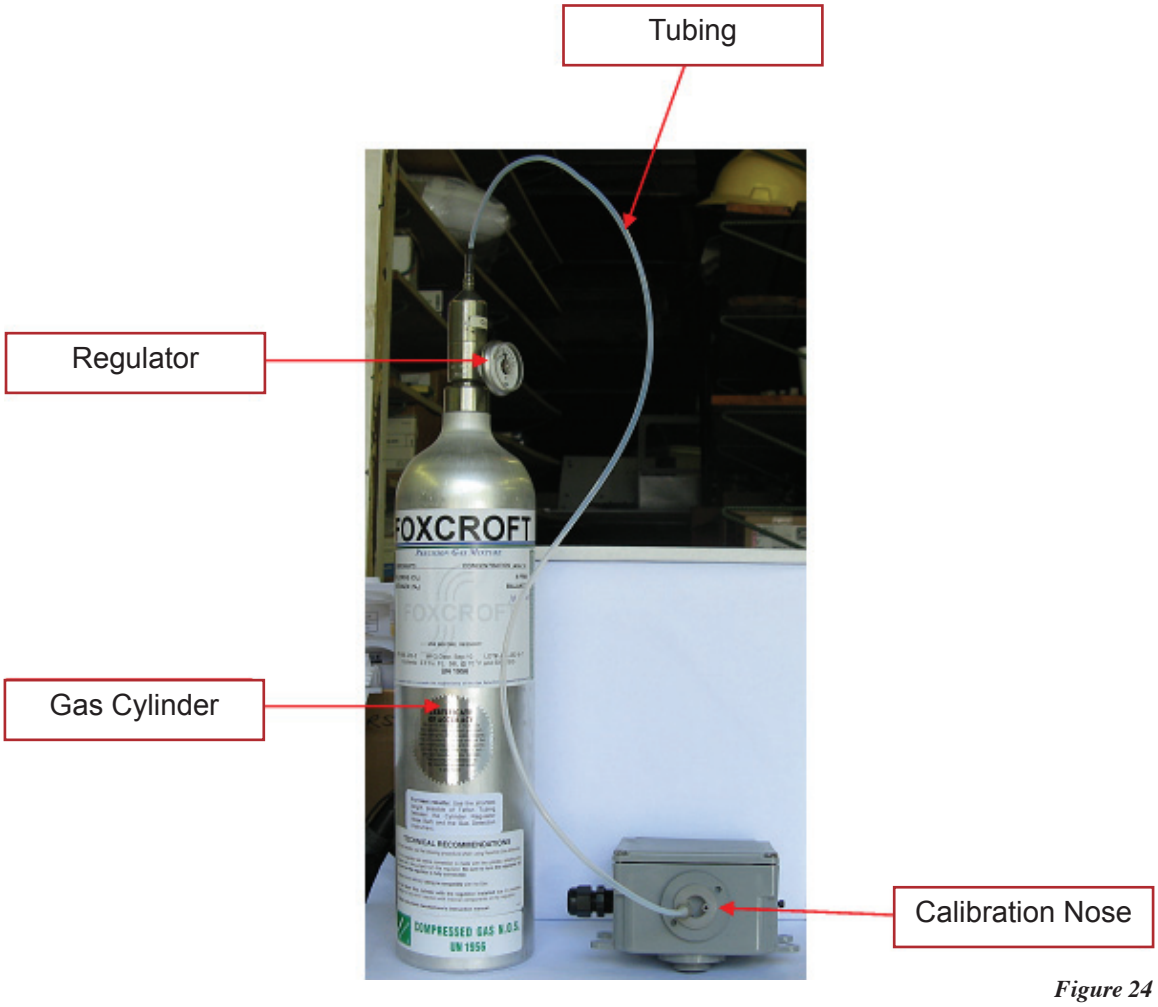

Figure 24

WARNING: Toxic gas sensors are supplied precalibrated, and the sensitivity of the sensor should not drift by more than 2% of full signal per month.

