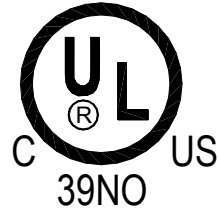# MINI-SA PORTABLE GAS DETECTION INSTRUMENT

INTRINSICALLY SAFE GAS
LEVEL DETECTOR

Exia ⅡC T3   CLASSIFIED

U L
C ® US
39NO

CERTIFIED BY UNDERWRITERS LABORATORIES INC.
ONLY AS TO INTRINSIC SAFETY

FOR USE IN HAZARDOUS LOCATIONS
CLASS I, DIV, 1, GROUPS A, B, C, & D.

CERTIFIED TO CANADIAN CSA STANDARD C22.2 NO. 157-92

WARNING:
SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
USE ONLY WITH APPROVED BATTERIES.
TEMPERATURE CODE T3C.

CAUTION:
FOR SAFETY REASONS, THIS EQUIPMENT MUST BE
OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY.
READ AND UNDERSTAND MANUAL BEFORE OPERATING AND SERVICING

CHANGE BATTERIES IN NON-HAZARDOUS AREA

SCOTT INSTRUMENTS
EXTON, PA 19341

SCOTT INSTRUMENTS
MINI-SA PORTABLE GAS DETECTION INSTRUMENT

Contents

SCOTT INSTRUMENTS MINI-SA PORTABLE GAS DETECTOR

1.0 INTRODUCTION

The SCOTT INSTRUMENTS MINI-SA Portable Gas Detector is a self contained instrument designed to detect and provide audible, visual, and tactile indication of the presence of oxygen or toxic gas in the air. The toxic gas concentration is monitored and shown in the graphic display in parts per million (ppm) of the atmosphere. The oxygen concentration is shown in the graphic display as a percent (%).   When the gas level exceeds the preset level, alarms actuate including a pulsing audible alarm tone, flashing LED, and a vibration alarm.

The alarm functions for toxic gases include a Time Weighted Average (TWA) Alarm and a Short Term Exposure Level (STEL) Alarm.

Other features include AUTO CALIBRATION and self diagnostic capabilities, a HOLD function that displays the lowest level detected, and user adjustable high and low ALARM SETPOINTS. A battery life indicator constantly monitors remaining battery capacity and a backlight provides visibility in low light situations.

Additional features include a PASSWORD PROTECT menu and a BATTERY SAVER mode.

2.0 OPERATIONAL ENVIRONMENT

The SCOTT INSTRUMENTS MINI-SA Portable Gas Detector is designed to be "INTRINSICALLY SAFE" suitable for operation in Class I, Division 1, Groups A, B, C & D Hazardous Locations.

3.0 GENERAL INSTRUCTIONS

3.1 UNPACKING

Remove the SCOTT INSTRUMENTS MINI-SA instrument from its packaging and examine it for external damage. If any damage is found, notify your SCOTT INSTRUMENTS distributor, sales representative, or the SCOTT INSTRUMENTS Service Department.

3.2 REGISTRATION

Fill out and mail the postage paid Registration Card provided. Registering your SCOTT INSTRUMENTS MINI-SA instrument assures that you will receive notification of any future enhancements and/or upgrades that become available.

3.3 BATTERY INSTALLATION

The SCOTT INSTRUMENTS MINI-SA instrument is powered by two "AAA" Alkaline batteries. Use only alkaline (Eveready Energizer Industrial EN 92, Duracell PC2400, or Ray-O-Vac AL-AAA) batteries. Use of any other batteries except those listed will void the intrinsic safety listing of the SCOTT INSTRUMENTS MINI-SA Portable Gas Detector. Use of rechargeable batteries is prohibited. Two of the specified "AAA" Alkaline batteries will provide approximately one hundred (100) hours of continuous non-alarming operation before requiring replacement.

Install the batteries as follows:

1) Remove the battery cover by loosening the #1-phillips-head captive cover screw counterclockwise, then lifting the cover out of the housing. Then lift the two batteries from the housing, using a small coin or tool.

2) Install two (2) AAA Alkaline batteries of the specified type. Note polarity orientation (+/-) as shown inside the battery box and push the batteries securely in between the contacts.

3) Replace the battery cover by pushing it into the bottom detents and secure by tightening the cover screw.

NOTE

The metal belt clip is designed to be removed from the instrument. After removing the battery cover, remove the cover screw completely and slide the clip out of the cover. Store the clip for future use. Replace the cover screw and reattach battery cover to the instrument.

4.0 INSTRUMENT DESCRIPTION

THE SCOTT INSTRUMENTS MINI-SA INSTRUMENT is designed for use as a personal monitor. The MINI-SA is equipped with a snap mounting clip for ease of use. A break-away neck strap and rubber boot are also available.

All operations of the instrument are controlled by two push-button actuators which are large enough to accommodate use with gloved hands. In each menu screen, "PROMPTS" over each push-button define their use.

The SCOTT INSTRUMENTS MINI-SA INSTRUMENT case is constructed of high impact resistant, flame retardant plastic. The push-button actuators and the graphic display overlay are UV and chemical resistant.

The Graphic Liquid Crystal Display (LCD) provides continuous readings of gas concentration as well as battery life remaining and other information.

