

*95 Series*  
*Operator's Guide*  
Personal Portable Gas Monitor  
*HS-95, CO-95, OX-95*

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# 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 guide to alert you to hazardous conditions to person or instrument and to notify you of additional information. This operator's guide uses the following notices:



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### **WARNING**

*Notifies you of potential danger of personal injury.*

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### **CAUTION**

*Notifies you of potential damage to equipment.*

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### **NOTE**

*Notifies you of additional or critical information.*

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# SERVICE POLICY

**Thermo GasTech** maintains an instrument service facility at the factory as well as authorized service facilities around the world. Should your instrument require service, you may contact us toll free at **1-877-GASTECH (427-8324) for US only or 1-510-745-8700**, or visit our website [www.thermogastech.com](http://www.thermogastech.com) for authorized service locations.

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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.

Repairs are warranted for 90 days from the date of shipment. Sensors have individual warranties.



## NOTE

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# **INTRODUCTION**      CHAPTER **1**

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## **OVERVIEW**

This Operator's Guide provides information on the proper set-up, use, calibration, and maintenance of the 95 Series of single-gas monitoring instruments.

Chapter 2 contains a physical description of your monitor. Instructions to use and interpret monitor readings are in Chapter 3, Start Up and Operation. Chapter 4, Calibration and Maintenance, also contains troubleshooting information and a list of replacement part numbers.

## **DESCRIPTION**

The 95 Series is a line of three personal, portable gas monitors that each detect one gas. Each pocket-size instrument detects either oxygen (O<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), or carbon monoxide (CO), and actuates an alarm to alert you should the measured gas surpass the alarm setting. Table 1-1 lists specifications for each model.

# SPECIFICATIONS

**Table 1-1 95 Series Gas Monitor Specifications**

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Model Designation (Gases Detected)	OX-95 (0-30.0% O <sub>2</sub> in 0.1% increments) HS-95 (0-100 ppm H <sub>2</sub> S in 1 ppm increments) CO-95 (0-500 ppm CO in 1 ppm increments)
Detection Method	Diffusion, electrochemical
Response Time	90% in 30 seconds
Accuracy	±5% of reading (±0.2% O <sub>2</sub> for OX-95**)
Repeatability	±3% of reading (±0.12% O <sub>2</sub> for OX-95**)
Gas Alarm Setpoints	OX-95: 19.5% vol, decreasing, (programmable) 23.5% vol, increasing, (programmable) HS-95: 10 ppm, and 15 ppm, (programmable) CO-95: 25 ppm, 200 ppm, (programmable)
Gas Alarm Delay	3 sec. (programmable to 0, 1, 2, or 3 sec.)
Other Alarm Modes	Weak or failed sensor, low or dead battery
Operator Controls	- Power switch - ZERO/- button - SPAN/+ button
Dimensions	4.5 in. H x 2.5 in. W x 1.0 in. D
Weight	6.5 ounces
Battery Life (approximate)	Continuous, non-alarm operation per one 9V alkaline battery: OX-95: 3,200 hours CO-95 and HS-95: 2,500 hours
Standard* and Optional Accessor- ies	Operator's guide*, hand-aspirated sample-draw adapter, earphone, test kits, vibrating alarm, *strap.
Operating Tempera- ture and Humidity	-4° F (-20° C) to 113° F (45° C) 0-95% relative humidity (RH), non-condensing
Regulatory Approvals	UL classified; CSA classified Class I, Division 1, Groups A, B, C, and D DEMKO EEx ia IIB T2

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\*\* In range of ±2% O<sub>2</sub> from calibration point.  
Specifications are subject to change without notice.

# PHYSICAL DESCRIPTION

# CHAPTER 2

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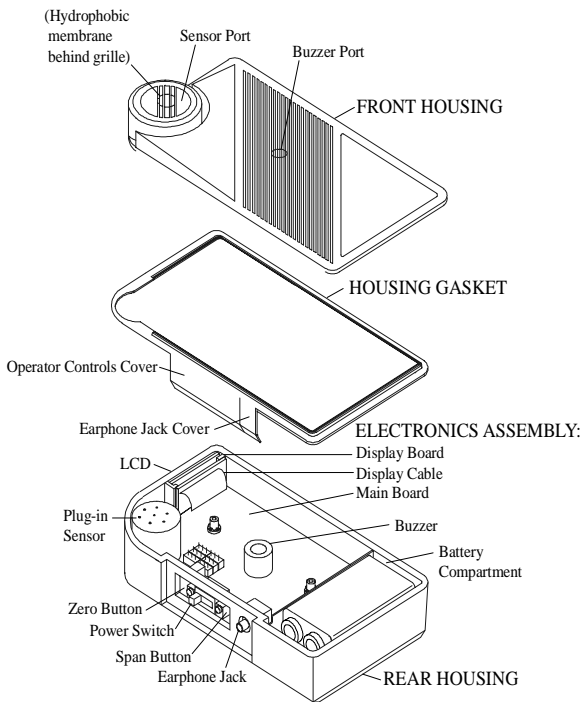
## OVERVIEW

This chapter describes the physical components of your 95 Series gas monitor. For purposes of identification throughout this guide, the monitor is described as having front and rear housing halves, as shown in Figure 2-1.