The full calibration procedure is not a requirement for normal operation of the FX-1 Mini Toxic Gas Detector. Full calibration is only necessary when it has been determined that there is a problem with the sensor, and only after the problem has been repaired, or the sensor has been replaced. However, full gas calibration is a good safety procedure, and is recommended as such, in this instruction manual, for the gas detector. If your on-site safety procedures require a gas detector test (which they should), we recommend a short gas leak test rather than a full calibration. There are two reasons for this:

1. The gas sensor is designed for ambient air conditions, and can eventually be “poisoned” by repeated overexposure to the test and target gases. This is usually noted as a gradual elevation in the zero reading over time and exposure to the test and target gases.

2. If the calibration is done improperly, or with old test gas (it has a shelf life listed on the cylinder), it could seriously impair the sensitivity and function of the gas detector.

WARNING: Target calibration gas contains toxic gas and should only be used by personnel who are fully trained in gas calibration procedures. All safety procedures and warnings on the gas cylinder should be read, understood, and observed.

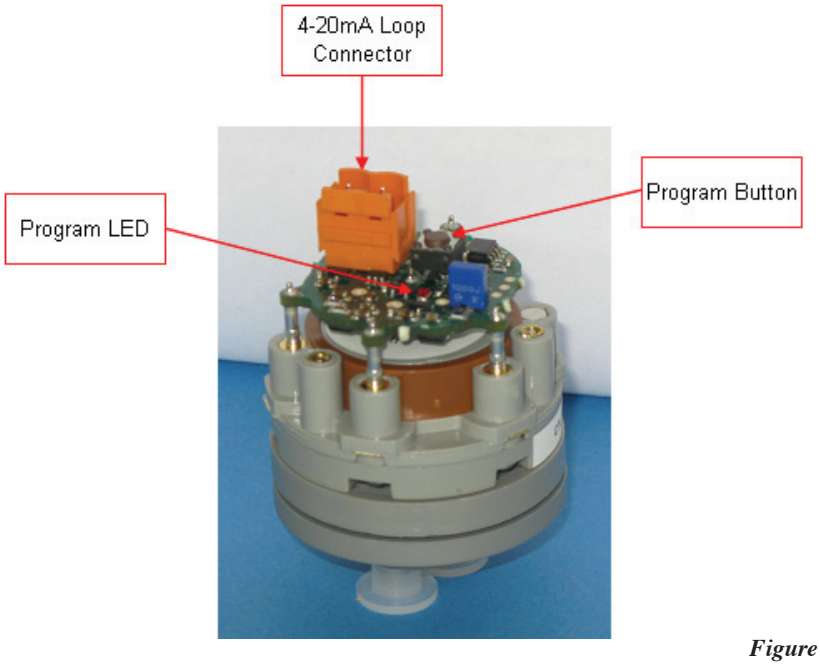

Figure 25

Short Gas Leak Test

Important: *This test is not a calibration; it is only to test the gas sensor response to a gas leak. Short gas leak tests can only be done with a known target concentration gas.*

It is **very important** *that this test sets off all the alarms and the target concentration gas level is displayed on the LED display.*

Full calibration is required if the test fails to set off alarms and the target concentration gas level is not displayed on the LED display.

1. NO alarms must be indicated.
2. Install the calibration nose in the sensor chamber; be sure the nose is sealed properly and is isolated from the atmosphere.
3. Connect the target calibration gas sample tubing to the nose.
4. Apply target calibration gas with a known concentration.
5. Wait for a stable reading to be obtained (five minutes is a suitable period).
6. All the alarms should be activated and the buzzer should be sounding.
7. If all alarms were activated, including the buzzer, the test is complete. Remove calibration nose and wait until the Warning LED goes out. Reset danger alarm.
8. If the target calibration gas did not activate the alarms, a full calibration is required.

Full Sensor Calibration

Each sensor is supplied precalibrated, and the sensitivity of the sensor should not drift by more then 2% of full signal per month. The oxygen sensor which has a single trimmer for span adjustment (see page 43) and has a separate calibration routine.