Alarm conditions are signaled by an alarm legend on the graphic display, an audible tone, a flashing light, and an internal vibration. Audible tones for certain alarms can be suspended for thirty (30) second intervals while others will continue until the unit is reset in an atmosphere that corresponds to the preset safe values. Alarms can also be configured to be latching or nonlatching. Latching alarms operate until acknowledged. Nonlatching alarms clear automatically when the detected gas is on the safe side of the alarm setting.
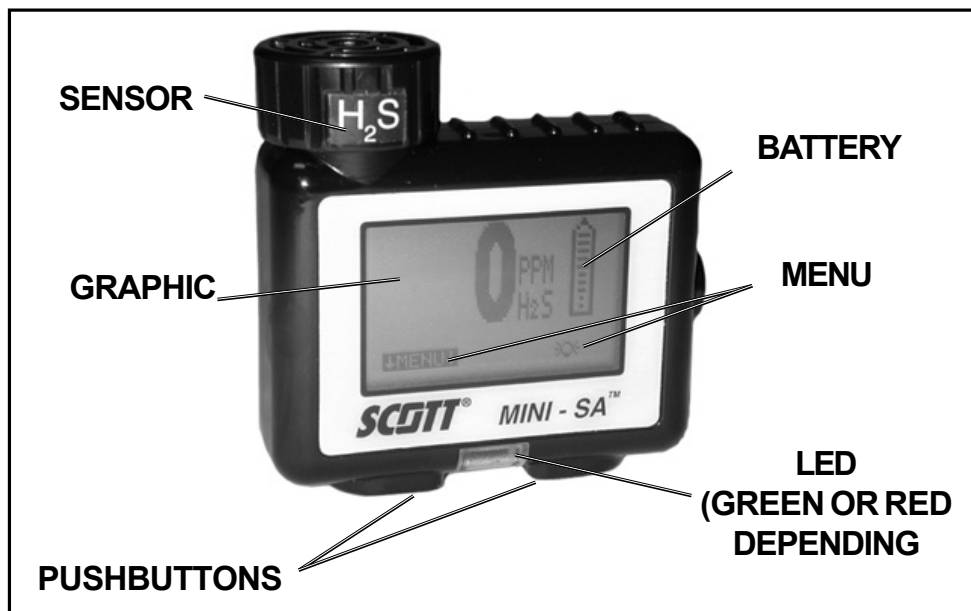
FIGURE 1
MINI-SA INSTRUMENT
(w/ H$_2$S Sensor shown for reference)

4.1 ALARM LEGENDS

The following alarm legends appear in the graphic display:

"ALARM" flashing legend indicates one of the following:

   a)   Gas concentration which exceeds the preset level

   b)   A Time Weighted Average (TWA) Alarm

   c)   A Short Term Exposure Level (STEL) Alarm.

For toxic gas, the ppm, TWA, or STEL level detected and the "ALARM" legend will flash alternately.

A graphic battery level indicator appears continuously on the display screen. The indicator shows battery capacity as ten (10) lines inside a picture of a battery. Each line represents approximately 10% of battery time remaining.

The battery level indicator flashes when the batteries are low. This will occur when approximately 10% of battery life remains.

**EACH LINE REPRESENTS
APPROXIMATELY 10%
OF BATTERY TIME REMAINING**
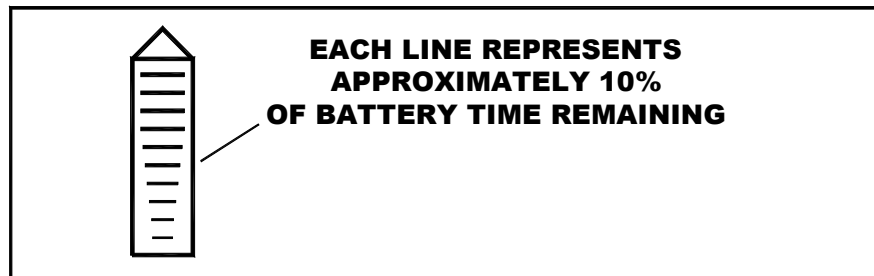
**FIGURE 2
BATTERY LEVEL INDICATOR**

An exhausted battery alarm will occur after the last bar disappears. See Figure 2.

"HOLD ACTIVATED" flashing legend indicates that the HOLD feature has been selected. The instrument will display the highest reading of a toxic gas or the lowest oxygen reading. This reading will continue to be displayed until the HOLD function is reset.

4.2 AUDIBLE ALARMS

The SCOTT INSTRUMENTS MINI-SA has an audible alarm which is activated when any of the following conditions occurs:

- The preset gas alarm level is exceeded (ALARM)
- The Time Weighted Average (TWA) is exceeded
- The Short Term Exposure Limit (STEL) is exceeded
- The battery is exhausted
- The sensor is missing or incompatible

In addition, each time the instrument is turned ON, the audible alarm will pulse three times.

The following describes the function of the Audible Alarm during the alarm conditions listed above:

GAS ALARM – The Audible Alarm sounds when a gas concentration is detected that exceeds the chosen alarm level, or when a TWA or STEL alarm value is exceeded. A repetitive pulsing tone will occur at one (1) second intervals while the alarm condition exists.

In the LATCHING alarm mode, selected in the Alarm Setpoint Menu, after an alarm condition has cleared, the alarm indication will continue until the alarm is acknowledged by depressing a pushbutton. In the NON-LATCHING alarm mode, all alarm indications clear when the alarm condition clears. In either mode, the instrument gives an "all clear" signal with three audible beeps, three flashes of the Red Alarm Light, and three vibration pulses when the alarm indication is cleared.

When an Audible Alarm sounds, depressing either pushbutton on the instrument will silence the Audible Alarm for thirty (30) seconds. If the original alarm condition still exists after the thirty (30) second silence period, the Audible Alarm will sound again. The Audible Alarm can be silenced repeatedly by depressing a pushbutton.

LOW BATTERY – An Audible Alarm tone will pulse once every fifteen (15) seconds to indicate when less than 10% of battery life remains.

MISSING SENSOR – The Audible Alarm for a missing or incompatible sensor is identical to the pulsing one (1) second tone that occurs during an ALARM condition. Depressing a pushbutton to acknowledge the condition turns the unit OFF.

4.3 VIBRATION ALARM

An internal vibrating motor activates whenever the Audible Alarm sounds. The Vibration Alarm operates as a secondary alarm feature in high noise environments where the audible alarm may be difficult to hear.

 The Vibration Alarm is reset the same as the Audible Alarm as described in Section 4.2.