## PHYSICAL DESCRIPTION

To open your monitor, loosen the two captive screws on the rear cover, then separate the two halves.

The components identified in Figure 2-1 are described in this chapter. The field replaceable units (FRUs) include the housing gasket, sensor, and battery.



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**Figure 2-1**    *Components of the 95 Series Gas Monitor*

## Electronics Assembly

The electronics assembly consists of the main board, operator controls (power switch, buttons, and earphone jack), display board with liquid crystal display (LCD), and the display cable. If any of these components fail, contact the factory for repair.

### Main Board

All buttons and operator controls are part of the main board. Control circuitry for other components is also located on the main board.

### ZERO/- and SPAN/+ Buttons

The ZERO/- button alone is used to zero the sensor and decrease parameter settings. The SPAN/+ button alone is used to set sensor span and increase parameter settings.

The ZERO/- and SPAN/+ buttons are pressed together to select setting modes.

### Power Switch

Set to the left position (toward the sensor) to turn the instrument on. Set to the right position (away from the sensor) to turn the instrument off.

### Earphone/Vibrating Alarm Jack

The earphone or vibrating alarm accessory is connected to this jack.

## Display Board/Display Cable

The display board is attached to the main board by a nondetachable ribbon cable.

## Liquid Crystal Display (LCD)

The LCD panel is visible through the window in the top of the housing. A red LED is visible through the display panel as a visual indication of alarm conditions. Display readings are described in Chapter 3.

## Buzzer

The buzzer is mounted on the main board.

## Housing/Housing Gasket

The instrument housing is a two-piece plastic case held together by two captive screws. A mylar gasket covers the operator controls to keep water and dust away from the internal components. The case is sealed using a detachable rubber gasket and two flaps to protect the operator controls and earphone/vibrating alarm jack.

The letters Z, P, and S on the inside of the flap identify the position of the ZERO/- button, the power switch, and the SPAN/+ button, respectively. The arrow next to the P indicates the direction to move the power switch to turn the instrument on and off.

## Sensor

Each model has a dedicated, detachable sensor that plugs into the main board. A hydrophobic (waterproof) membrane on the inside of the case sensor opening is held down by a gasket. The membrane permits diffusion of the surrounding atmosphere to the sensor.

When sufficiently exposed to the target gas, the electrical output of the sensor causes a reading on the display. Readings are in parts per million (PPM) for H<sub>2</sub>S and CO, or percent (%) by volume for O<sub>2</sub>.

## Battery Compartment

The battery compartment houses a standard 9V alkaline battery.





# START UP & OPERATION

# CHAPTER 3

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## OVERVIEW

This chapter describes the normal operation of your 95 Series gas monitor, and how to respond to abnormal operation. Normal operation is any time that start up has been completed, and the monitor is not indicating an alarm, fault, or low battery condition. This chapter also contains interference charts listing other gases that can affect the sensor in the HS-95 or CO-95 monitor, and procedures to use the optional accessories available for your monitor.

## START UP

Perform the following steps to start up your monitor. Refer to Figure 2-1 as needed.



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### CAUTION

*Perform start up only in a fresh air environment.*

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1. Flip open the housing gasket flap that covers the operator controls, and move the power switch toward the sensor to turn the monitor on. The unit should sound a single audible tone, and display the installed version of software. A number will then be displayed. Allow a few seconds for the reading to stabilize, then check the display. If your HS-95 or CO-95 shows a reading of 0 PPM, or your OX-95 a reading of 20.9%, proceed to Step 4. If the reading is anything other than this, perform Step 2 or 3, as appropriate.
2. Zero the HS-95 or CO-95 by pressing the ZERO/- button until the PASS message appears (about 5 seconds).
3. Span the OX-95 by pressing the SPAN/+button until the PASS message appears (about 5 seconds).
4. Close the operator controls flap. Your monitor is ready for use.