Important: *Full sensor calibration is only as accurate as the digital millivolt meter being used (or the FX-1 Mini Toxic Gas Detector LED display), and the freshness of the target gas being used. So it is important to use an accurate digital meter and a fresh target gas cylinder. The FX-1 remote alarm unit already has a factory precalibration and calibration should not be required. If you have reason to believe that the display or alarm level calibration of the FX-1 remote alarm unit is off, we recommend that you contact Foxcroft, to arrange an "RMA", to return the entire unit with the sensor, for a complete calibration. Foxcroft maintains a serial number calibration database for all of our gas detectors. Foxcroft does not recommend electronic calibration of the remote unit in the field.*

1. The gas sensor enclosure mounting system allows easy zeroing and aspiration using the calibration nose provided (see page 52). With the plug in place and sealing caps fitted, the sensor is completely isolated from the atmosphere. Removing the cap seals allows the calibration target gas to be connected to one of the inlets and exhausted through the other. A flow of 500 milliliter/minute is recommended.

2. Ensure the sensor is free from the target gas being measured either by purging the sensor with an inert gas, or blanking the sensor from the atmosphere with the calibration nose supplied.

3. Apply a target calibration gas of a known concentration to the sensor.

4. Wait for a stable reading to be obtained (five minutes is a suitable period of time).

Important: *It is very important to maintain weekly and monthly test logs (see pages 54-56). Regular testing ensures the proper operation and life of the detector.*

Oxygen Sensors

See photo below.

Calibration should be carried out in ambient air, and is done simply by adjusting the span trimmer until a reading of 173.8mV is displayed on the digital multimeter.

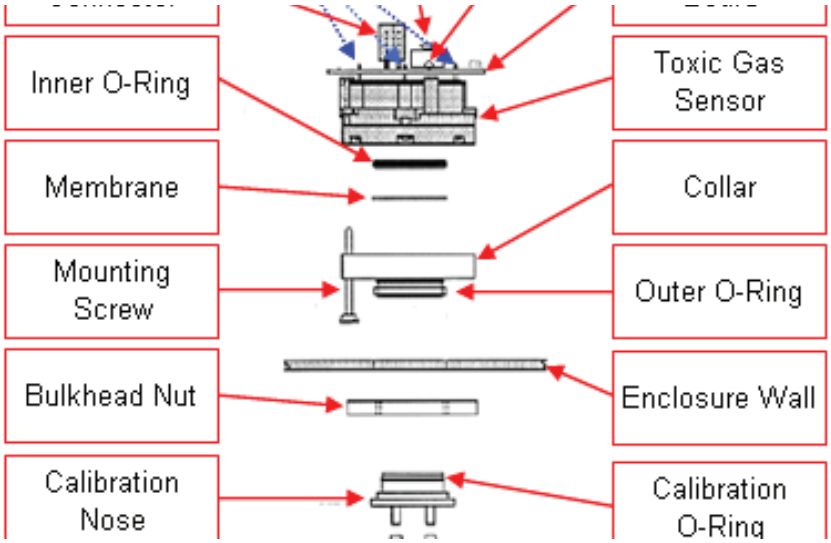

Figure 26

FX Easy Calibration

Performance Characteristics (Chlorine only)

Sensor Type Used	3CLH
Expected Operating Life	Two years in air
Resolution	0.1ppm
Temperature Range	-20°C to +50°C
Pressure Range	Atmospheric +/- 10%
Pressure Coefficient	No data
T_{90} Response Time	≤ 60 seconds
Relative Humidity Range	15-90% non-condensing
Maximum Zero Shift (20°C - 40°C)	-0.2ppm equivalent
Long Term Output Drift	< 2% signal loss/year
Repeatability	2% of signal
Output Linearity	Linear

N.B. All performance data is based on conditions at 20C, 50%RH and 1013mBAr.