The Vibration Alarm will also pulse briefly whenever the MINI-SA instrument is turned ON or OFF.

```
WARNING
THE VIBRATION ALARM DOES NOT FUNCTION FOR THE LOW BAT-
TERY INDICATION.
```

4.4 ALARM LIGHT

The SCOTT INSTRUMENTS MINI-SA instrument contains a Red Light Alarm LED (Light Emitting Diode) which flashes whenever any Alarm Condition occurs. It will continue to flash when the Audible Alarm is silenced and will flash as long as the alarm condition is present. In the LATCHING alarm mode, selected in the Alarm Setpoint Menu, after an alarm condition has cleared, the alarm indication will continue until the alarm is acknowledged by depressing a pushbutton. In the NON-LATCHING alarm mode, all alarm indications clear when the alarm condition clears.   In either mode, the instrument gives an "all clear" signal with three audible beeps, three flashes of the Red Alarm Light, and three vibration pulses when the alarm indication is cleared.

4.5 STATUS LIGHT

The instrument also has a Green Status LED that flashes periodically, indicating continuing instrument operation.

5.0 SWITCH FUNCTIONS AND DISPLAYS

All operations on the MINI-SA Portable Detector are controlled by two push-buttons located on the bottom of the unit. The operations vary depending on the operating mode and the graphic display appearing above the two switches. The unit sounds a brief audible "beep" whenever either pushbutton is de-pressed while the instrument is on. Whenever the instrument is turned ON or OFF, three successive audible tones will sound and the Red Alarm LED will flash. The Green Status LED will flash once every fifteen (15) seconds during instrument operation. When in the BATTERY SAVER mode, the Green Status LED flash rate increases to once every five (5) seconds.
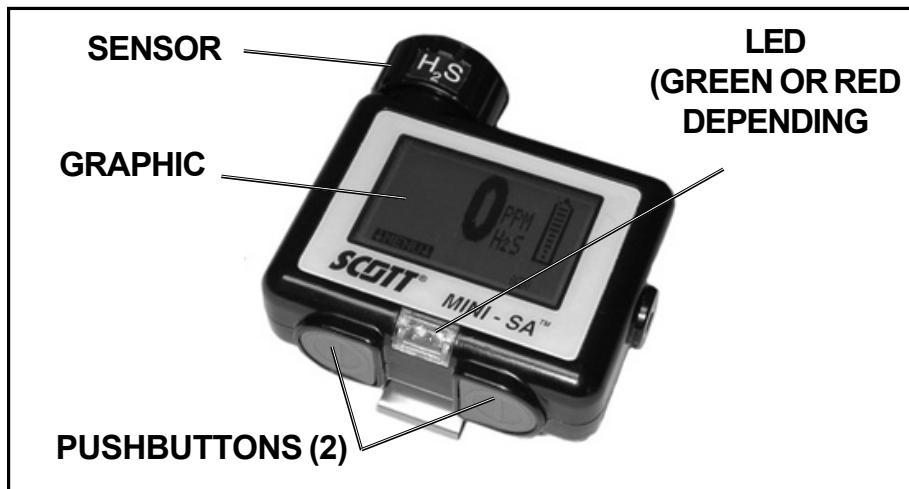
FIGURE 3
COMPONENT LOCATIONS

When the unit is in the operating mode, depressing the Display Backlight Pushbutton will illuminate the graphic display for fifteen (15) seconds. A light bulb icon ✳ for the Backlight is located above the pushbutton on the operating mode screen. Depressing the button again extinguishes the Backlight. The Backlight is sustained ON or OFF while the MENU operations are in progress, except for calibration. In an alarm condition, the Backlight flashes for the duration of the alarm indication.

When in the BATTERY SAVER mode, the instrument graphic display will be blank. Depressing either pushbutton will turn on the graphic display. The display remains on for thirty (30) seconds after the last pushbutton operation.

WARNING

USE OF THE DISPLAY BACKLIGHT FOR EXTENDED PERIODS OF TIME WILL REDUCE BATTERY SERVICE LIFE.

6.0 OPERATING INSTRUCTIONS

Before using this instrument, read and understand **ALL** instructions for **ALL** operating modes described in this Section. Prior to use, the instrument should be checked for proper calibration as described in this Section.

WARNING

BEFORE EACH DAY'S USAGE, THE SENSITIVITY OF THE GAS SENSOR MUST BE TESTED ON A KNOWN CONCENTRATION OF CALIBRATION GAS.

WARNING

ACTUAL CALIBRATION SHOULD ONLY BE PERFORMED BY QUALI-FIED INSTRUMENT MAINTENANCE PERSONNEL.

WARNING

ANY INDICATION OR READING DENOTING A TOXIC GAS OR A LACK OF OXYGEN SIGNIFIES THE NECESSITY TO FOLLOW ESTAB-LISHED COMPANY PROCEDURES FOR THE INDICATED CONCEN-TRATIONS OF THE PARTICULAR GAS.

WARNING

USE IN OXYGEN ENRICHED ATMOSPHERES (ABOVE 25% O_2) MAY BE HAZARDOUS.

WARNING

CONFIRM THE INSTRUMENT'S BASIC CALIBRATION IS APPRO-PRIATE FOR THE INTENDED USE.

6.1 INSTRUMENT TURN ON / OFF

To turn the instrument ON, depress either pushbutton. Three successive "beeps" will sound. The Red LED will flash and the vibration alarm will pulse for each "beep." The graphic display will show one of the following screens while the instrument initializes. The sensor installed in the unit defines which display is shown:

For Toxic Gases

```
SCOTT INSTRUMENTS

MINI-SA        VERSION X.X

      <gas> SENSOR

        INITIALIZING
```

All toxic gas screens appear similar, therefore wherever the symbol <gas> appears on any of the graphic display screens in this manual, it will be substituted with the applicable toxic sensor (either CO, Cl_2, ClO_2, HCN, H_2S, NH_3, NO_2, NH_3, PH_3 or SO_2) installed in the instrument at the time. For some toxic gases, the screen display will show 0.0 or 0.00 resolution.