## INSTRUMENT OPERATION

In normal operation, your instrument monitors the environment and displays the current gas concentration. The instrument displays alarms to indicate gas concentrations outside preset limits. Low and dead battery as well as weak and failed sensor conditions are also indicated.



### NOTE

*Momentary small negative gas readings are not abnormal with the HS-95 and the CO-95. The instrument automatically corrects itself.*

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## Alarm Indications

When a gas concentration reaches the alarm setpoint, the alarm is indicated by the buzzer pulsing, the red alarm light flashing, and the gas reading blinking, all in unison. For the HS-95 and the CO-95, the gas alarm is a pulsing audible tone with a blinking reading for the low level alarm, and a steady audible tone with pulsing display for the high level alarm. For the OX-95, you can tell whether the alarm is a high or low alarm by the gas reading. A high O<sub>2</sub> alarm shows a reading above the high setpoint, and is signified by a pulsing audible tone. A low O<sub>2</sub> alarm shows a reading below the low setpoint, and is signified by a steady audible tone.



### NOTE

*Preset alarm setpoints conform to current OSHA standards, but can be adjusted. See Chapter 4 for alarm adjust procedures.*

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### Recommended Action:

When an alarm occurs, follow the established procedure for an alarm condition. If no procedure is in place, please establish one that is appropriate for your application.

The alarm circuit is self-resetting. When the instrument is moved from the suspect environment, the alarm ceases, and the instrument returns to normal operation. However, this does not mean that the danger has passed.

## Low or Dead Battery Indications

**Low Battery:** When your monitor senses that the battery has approximately 8 hours remaining, the word LOBAT blinks on the LCD. In addition, the buzzer emits a short chirp and the red alarm light flashes every 30 seconds.

**Dead Battery:** When the battery is past the point of useful operation, LOBAT appears steadily on the LCD. In addition, the buzzer sounds continuously and the red alarm light is on steady. When these indications occur, the instrument is not operable.

### Recommended Action:

Replace a dead battery immediately or a low battery as soon as possible, following the procedure in Chapter 4.

## Weak or Failed Sensor Indications

**Weak sensor:** When a weak sensor is detected during calibration, the word FAULT blinks on the LCD. The instrument is still functioning normally, but you should replace the sensor as soon as possible.

**Failed sensor:** When a defective sensor or sensor circuit is detected, the word FAULT is displayed on the LCD. In addition, the buzzer sounds continuously and the red alarm light is on steady. A fault condition is caused by a missing or bad sensor, a bad connection, or a main board sensor circuit fault.

### Recommended Action:

Remove the instrument from the monitoring environment. Refer to the troubleshooting guide in Chapter 4 to determine the cause of the alarm condition and the recommended course of action.



### WARNING

*A reading of 23.5% O<sub>2</sub> or more must be treated as a high-oxygen alarm condition until proven otherwise.*

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## INTERFERENCE CHARTS

Your HS-95 or CO-95 monitor can respond to gases other than  $H_2S$  and CO. Tables 3-1 and 3-2 indicate the readings that can occur for specified concentrations of other gases.

**Table 3-1** *HS-95 Interference Chart,  $H_2S$  Sensor*

Interfering Gas	Concentration Tested	Reading
Acetylene $C_2H_2$	50 ppm	170 ppm
Chlorine $Cl_2$	5 ppm	Negative response <b>(AVOID)</b>
Dimethyl sulfide $(CH_3)_2S$	2.8 ppm	No response
Hexane $C_6H_{14}$	4400 ppm	No response
Hydrogen $H_2$	10,000 ppm	8 ppm
Methane $CH_4$	2.5%	No response
Methanol $CH_3OH$	1000 ppm	No response
Methyl mercaptan $CH_3SH$	5 ppm	6 ppm
Nitrogen dioxide $NO_2$	10 ppm	1 ppm
Sulfur dioxide $SO_2$	10 ppm	1 ppm

**Table 3-2 CO-95 Interference Chart, CO Sensor**

<b>Interfering Gas</b>	<b>Concentration Tested</b>	<b>Reading</b>
Acetylene C <sub>2</sub> H <sub>2</sub>	100 ppm	No response
Chlorine Cl <sub>2</sub>	7 ppm	No response
Hexane C <sub>6</sub> H <sub>14</sub>	4400 ppm	No response
Hydrogen H <sub>2</sub>	100 ppm	12 ppm
Hydrogen sulfide H <sub>2</sub> S	10 ppm	No response*
Methane CH <sub>4</sub>	2.5%	No response
Methanol CH <sub>3</sub> OH	1000 ppm	No response*
Methyl mercaptan CH <sub>3</sub> SH	5 ppm	No response*
Nitrogen dioxide NO <sub>2</sub>	10 ppm	No response*
Sulfur dioxide SO <sub>2</sub>	10 ppm	No response*

\* The CO sensor has an internal filter that absorbs certain gases to keep them from interfering with the CO reading. The internal filter is good for approximately one year. If the filter is saturated, the gases marked with an asterisk (\*) may produce an interference reading.