Electrical Properties (Chlorine only)

Minimum Input Span	5uA
Maximum Input Span	+/-100uA
Linearity @ 25°C	0.01% Full Scale
Thermal Drift (Input)	0.02% per °C
Linearisation	Linear Response
Output	4-20mA, 2 wire loop powered
Maximum Output Range	3.8 to 21mA
Operating Voltage	10 to 30VDC
Thermal Drift (Output)	2uA per °C
Output Accuracy	+/- 5uA
Protection	Reverse Polarity Protected
Maximum Loop Load	$R_{LOAD} = (V_{supply}-10)*50$ e.g. 700Ω at 24V

Physical Characteristics (Chlorine only)

Weight	58g (including mounting accessory)
Position Sensitivity	None
Storage Life	Six months in CTL Container
Recommended Storage Temperature	0-20°C
Linearisation	Linear Response
Warranty Period	12 months from date of despatch

Calibration Notes

Recalibration is only possible if the output of the sensor at full scale is greater than 50% of the original factory calibration. Failure can occur if:

1. Attempts to recalibrate to a range less than 50% of the original factory calibrated range
2. The output of the sensor has fallen by more than 50% (replace sensor)
3. Incorrect span gas used (use correct span gas)
4. Insufficient time for output to settle after exposing sensor to span gas (apply span gas for 2-5 mins before setting 20mA level)

Transmitter Error Condition

Any time the error condition is set the output will be forced to 21mA and the LED will be held on. Carry out the Reset function to reset the error.

Reset to Factory Calibration

1. Remove loop power from transmitter.
2. Hold down push button and connect loop power to transmitter.
3. LED will blink as soon as power is applied (approx. 2Hz).
4. Transmitter output set to 21mA.
5. Releasing button will start an 8 second timout period.
6. After 8 seconds the factory calibration will overwrite user calibration.
7. LED clears and transmitter goes back into normal mode.

User Calibration Method

(Span gas = 20mA signal)

1. Connect loop power to the transmitter.
2. Apply required zero gas/air to transmitter for 2 minutes.
3. Hold down button until LED flashes at approx. 1Hz. (4mA level now set)
4. Apply required span gas to transmitter for 2 to 5 minutes.
5. Press and release button (20mA level now set)
6. There will be an 8-second timeout period and flashing LED approx. 8Hz.
7. Calibration is complete, LED clears and returns to normal mode.

Non Standard Span Gas Calibration (Span gas ±5% full range)

1. Calculate the mA signal expected for span gas.

Example:

1. Required 4-20mA range is 0-500ppm	5. Expected signal at 480ppm = (15.36mA + 4mA) = 19.36mA
2. Available span gas is 480ppm	6. Each time button is pressed signal increases by 40uA. When the output reaches 20.8mA the next button press will take the output to 19.2mA. Further button presses will again increase the output by 40uA.
3. Dynamic range is 16mA	
4. Therefore 1mA = 31.25ppm	7. The output range available is 19.2mA to 20.8mA.

2. Carry out steps 1-4 of User Calibration Method
3. Press and release button to set 20mA level.
4. Continued momentary pressing of the button within an eight second period will trim the output by 40uA. When the required output is reached, allow the transmitter to timeout.
5. Calibration is complete, LED clears and returns to normal mode.

Non Standard Span Gas Calibration (Span gas not within ±5% of full range; current source required)

1. Measure the current of the sensor with a known gas concentration. This can then be used to calculate the µA/ppm for the specific sensor.
2. Now calculate the expected current when the sensor is exposed to the full scale of target gas.

Example:

1. Required 4-20mA range is 0-500ppm	4. Therefore sensitivity = 0.11 uA/ppm
2. Available span gas is 300ppm	5. Expected sensor output at 500ppm = 55uA
3. Current from sensor when exposed to span gas = 33uA	

3. Connect current loop power to the transmitter.
4. Connect a current source to the transmitter. For oxidizing sensors (CO, H_2S, SO_2, NO, ...) connect the negative to ‘SEN’ and positive to ‘CNT’. For reducing sensors (Cl_2 or NO_2) connect the positive to ‘SEN’ and negative to ‘CNT’. ‘CNT’ and ‘REF’ terminals on the transmitter board should be connected.
5. Set the current source to zero.
6. Hold down button until LED flashes at approx. 1Hz.