The following toxic gas sensors are available in the MINI-SA:

> CO = Carbon Monoxide
>
> Cl_2 = Chlorine
>
> ClO_2 = Chlorine Dioxide
>
> HCN = Hydrogen Cyanide
>
> H_2S = Hydrogen Sulfide
>
> NH_3 = Ammonia
>
> NO_2 = Nitrogen Dioxide
>
> PH_3 = Phosphine
>
> SO_2 = Sulphur Dioxide

Refer to Section 9.0 for sensor specifications.

For O_2

```
SCOTT INSTRUMENTS

MINI-SA        VERSION X.X

       O₂ SENSOR

        INITIALIZING
```

After a few seconds, the instrument will sound a single "beep" and go to the Operating Mode where the graphic display will show one of the following screens:

Note: If a new sensor is installed or if batteries have been removed for more than a few minutes, the initialization sequence may take longer. If the

sensor type has been changed or if the previous calibration was not successful, the bottom line of the display will show "CALIBRATION REQUIRED".

For Toxic Gases

ppm
<gas>

0

▼ MENU ✳

For O$_2$

20.9% O$_2$
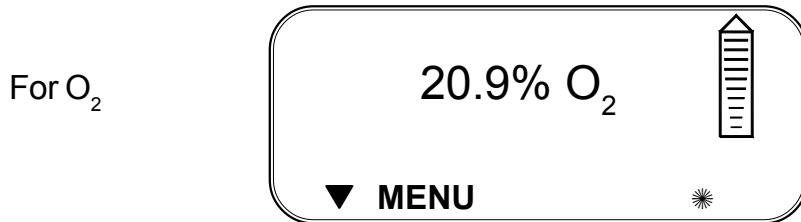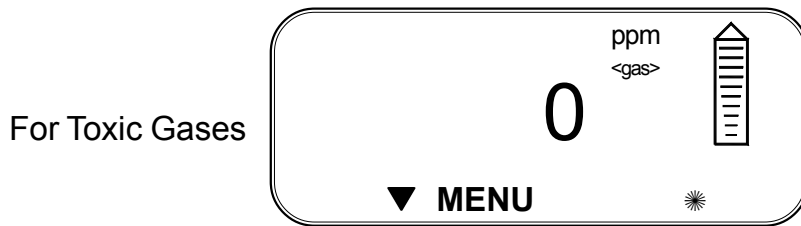
▼ MENU ✳

In the normal Operating Mode, the following information is displayed:

- Gas concentration in either ppm (toxic Gas) or % (oxygen)
- Battery life indication
- Backlight prompt ✳
- Menu prompt

To turn OFF the instrument, depress and hold both push-buttons. The unit will sound three successive "beeps" accompanied by flashes of the Red LED. The instrument will then display the following screen:

DO YOU WANT TO TURN
THE UNIT OFF?
YES   NO
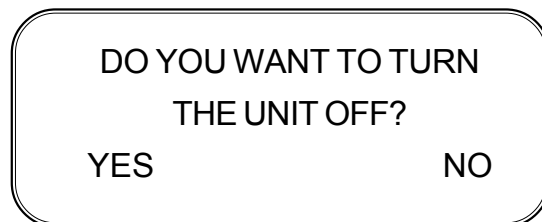
6.2 MENU SELECTION

From the Operating Mode screen, there are six menus that can be selected by the user. They are "ZERO CALIBRATION," "SPAN CALIBRATION," "PEAK/HOLD," "ALARM SETPOINT," "TWA/STEL," and "CONFIGURATION." Depress the pushbutton below the MENU prompt on the display and then one of the following screens will appear:

For Toxic Gases

```
        ZERO CALIBRATION


   NEXT              AUTO ZERO
```

For O$_2$

```
        AUTO CALIBRATION


   NEXT               CALIBRATE
```
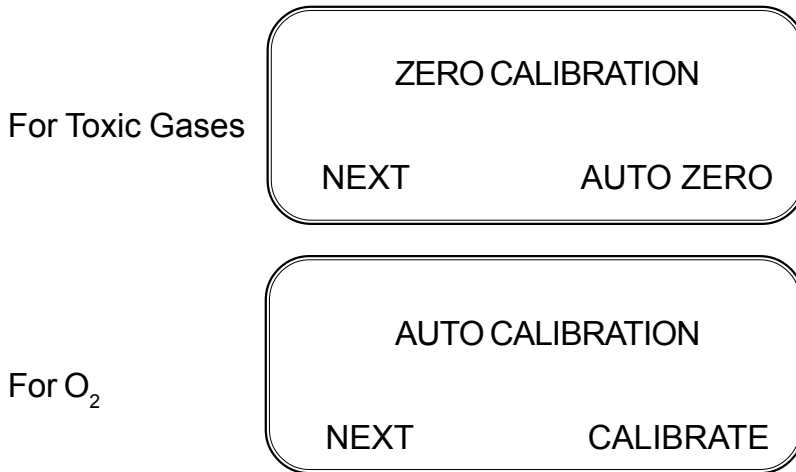
The AUTO ZERO or CALIBRATE command and "NEXT" command appear above the pushbutton that activates that function.

To AUTO ZERO or CALIBRATE the sensor, depress the right pushbutton. See Section 6.3 for details on calibration.

To go to the next menu, depress the left pushbutton below the "NEXT" command and the following screen will be displayed:

For toxic gases

```
        SPAN CALIBRATION


   NEXT               SELECT
```
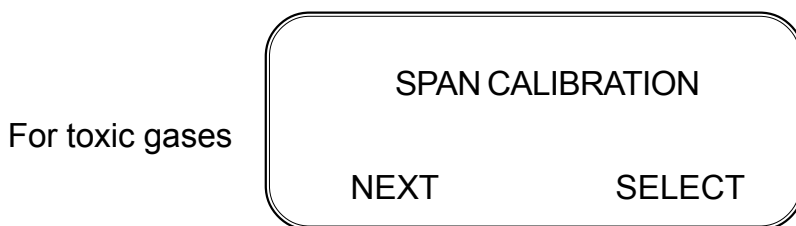
To Span a toxic gas sensor, depress the "SELECT" pushbutton. See Section 6.4 for details on span calibration.