## OPTIONAL ACCESSORIES

This section describes the optional accessories available for your 95 Series gas monitor, and how to use them.

### Hand-aspirated Sample-draw Adapter

#### Description

The sample-draw adapter is used to draw a gas sample from a particular location. The adapter consists of a test cup, aspirator bulb, 10 feet of tubing, fittings, and a probe.

#### How to Use

1. Attach the test cup over the sensor port. The cup fits into the groove around the port, and is held snugly by the retainer arm pressing onto the back of the instrument.
2. Place the probe in the sampling location.
3. Squeeze the aspirator bulb repeatedly until the display stabilizes. Continue to squeeze the bulb repeatedly during the monitoring process, to maintain the sample flow to the monitor.
4. After use, the adapter can remain connected for the next use. Keep in mind that the monitor is not operational in the diffusion mode if the adapter is in place.



## Earphone

### Description

The earphone has an earpiece on one end, with a cord and adapter plug extending from it. The earphone repeats the audible alarms of your monitor. Since the earphone is in your ear during operation, you can hear the alarm in noisy environments.

### How to Use

1. Open the earphone flap, then insert the adapter plug into the earphone jack.
2. Insert the earpiece into your ear.

## Vibrating Alarm

### Description

The Vibrating Alarm is housed in its own compact case with a cord and adapter that plug into the 95 Series earphone/vibrating alarm jack. It operates from its own batteries and vibrates simultaneously with the alarms of the monitor. It has its own clip that can be attached to the belt or shirt pocket.

### How to Use

1. Plug the Vibrating Alarm into the instrument.
2. Place the plastic housing on your belt or pocket, (the belt is recommended for maximum effectiveness).
3. Turn the instrument on.
4. Vibration should occur for approximately 1 second.

Note: Vibration should always occur with the audible buzzer and display light. If it does not vibrate, replace the battery. (see chapter 4 for maintenance).



**NOTE**

*Close the earphone flap when the earphone or vibrating alarm is not in use.*

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# CALIBRATION & MAINTENANCE

## CHAPTER 4

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### OVERVIEW

This chapter contains calibration instructions for all models of the 95 Series single-gas monitors.

A troubleshooting guide, alarm setting procedures, and field replaceable unit (FRU) replacement procedures are also provided in this chapter. A part number list for FRUs and accessories is on the final page.



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#### CAUTION

*Calibrate or perform maintenance on your instrument **only** in a “fresh air” environment. For the HS-95, this is an environment free of H<sub>2</sub>S. For the CO-95, this is an environment free of CO. For the OX-95, this is an environment known to consist of normal O<sub>2</sub> content.*

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## TEST KIT

The test kits includes test gas cylinders, a regulator or dispensing valve and flowmeter, a test cup, and flexible tubing. The test kit is housed in a custom storage case.

### Test Gas Cylinders

The test gas cylinder for the CO-95 contains 200 ppm of CO in air. The test gas cylinder for the HS-95 contains 25 ppm of H<sub>2</sub>S in N<sub>2</sub>. These concentrations are nominal; the actual concentration is listed on the cylinder label. The cylinder for zeroing the OX-95 contains pure nitrogen (N<sub>2</sub>). The gas is released when the regulator or dispensing valve is attached to the cylinder and the flow control knob is opened.

### H<sub>2</sub>S Regulator (for HS-95)

The H<sub>2</sub>S regulator allows the test gas to flow to the HS-95 at a fixed flow rate. The regulator gauge shows the pressure of the gas in the cylinder. The flow control knob opens and closes the regulator. To connect, screw the regulator onto the cylinder, and install the tubing leading to the test cup.

### Dispensing Valve (for CO-95 and OX-95)

The dispensing valve controls the flow of test gas to the CO-95 or the OX-95. The flow control knob opens and closes the valve and controls the flow rate of the test sample. To connect, screw the valve on to the test cylinder. Insert the gas outlet into the sample tubing.

## Flowmeter (for CO-95 and OX-95)

The ball in the flowmeter column indicates the flow rate of the gas from 0.2 to 2.0 standard cubic feet per hour (SCFH). The inlet is on the bottom and the outlet is on the top.