   (4mA level now set in RAM)
7. Set the current source to the value calculated for the full scale of target gas.
8. Press and release button

   (20mA level now set into RAM)
9. There will be an 8-second timeout period and flashing LED approx. 8Hz.
10. Calibration is complete, LED clears and returns to normal mode.

Chlorine - Output vs Temperature

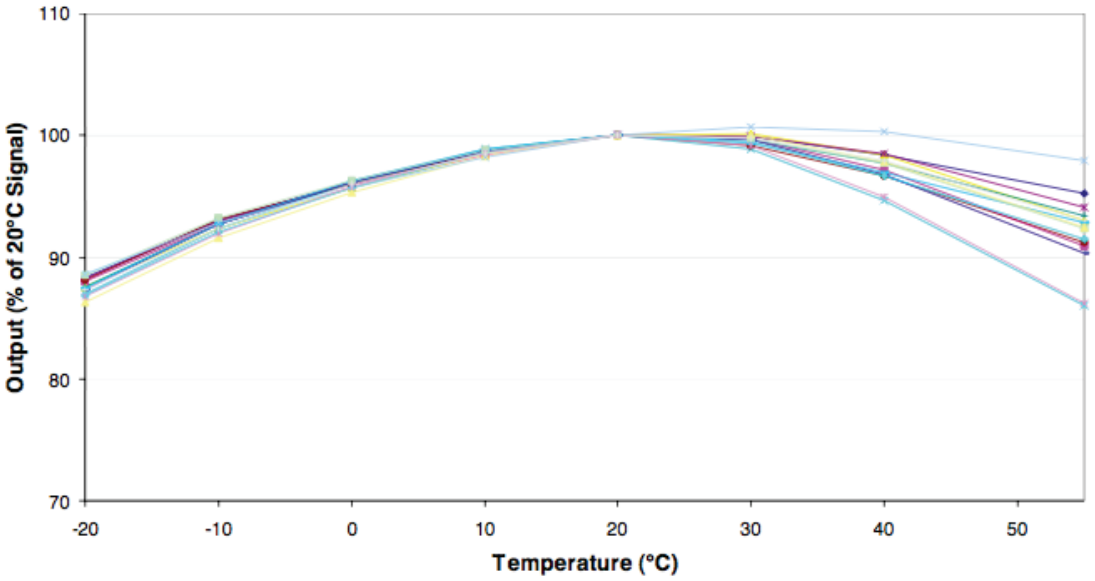

Figure 27

Gas Sensor Replacement

Gas sensor replacement in the FX-1 MiniToxic Gas Detector is easily done with minimal tools.

Tools required:
- Small Jeweler's Screwdriver
- General Small Screwdriver
- Needlenose Pliers

1. Disconnect the AC power from the detector.

2. Remove the FX-1 from the wall.

3. Remove the front cover of the FX-1.

4. Carefully pull off the orange wire connector.

5. Flip the enclosure so that you can see the sensor opening. Place the tips of a pair of needlenose pliers in the two holes of the sensor bulkhead nut. Turn the ring counterclockwise to loosen the ring, and remove the entire sensor from the enclosure.

6. The transmitter PC board is mounted to the sensor with disconnect pins. Hold the PC board by the edges and carefully pull the board off of the sensor.

9. Remove the shorting wire from the gold pins on the new sensor, and carefully line up the 3 gold pins on the new sensor with the 3 sockets on the bottom of the transmitter board. Press evenly on the board until it fully seats on the gold pins.

10. Installation of the completed sensor/transmitter assembly is the reverse of its removal.

11. After completing the sensor replacement procedure, power-up the gas detector and allow it to stabilize for 20 minutes (some sensor gas types take up to 24 hours to stabilize). If the cell failure/problem light is blinking, the sensor requires a full sensor calibration. Go to page 42.

12. If the cell failure/problem light is not blinking, then refer to page 41 and perform the short gas leak test.

WARNING: Even the ability of the gas sensor to sense toxic gas or low oxygen levels must be verified on a regular basis. It is recommended that the gas sensor be tested by means of a certified gas standard at least every six months.