NOTE: There is no span calibration screen when using the Mini-Sa portable to detect oxygen. The screen will go directly to the next menu.

To go to the next menu, depress the left pushbutton below the "NEXT" command and the following screen will be displayed:

```
┌─────────────────────────────────┐
│           PEAK / HOLD           │
│                                 │
│                                 │
│    NEXT            SELECT        │
└─────────────────────────────────┘
```

To go to the PEAK/HOLD menu, depress the "SELECT" pushbutton.

To go to the next menu, depress the left pushbutton below the "NEXT" command and one of the following screens will be displayed:

For Toxic Gases

```
┌─────────────────────────────────┐
│       <gas> ALARM SETPOINT      │
│                                 │
│                                 │
│    NEXT            SELECT        │
└─────────────────────────────────┘
```

For O$_2$

```
┌─────────────────────────────────┐
│        O$_2$ ALARM SETPOINT     │
│                                 │
│                                 │
│    NEXT            SELECT        │
└─────────────────────────────────┘
```

To go to the ALARM SETPOINT menu, depress the "SELECT" pushbutton.

To go to the next menu, depress the left pushbutton below the "NEXT" command and one of the following screens will be displayed:

For Toxic Gases

```
┌─────────────────────────────────┐
│          <gas> TWA/STEL         │
│                                 │
│                                 │
│    NEXT            SELECT        │
└─────────────────────────────────┘
```

NOTE: There is no TWA/STEL menu displayed when an instrument is used for oxygen detection.

To go to the TWA/STEL menu, depress the "SELECT" pushbutton. See Section 6.8 for details.

To go to the next menu, depress the left pushbutton below the "NEXT" command and the following screen will be displayed:

15

```
┌─────────────────────────────────┐
│                                 │
│         CONFIGURATION           │
│                                 │
│                                 │
│    NEXT              SELECT      │
│                                 │
└─────────────────────────────────┘
```
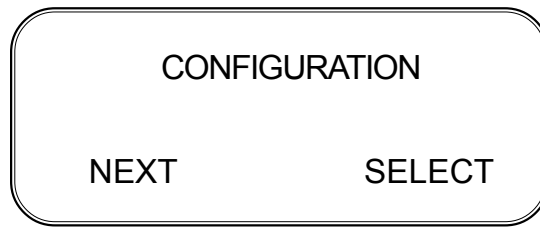
To go to the CONFIGURATION menu, press the "SELECT" pushbutton.

To go to the next menu, depress the left pushbutton below the "NEXT" command and the ZERO CALIBRATION for toxic gas or AUTO CALIBRATION for oxygen screen will again be displayed.

The MINI-SA will scroll repeatedly through these Menus each time the "NEXT" pushbutton is depressed. Each time either pushbutton is depressed, the unit will sound a single "beep".

If no menu action is taken for fifteen (15) seconds while one of the menus is displayed, the instrument will automatically return to the operating mode, signified by a single "beep".
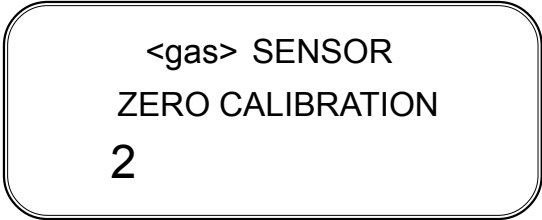
6.3 ZERO CALIBRATION MENU

The MINI-SA instrument can be Auto Zeroed at any time. An Auto Zero should only be performed in an area known to be free of toxic gas or any known cross sensitive materials. See Section 8.0 for SCOTT INSTRUMENTS supplied calibration gas cylinders. When performing an auto-zero with an oxygen unit, be sure the area contains 20.9% oxygen.

To perform Zero Calibration of the sensor as described in Section 6.2, depress the "AUTO ZERO" pushbutton when the ZERO CALIBRATION menu screen is displayed.

The instrument will display one of the following screens while it calibrates the appropriate sensor.

For Toxic Gases

> <gas> SENSOR
>
> ZERO CALIBRATION
>
> 2

For O_2

> O_2 SENSOR
>
> ZERO CALIBRATION
>
> 2

The instrument display will count down 2 seconds while the sensor is zeroed. After a successful "ZERO CALIBRATION", the instrument will sound a "beep" and automatically go back into the Operating Mode.

If, during the "ZERO CALIBRATION", the unit detects that the sensor is out of range, an error message will be displayed. See Section 7.0 for a description of error messages.

17

6.4 SPAN CALIBRATION MENU FOR TOXIC GAS ONLY

Note: The MINI-SA software requires that an "AUTO ZERO" be performed as described in Section 6.3 before the instrument will allow a "SPAN CALIBRATION". Failure to do so will display the following screen when attempting a "SPAN CALIBRATION" of the instrument:

```
┌─────────────────────────────────┐
│      AUTO ZERO REQUIRED         │
│           BEFORE                │
│      SPAN CALIBRATION           │
│   ▼      ACKNOWLEDGE     ▼      │
└─────────────────────────────────┘
```
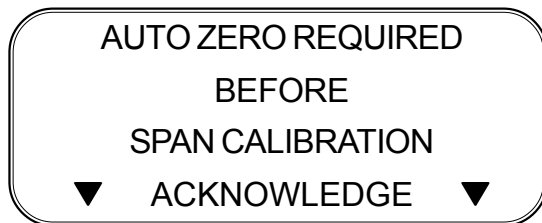
Depress both pushbuttons simultaneously to acknowledge this message and "AUTO ZERO" the instrument per Section 6.3 to procede.