## Test Cup

The test cup is a rubber cylinder that fits into the groove around the sensor port and is held in place by a retainer arm. A metal fitting connects to the tubing.

## Tubing

The 3/16 in. I.D flexible vinyl tubing connects the cylinder, the flowmeter (CO-95 and OX-95), and the test cup.

## Test Kit Instruction Sheet

The test kit instruction sheet describes how to prepare and operate the test kit with the 95 Series gas monitors.

# CALIBRATION PROCEDURES

Calibration procedures include preparing your instrument, verifying or adjusting zero, verifying or adjusting span, then returning your instrument to normal operation.



### WARNING

*Accurate calibration is essential for correct gas or oxygen readings. Incorrect calibration can impair the performance of the instrument, placing you in potential danger if hazardous conditions exist.*

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## Preparing for Calibration (all models)



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### NOTE

*With a HS-95 or CO-95, if the battery has gone dead or the battery has been out of the instrument for 30 minutes or more, allow 1 hour after the new battery has been installed for the sensor to stabilize before beginning calibration procedures.*

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1. Check that the flow control knob or dispensing valve is shut off. Screw the regulator or the dispensing valve onto the test cylinder for your detector.
2. Securely attach one end of the tubing to the gas outlet of the regulator or dispensing valve. For the HS-95, securely attach the other end of the tubing directly to the test cup.
3. For the CO-95 or OX-95, attach the other end of the tubing from the dispensing valve to the inlet (bottom) connector of the flowmeter. Attach a second piece of tubing between the outlet (upper) connector of the flowmeter and the test cup.



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### CAUTION

*The flowmeter must be vertical and right side up in order for you to attain accurate readings.*

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## How to Use the Control Buttons

- The control buttons are ZERO/- and SPAN/+.
- A button should be pressed for at least 1/2 second to be sure that it is recognized.
- The ZERO/- button is used to set zero. The SPAN/+ button is used to set span. See the Calibration section for details.

- When you press and release the ZERO/- and SPAN/+ buttons at the same time, the mode changes. In the HS-95 and CO-95, the modes are: span calibration (C), set low gas alarm (L), set high gas alarm (H), set alarm delay (d), and normal. In the OX-95, the modes are: set low alarm (L), set high alarm (H), set alarm delay (d), and normal.
- When any setting mode is active, the mode letter is displayed to the left of the setting: (C) for setting the span calibration, (L) for setting the low and (H) for setting the high alarm, and (d) for setting the alarm delay.
- Normal mode is not indicated by a letter. The space to the left of the current gas reading is blank.
- In all setting modes, press and release ZERO/- to decrease and SPAN/+ to increase the setting by one count. Press for at least 1/2 second before releasing. Hold the button down to change the setting rapidly.

## Calibration (HS-95, CO-95)

Open the operator controls flap, and slide the power switch on (toward the sensor). Allow a few seconds for the instrument to stabilize.

1. Make sure the instrument is in a fresh air environment, free of H<sub>2</sub>S or CO gas. Press and hold the ZERO/- button. A low bar is displayed to the left of the gas reading during the automatic zero calibration. Release the button when the PASS or FAIL message is displayed. The instrument returns to normal mode, with the alarm inhibited for 2 minutes.
2. Go to span calibration mode by pressing and releasing the ZERO/- and SPAN/+ buttons at the same time. The letter C appears. The value displayed is the current span calibration setting. If necessary, press the ZERO/- or SPAN/+ button to change the setting to match the concentration indicated on the test gas cylinder.
3. When the values match, return to normal mode by pressing and releasing ZERO/- and SPAN/+ twice. The instrument passes through set gas alarm (L & H) modes and set delay (d) mode and enters normal mode.
4. Fit the test cup into the groove around the sensor port with the retainer arm around the back of the instrument holding the cup in place. The fitting should extend to the right across the top of the instrument.
5. Open the flow control knob on the H<sub>2</sub>S cylinder regulator or the CO cylinder dispensing valve. For the HS-95, verify that the regulator gauge shows a pressure greater than 0. For a CO-95, set the flow rate to 1.0 SCFH. Allow 90 seconds for the reading to stabilize.



6. Press and hold the SPAN/+ button. A high bar is displayed to the left of the gas reading during the automatic span calibration. Release the button when the PASS or FAIL message is displayed. The instrument returns to normal mode, with the alarm inhibited for 30 seconds.