WARNING: All functions of this FX-1 Mini Toxic Gas Detector must be checked and verified on a regular basis.

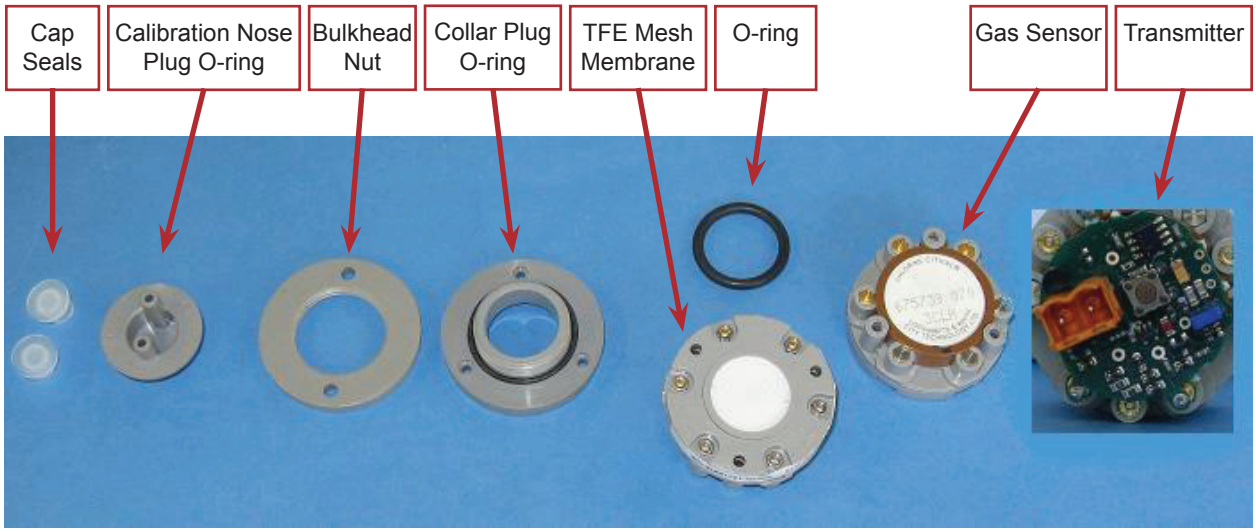

Figure 28

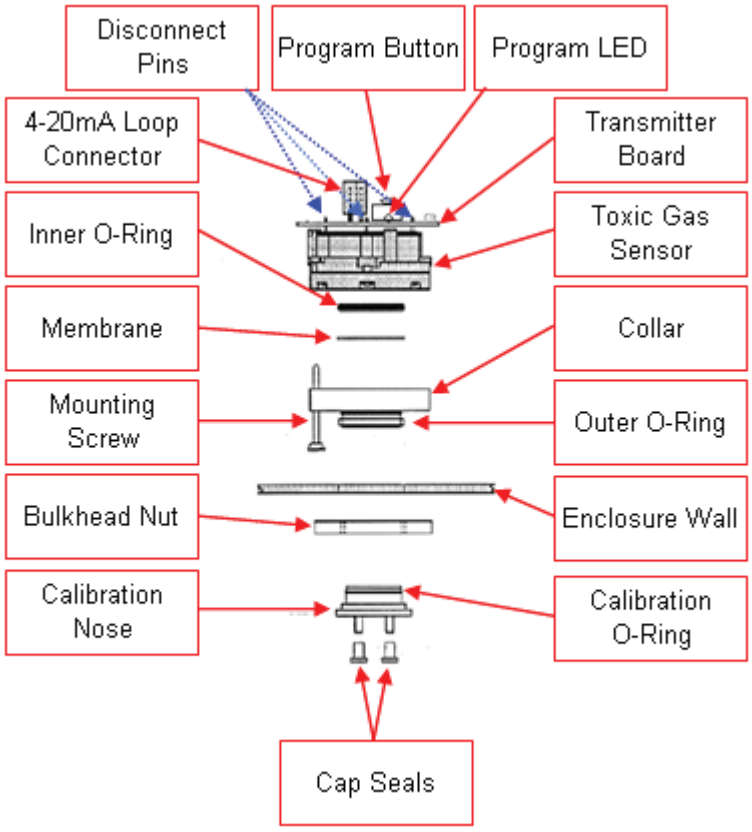

Figure 29

Parts Listing

Electronics

Item Number	Description	Part Number
1	Gas Sensor Only	Specify gas type
2	Gas Sensor Transmitter Only	Specify gas type
3	Gas Sensor with Transmitter	Specify gas type
4	Amplifier Card	FX-112433601
5	Power Supply Card	FX-111433601
6	Ribbon Cable	FX-9431323-06
7	Power Supply Wall (110 VAC)	FX-9289770
8	Power Supply Wall (220 VAC)	FX-9289771
9	Pulsing Piezo Buzzer	FX-273006

Calibration Gas Kits

Remote Alarm

Telephone Dialing Systems

Figures 30-32

Monthly Sensor Test Log

Date	Initials	Date	Initials
Month of		Month of	
Month of		Month of	
Month of		Month of	
Month of		Month of	
Month of		Month of	
Month of		Month of	
Month of		Month of	
Month of		Month of	

Weekly Electronic Test Log

Date	Initials	Date	Initials
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Service

System Repair

Customer Service Department

If you need spare parts, assistance in troubleshooting, or repair service, please contact Foxcroft Customer Service at:

Foxcroft Equipment and Service, Co. Inc.
2101 Creek Road, P.O. Box 39
Glenmoore, PA 19343

Tel: (800) 874-0590
(610) 942-2888
Fax: (610) 942-2769
Email: service@foxcroft.com
www.foxcroft.com

Customer Repair / Returns Policy

All systems returned for repair or replacement must be freight prepaid and include the following information:

1. A clearly written description of the malfunction.

2. Name of person to contact and the phone number where they can be reached.

3. Proper return address for shipping system back. Include preferred shipping method.

4. A purchase order if the system is out of warranty to cover costs of repair.

5. A Return Material Authorization Number (RMA) is required before shipping any products for service. Call telephone number above to receive a RMA number.