The MINI-SA instrument can be calibrated with span gas supplied by SCOTT INSTRUMENTS or with a calibration gas supply certified to a concentration within the following ranges:

CO = 25 to 120 ppm

Cl_2 = 5 ppm only Cl_2

ClO_2 = 5 ppm only Cl_2

HCN = 2.0 to 25.0

H_2S = 10 to 110 ppm

NH_3 = 10 to 40 ppm

NO_2 = 2.0 to 15.0 ppm

PH_3 = 0.5 to 4.5 ppm

SO_2 = 2.0 to 18.0 ppm

See Section 8.0 for SCOTT INSTRUMENTS supplied calibration gas cylinders.

To perform "SPAN CALIBRATION" of the sensor, depress the "SELECT" pushbutton when the "SPAN CALIBRATION" screen is displayed as described in Section 6.2. The instrument will display the one of the following screens:

For Toxic Gases
```
┌─────────────────────────────────┐
│        <gas> SENSOR             │
│       SPAN CALIBRATION          │
│    USING <_> ppm <CALGAS>       │
│    CHANGE            OK          │
└─────────────────────────────────┘
```
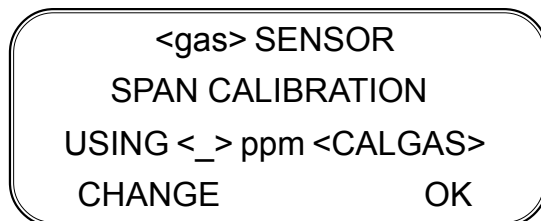
Calibration cylinders supplied by SCOTT INSTRUMENTS contain 25 PPM H_2S or 50 PPM CO. To use another certified concentration, depress the left pushbutton below the "CHANGE" command. The one of the following screens will be displayed:

For Toxic Gases

```
          <gas> SENSOR
        SPAN CALIBRATION
     GAS = <_> ppm <CALGAS>
        UP            DOWN
```

Factory preset span calibration gas values:

CO   = 50 ppm

Cl_2 = 5.0 ppm

ClO_2 = 5.0 ppm Cl_2

HCN = 10.0 ppm

H_2S = 25 ppm

NH_3 = 25 ppm

NO_2 = 5.0 ppm

PH_3 = 1.0 ppm

SO_2 = 10 ppm

If you select the "UP" pushbutton, for example, one of the following screens will display with the number value flashing:

For Toxic Gases

```
          <gas> SENSOR
        SPAN CALIBRATION
     GAS = <_> ppm <CALGAS>
        UP            SET
```

When the desired value has been reached depress the "SET" pushbutton and the "CHANGE/OK" screen will appear again. Select the "OK" pushbutton and one of the following screens will display:

For Toxic Gases

```
          <gas> SENSOR
        SPAN CALIBRATION
    INJECT <_> ppm <CALGAS>
                      EXIT
```

This screen will remain on until the instrument detects calibration gas. If no calibration gas is detected after thirty (30) seconds, the instrument will sound a single beep and return to the operating mode.

Depressing the "EXIT" pushbutton will also return the instrument to normal operation with no calibration having occurred. The last successful calibration will remain valid.

To continue "SPAN CALIBRATION", attach the 40014936 Calibration Adapter over the sensor cap as shown in Figure 4.

FIGURE 4
CALIBRATION ADAPTER

Attach the hose of the Adapter to the calibration gas cylinder and begin flowing gas to the cap at a flow rate of 500 cc/min. (300 cc/min. for Cl_2 and ClO_2). When the instrument detects the gas, the display will change to one of the following screens:

For Toxic Gases

```
          <gas> SENSOR

        SPAN CALIBRATION

          <time> seconds
```

The display will count down <seconds> (See chart below for applicable sensor) after which the instrument will display the message "SPAN CALIBRATION PASSED ACKNOWLEDGE". Press either button to return to the Operating Mode showing the gas concentration. If the user does not acknowledge within 2 minutes, the instrument returns to Operating Mode automatically. In either case, the calibration is accepted as valid. If the calibration gas concentration exceeds the alarm setpoint, the alarm will operate. Turn off the gas supply and remove the Calibration Adapter.

If, during "SPAN CALIBRATION", the unit detects that the sensor is out of range, an error message will be displayed. See Section 7.0 for a description of error messages.

Max. Span Cal Time in Seconds	Applicable Toxic Sensor
300	Ammonia (NH_3)
180	Chlorine(Cl_2)
180	Chlorine Dioxide (ClO_2)
60	Carbon Monoxide (CO 500)
90	Carbon Monoxide (CO 1000)
180	Hydrogen Cyanide (HCN)
60	Hydrogen Sulfide (H_2S 100)
60	Hydrogen Sulfide (H_2S 500)
90	Nitrogen Dioxide (NO_2)
90	Phosphine (PH_3)
120	Sulfur Dioxide (SO_2)

Note: SCOTT INSTRUMENTS supplies Teflon®-lined tubing with all chlorine and ammonia calibration kits. Sticky gases such as chlorine and ammonia require this tubing be used for calibration. Using tubing of another type may inhibit the automatic calibration of a MINI-SA and lead to improper readings or a false failed sensor message. All other calibration kits are supplied with Tygon (R-3603) Tubing.

SCOTT INSTRUMENTS also recommends that the tubing and cylinder regulator used with a specific toxic gas not be used with other gases.

6.5 SENSOR REPLACEMENT MESSAGE

If a successful "AUTO CALIBRATION" reveals that the gas sensor is near the end of its service life, the MINI-SA will display one of the following REPLACE-MENT MESSAGE:

For Toxic Gases

```
WARNING <gas> SENSOR
APPROACHING FAILURE
REPLACE SOON!
ACKNOWLEDGE
```

For O$_2$

```
WARNING OXYGEN SENSOR
APPROACHING FAILURE
REPLACE SOON!
ACKNOWLEDGE
```

The user must "ACKNOWLEDGE" this message by depressing either pushbutton.