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**NOTE**

*The HS-95 and CO-95 gas alarm is inhibited for 2 minutes after a successful (PASS) zero calibration and after an unsuccessful (FAIL) span calibration. The alarm is also inhibited for 30 seconds after a successful (PASS) span calibration. The alarm is inhibited to allow you to finish calibration without setting off the alarm. During the inhibit period, a rotating pattern of horizontal bars appears to the left of the gas reading to remind you that the alarm is shut off.*

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## Calibration (OX-95)

Open the operator controls flap, and slide the power switch on (toward the sensor). Allow a few seconds for the instrument to stabilize.

1. Fit the test cup into the groove around the sensor port with the retainer arm around the back of the instrument holding the cup in place. The gas inlet should extend to the right across the top of the instrument.
2. Open the N<sub>2</sub> cylinder dispensing valve. Set the flow rate to 1.0 SCFH. Allow 90 seconds for the reading to stabilize. The low oxygen alarm will sound. This is normal.

3. Press and hold the ZERO/- button. A low bar is displayed to the left of the gas reading during the automatic zero calibration. Release the button when the PASS or FAIL message is displayed. The instrument returns to normal mode, with the alarm inhibited for 2 minutes.
4. Turn off the gas and remove the test cup.
5. Let the instrument stabilize for 90 seconds in fresh air. Press and hold the SPAN/+ button. A high bar is displayed to the left of the gas reading during the automatic span calibration. Release the button when the PASS or FAIL message is displayed. The instrument returns to normal mode, with no additional alarm inhibition.



#### NOTE

*The OX-95 gas alarms are inhibited for 2 minutes after a successful (PASS) zero calibration and after an unsuccessful (FAIL) span calibration. This allows you to finish calibration without setting off an alarm. During the inhibit period, a rotating pattern of horizontal bars appears to the left of the gas reading to remind you that the alarms are shut off. The OX-95 alarms are NOT inhibited after a successful (PASS) span calibration.*

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## If Calibration Fails

On all models, if the zero or span calibration fails, the FAIL message is displayed. Try the zero or span procedure a second time. If the FAIL message appears again:

1. Turn the instrument off.
2. Replace the sensor.

3. For the HS-95 or CO-95, allow the new sensor to stabilize for 1 hour. For the OX-95, allow the new sensor to stabilize for 5 minutes.
4. Turn the instrument on.
5. Run the zero and span calibration procedures from the beginning.

**WARNING**

*You should not ignore the alarm even if you decide that it was caused by this mistake. Move immediately to a safe area.*

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## Switch to Default Zero (OX-95)

If you press and hold the ZERO/- button on the OX-95 while the instrument is in fresh air, the sensor becomes uncalibrated, the reading goes to 0%. A rotating pattern of horizontal bars appears for 2 minutes and then the low O<sub>2</sub> alarm occurs—the buzzer pulses, the red alarm light flashes, and the reading blinks.

To restore proper function, the instrument must be rezeroed with N<sub>2</sub> test gas. To keep the instrument operational in the meantime, you can switch to the default zero value:

1. Go to default zero mode by pressing and releasing the ZERO/- and SPAN/+ buttons simultaneously one or more times, until 0CAL is displayed.
2. Press and hold the ZERO/- button until 0CAL changes to 0DEF, indicating that the default zero value has been loaded.
3. To exit, press and release the ZERO/- and SPAN/+ buttons simultaneously until normal mode comes up.
4. Respan in fresh air. Press and hold the SPAN/+ button until PASS or FAIL appears.

Using the default zero value, the readings are approximate. You should recalibrate as soon as possible, using N<sub>2</sub> gas for zero and fresh air for span. The reading with N<sub>2</sub> may be several percent off zero until you press the ZERO/- button.

## Return to Normal Operation

After calibration, return to normal operation.

1. Close the flow control knob or the dispensing valve.
2. Remove the test cup and close the flap that covers the operator controls.
3. Disassemble the test kit. Store the components in the storage case. You can leave the hoses attached for the next calibration. Your instrument is now ready for normal operation.



### NOTE

*While in normal mode, the HS-95 or CO-95 goes into a FAULT condition if you press the SPAN/+ button for several seconds without introducing calibration gas to the sensor. To return to normal operation, turn the power switch off, wait a few seconds, then turn the power switch back on.*

*If the HS-95 or CO-95 “fails” a calibration (with gas introduced to the sensor), see page 4-9.*

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## MAINTENANCE

This section contains troubleshooting and maintenance procedures, including procedures for alarm point adjustment.

### How to Open and Close Your Monitor

To open your monitor, open both gasket flaps, then ensure that the power switch is off. Loosen the two captive screws on the rear housing, then separate the two halves. The gasket normally remains attached to the front housing, but may slip out of its retaining groove.