NOTE: *Returns will only be held at Foxcroft for 90 days. If a decision is not made regarding the repair, the product will be returned.*

Product Warranty

Foxcroft Equipment & Service warrants all products obtained hereunder to be free from defects in material and workmanship for a period of one year from the date of shipment. In the event of a product failure or defect requiring warranty repair, the customer must obtain an RMA number by calling 1-800-874-0590, before returning the product, at the customer's expense to Foxcroft for repair. Warrantor (Foxcroft Equipment and Service) will repair the unit, without charges for parts, labor and return freight.

Foxcroft Equipment & Service is not responsible for damage to its products through improper installation, maintenance, act of God, use or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or for any unauthorized repair.

Buyer agrees to hold Foxcroft Equipment & Service harmless from all claims for damages arising out of injury or death to any person or damage to any facility, or any other property, or loss of use of any such property, whether such person or property is on or off the installation or activity site for which the equipment or material furnished hereunder is destined and whether such damage, loss destruction or loss of use, injury or death results directly or indirectly from a nuclear incident or for any other cause.

Statements and instructions set forth herein are based upon the best information and practices known to Foxcroft Equipment & Service but it should be assumed that every acceptable safety procedure is contained herein. Of necessity this company cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of hazards and it assumes no liability for accidents that may occur.

FOXCROFT

EQUIPMENT & SERVICE COMPANY, INCORPORATED

Serial Number Label of FX-1 Single Channel Toxic Gas Detector:

Foxcroft Equipment and Service, Co. Inc.
2101 Creek Road, P.O. Box 39
Glenmoore, PA 19343

Tel: **(800) 874-0590**
(610) 942-2888
Fax: **(610) 942-2769**
Email: **service@foxcroft.com**
www.foxcroft.com