WARNING
THIS SCREEN IS FOR INFORMATION ONLY AND IS NOT INTENDED TO BE AN EXACT DETERMINATION OF WHEN A SENSOR WILL FAIL AND REQUIRE REPLACEMENT. THE TIME REMAINING UNTIL A SENSOR FAILS AFTER A REPLACEMENT MESSAGE IS DISPLAYED IS BASED ON MANY FACTORS SUCH AS FREQUENCY OF CALIBRATION, LAST CALIBRATION, FREQUENCY OF USE AND LEVEL OF GAS TO WHICH SENSOR IS EXPOSED. A SENSOR MAY FAIL PRIOR TO DISPLAY OF THE REPLACEMENT MESSAGE.

6.6 PEAK / HOLD MENU

The MINI-SA can be set to display either the lowest and highest gas reading (PEAK) or just the highest toxic gas or lowest oxygen reading (HOLD) during use. To enter the PEAK/HOLD menu, depress the "SELECT" pushbutton when the PEAK/HOLD menu is displayed as described in Section 6.2. The following screen will appear:

```
           SELECT MODE


      PEAK           HOLD
```
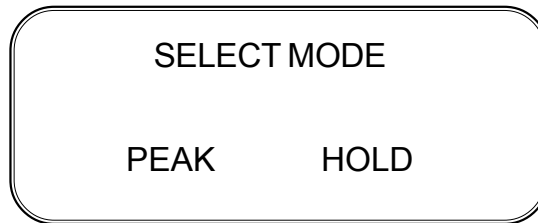
If neither pushbutton is depressed for fifteen (15) seconds after the above display appears, the unit will automatically return to the Operating Mode accompanied by a single "beep".

6.6.1 PEAK

The PEAK feature allows the user to display both the lowest and highest readings that were detected since the instrument was last turned on, or since the readings were last reset.

In the SELECT MODE menu, depress the "PEAK" pushbutton. Then one of the following screens will appear for fifteen (15) seconds displaying the highest reading since instrument turn on:

For Toxic Gases

```
        PEAK <gas> LEVEL
         MAX = <_>  ppm
       RESET            SHOW
       PEAK             PEAK
```

For O_2

```
        PEAK O₂ LEVEL
         MAX = 20.9%
         MIN  = 20.2%
       RESET            SHOW
       PEAK             PEAK
```
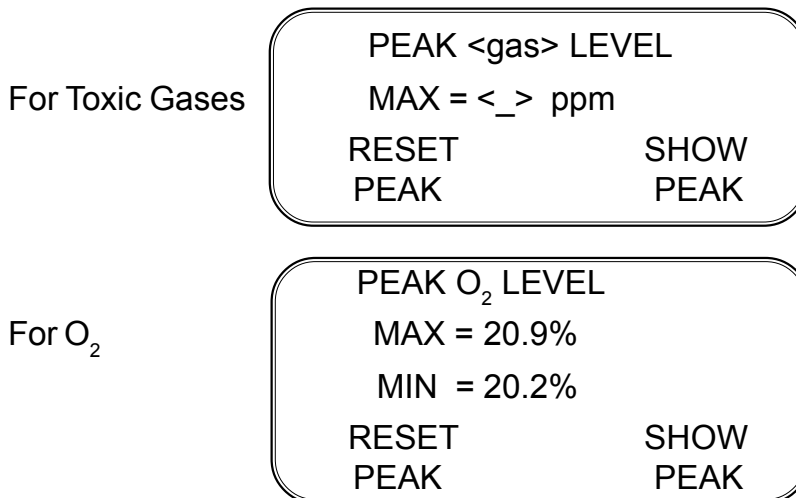
If neither the "RESET PEAK" or "SHOW PEAK" pushbutton is depressed, the unit will return to the Operating Mode accompanied by a single "beep".

If the "SHOW PEAK" pushbutton is depressed, the instrument will return to the Operating Mode and display the peak values as follows on the appropriate screen:

23

For Toxic Gases

```
                 4    ppm
                     <gas>


          MAX = <_> ppm
         ▼  MENU              ✳
```

For O$_2$

```
               20   %
                    O$_2$
          MAX = 21.5 %
          MIN = 20.9 %
         ▼  MENU              ✳
```

Current and peak readings update continuously while this screen is displayed.

If the PEAK menu is accessed from a peak reading display, the option "SHOW PEAK" will read "HIDE PEAK" instead, as follows:

For Toxic Gases

```
        PEAK <gas>  LEVEL
            MAX =<_> ppm
       RESET              HIDE
       PEAK               PEAK
```

For O$_2$

```
         PEAK O$_2$  LEVEL
         MAX =20.9 %
         MIN = 20.2%
       RESET              HIDE
       PEAK               PEAK
```

Selecting "HIDE PEAK" will return the display to the standard Operating Mode screen with only the current reading displayed. The "SHOW PEAK" function is latching and will not change by turning the instrument OFF.

To reset the peak value, depress the "RESET PEAK" pushbutton in the PEAK menu. This will reset the MAX value to the current ambient reading. Turning the instrument O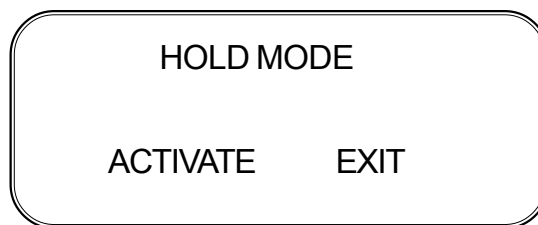FF will also RESET the PEAK value the next time the unit is turned ON. The PEAK value will continue to be displayed until "HIDE PEAK" is selected in the PEAK menu.

NOTE: After an Alarm Condition occurs and the Audible Alarm is silenced as instructed in Section 4.0, the instrument will automatically change to the "SHOW PEAK" display to inform the user of the actual level responsible for the alarm condition. To return to the standard operating screen, depress the pushbutton under "HIDE PEAK," which appears in place of "MENU."