To close, first verify that the gasket is securely within the groove around the front housing. Then place the two halves together and tighten the two screws.

Test the placement and seal of the gasket by closing its two flaps. Each flap should neatly click shut.



#### NOTE

*Should you ever replace the gasket, remember to test the placement and seal of the new gasket.*

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## Troubleshooting Guide

The following troubleshooting guide lists possible indications, probable cause, and recommended actions.

**Table 4-1 95 Series Gas Monitor Troubleshooting Guide**

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<b>Indication</b>	<b>Condition and Probable Cause</b>	<b>Recommended Action</b>
Blinking LOBAT message. Buzzer chirps and alarm light flashes every 30 sec.	Low battery. Less than 8 hours of operating life remaining.	Replace the battery.
Steady LOBAT message. Steady buzzer and alarm light. No gas reading.	Battery below operating level. Instrument inoperative.	Replace the battery immediately.
Steady FAULT message. Steady buzzer and alarm light.	Bad sensor or faulty sensor circuit. Or, improper calibration.	Recalibrate. If the indication persists, replace the sensor and recalibrate. If the indication persists, contact the factory for repair.
Blinking FAULT message. No buzzer or alarm light.	Sensor is still functioning but is near the end of its life.	Recalibrate. If the indication persists, replace the sensor as soon as practical. Calibrate the new sensor.
FAIL message during calibration procedure.	Improper calibration. Or, sensor needs replacement.	Repeat the entire calibration procedure. If condition persists, replace the sensor, then recalibrate.

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## Changing Alarm Setpoints

The 95 Series has two alarms, low and high, each with its own setpoint. The low alarm sounds when the reading is at or above the low setpoint for the CO-95 and HS-95. The high alarm sounds when the reading is at or above the high setpoint. You can change the low setpoint when L is displayed on the LCD and the high setpoint when H is displayed.

Preset alarm points are listed in Table 1-1, Specifications. To adjust an alarm setpoint, turn your monitor on, allow it to stabilize for a few seconds, then perform the following steps. Refer to Figure 2-1 for locations of the buttons.

1. Press and release the ZERO/- and SPAN/+ buttons simultaneously one or more times, until the letter L, or H is displayed, indicating the desired alarm.
2. The current alarm setpoint is displayed. Press the ZERO/- button to decrease and the SPAN/+ button to increase the setpoint.
3. When the desired value is displayed, exit by pressing and releasing the ZERO/- and SPAN/+ buttons simultaneously one or more times, until normal mode comes up, as indicated by only the gas reading without any additional letter.

## Changing the Alarm Delay

The instrument can be programmed to delay the audible and visual alarm indications for a pre-determined time after a gas alarm setpoint has been exceeded. This feature prevents nuisance alarms caused by transient radio frequency interference (RFI). The alarm delay can be set from 0p(no delay) to 3 seconds (factory setting). To set the alarm delay, turn your monitor on, allow it to stabilize for a few seconds, then perform the following steps. Refer to Figure 2-1 for locations of the buttons.

1. Press and release the ZERO/- and SPAN/+ buttons simultaneously one or more times, until the character d is displayed on the LCD, indicating the delay setting mode.
2. The current alarm delay is displayed. Press the ZERO/- button to decrease and the SPAN/+ button to increase the alarm delay setting.
3. When the desired value is displayed, exit by pressing and releasing the ZERO/- and SPAN/+ buttons simultaneously one or more times, until normal mode comes up, as indicated by only the gas reading without any additional letter.

## Replacing Defective Components

This section describes how to remove and replace the sensor and battery. The location of these components is shown in Figure 4-1.



### NOTE

*Electronic components can be damaged by electrostatic discharge (ESD). All standard ESD precautions must be exercised while handling the electronic components.*

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## Replacing the Sensor

Open the instrument, then perform the following steps:

1. Hold the monitor in one hand with your thumb on top of the buzzer. This holds the electronics assembly in place while you remove the sensor. Do not touch the main board during this process.
2. With your other hand, pull the sensor straight up out of its socket.
3. The sensor has four pins ( $\text{H}_2\text{S}$  and  $\text{CO}$ ) or two pins ( $\text{O}_2$ ) that match the socket pattern on the main board. Align the pins of the new sensor with the socket, then insert them straight down into the board.
4. Securely close your monitor.
5. Allow at least 1 hour for the new  $\text{CO}$  or  $\text{H}_2\text{S}$  sensor or 5 minutes for the  $\text{O}_2$  sensor to stabilize before turning on your monitor
6. Calibrate the new sensor before using the instrument.



### NOTE

*If the FAIL message was displayed before you replaced the sensor, the FAIL message will appear when you turn the instrument on with the new sensor. When you calibrate the new sensor, the FAIL message is removed and the instrument operates properly.*

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## Replacing the Instrument Battery



### WARNING

*To maintain approvals, use only Duracell PC1604 or Eveready EN22 batteries.*

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Open the instrument, then perform the following steps:

1. Lift the old battery from its compartment.
2. Insert the new battery into the compartment. Make sure to align the positive and negative clips with the figure in the bottom of the battery compartment.
3. Close your monitor.
4. For the CO-95 and the HS-95, if the old battery was completely spent, the sensor has lost its bias. In this case, allow at least 1 hour after battery replacement before turning on the monitor. If the battery was low but still functional when it was replaced, allow 15 minutes. For the OX-95, allow 5 minutes.
5. After turning your monitor back on, verify proper calibration before actual use. If recalibration is needed for an HS-95 or CO-95, wait 1 hour after battery replacement.

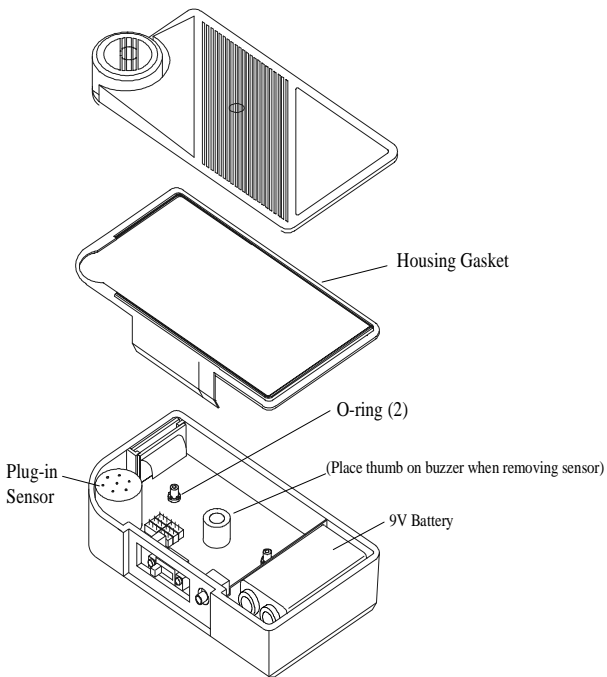
## Replacing the Vibrating Alarm Batteries

1. Unplug the Vibrating Alarm from the instrument.
2. Remove the cover by unscrewing the #4 Phillips head screw located in the middle of the enclosure lid.
3. Remove the batteries inside the housing by gently lifting the batteries from the retaining clips.

4. Install a fresh set of “AA” batteries noting the polarity (+side of battery to + on circuit board).
5. Replace the cover making sure the notches line up and ensuring the cord is not crimped. Replace the screw used in step 2.
6. Test the Vibrating Alarm using the Testing instructions. If The alarm does not vibrate after changing the batteries, contact **Thermo** GasTech for further instructions

### Electronics Assembly Components

The electronics assembly consists of the main board, power switch, buttons, earphone/vibrating alarm jack, liquid crystal display (LCD), and display cable. If any of these components fail, contact the factory for repair.



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**Figure 4-1** 95 Series Gas Monitor FRU Locations

## FRUs AND ACCESSORIES LIST

Table 4-2 lists the field replaceable units (FRUs) and accessories for all 95 Series instruments.

**Table 4-2 95 Series Gas Monitor FRUs and Accessories**

Part No.	Description
07-0080	Housing gasket
07-0090	Gasket, switch cover
07-6010	O-ring
13-0197	Strap, lanyard
49-1215	(2) AA alkaline batteries (vibrating alarm)
49-1302	9V alkaline battery
52-2022	Vibrating alarm
52-7515	Earphone alarm
65-1059	O <sub>2</sub> sensor for OX-95
65-2007	CO sensor for CO-95
65-2037	H <sub>2</sub> S sensor for HS-95
71-0011	Operator's Guide
72-0020-02	OX-95 gas monitor
73-0010-01	CO-95 gas monitor
73-0011-01	HS-95 gas monitor
81-0066	Test gas cylinder, 200 ppm CO in air
81-0078	Test gas cylinder, 100% N <sub>2</sub>
81-0151	Test gas cylinder, 25 ppm H <sub>2</sub> S in N <sub>2</sub>
81-0249	Test kit, OX-95
81-0250	Test kit, CO-95
81-0251	Test kit, HS-95
81-1185	Test cup (all models)
81-1186	Hand-aspirated sample-draw adapter