6.6.2   HOLD

The HOLD feature displays the highest toxic gas or the lowest oxygen concentration detected while the MINI-SA instrument is in the "HOLD MODE".

To activate the "HOLD MODE", return to the "PEAK/HOLD" menu and select the "HOLD" pushbutton. The following screen will be displayed:

```
┌─────────────────────────────────┐
│                                 │
│          HOLD MODE              │
│                                 │
│                                 │
│      ACTIVATE      EXIT         │
│                                 │
└─────────────────────────────────┘
```

Depress the "ACTIVATE" pushbutton to turn on the HOLD feature. The "EXIT" pushbutton will return to the Operating Mode without activating the HOLD feature.

In the "HOLD MODE", the instrument will continually update and display the highest toxic gas or lowest oxygen reading. One of the following screens will appear with the words "HOLD ACTIVATED" flashing:

For Toxic Gases
```
┌─────────────────────────────────┐
│          0      ppm             │
│                 <gas>           │
│        HOLD ACTIVATED           │
│        RESET           ☀        │
└─────────────────────────────────┘
```

For O$_2$
```
┌─────────────────────────────────┐
│        20.9     %               │
│                 O$_2$            │
│        HOLD ACTIVATED           │
│        RESET           ☀        │
└─────────────────────────────────┘
```
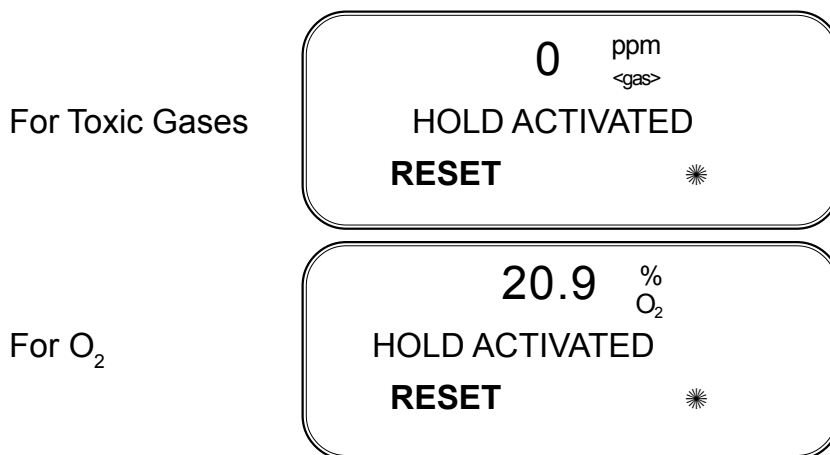
Depress the "RESET" pushbutton to turn off the HOLD feature and return the unit to the standard Operating Mode.

Note: The HOLD and PEAK function automatically reset when the calibration menu is entered.

6.7 ALARM SETPOINT MENU

The "ALARM SETPOINT" can be adjusted by the user in the ALARM SETPOINT menu within the following ranges:

CO = 5 to 250 ppm

Cl_2 = 0.1 to 10.0 ppm

ClO_2 = 0.10 to 2.00 ppm

HCN = 0.1 to 50.0 ppm

H_2S = 5 to 100 ppm

NH_3 = 5 to 100 ppm

NO_2 = 0.2 to 5.0 ppm

O_2 LO = 0.0 to 21.0%

O_2 HI = 21.0 to 25.0%

PH_3 = 0.10 to 5.00 ppm

SO_2 = 0.5 to 20.0 ppm

Very low oxygen alarm settings are useful when the instrument is used to verify nitrogen purging. On leaving the setpoint function or on subsequent power on, the user will be prompted to verify the safety of abnormally low settings

To enter the ALARM SETPOINT menu, depress the "SELECT" pushbutton in the menu selection screen as described in Section 6.2 above. One of the following ALARM SETPOINT menu screens will appear:

For Toxic Gases

```
      <gas> ALARM SETPOINT
         HI ALARM = <_> ppm
   CHANGE                OK
```

For O_2

```
       ALARM SETPOINT
       HI ALARM = 23.5%
       LO ALARM = 19.5%
   CHANGE                OK
```

The setpoint shown is the factory default setting. If acceptable, depress

the "OK" pushbutton to return to the Operating Mode.

To change the setpoint, depress the "CHANGE" pushbutton. One of the following screens will be displayed:

For Toxic Gases

```
<gas> ALARM SETPOINT

  HI ALARM = <_ >ppm

UP              DOWN
```

For O_2

```
  CHANGE O₂ ALARM

HI ALARM = 23.5%

LO ALARM = 19.5%

LO              HI
```

For toxic gases, choose "UP" or "DOWN" to change the corresponding "ALARM SETPOINT". For example, choose "UP" and one of the following screens will appear:

For Toxic Gases

```
<gas> ALARM SETPOINT

  HI ALARM = <_ >ppm

UP              SET
```

Choose "DOWN" and one of the following screens will appear:

For Toxic Gases

```
<gas> ALARM SETPOINT

  HI ALARM = <_ >ppm

DOWN              SET
```

The ppm value will flash while either of these screens is displayed. Each time the "UP" or "DOWN" pushbutton is depressed, the setpoint will be changed by 1 ppm. Holding the pushbutton automatically repeats the action.

For oxygen, choose "LO" or "HI" to change the corresponding "ALARM SETPOINT". For example, choose "LO" and the following screen will appear:

For O_2

```
┌─────────────────────────────┐
│      CHANGE O₂ ALARM        │
│     LO ALARM  = 19.5 %      │
│                             │
│     UP           DOWN       │
└─────────────────────────────┘
```

To raise or lower this setpoint, select the "UP" or "DOWN" command. For example, choose "DOWN" and the following screen will appear:

For O_2

```
┌─────────────────────────────┐
│      CHANGE O₂ ALARM        │
│     LO ALARM  = 19.5 %      │
│     DOWN            SET      │
└─────────────────────────────┘
```

The % value will flash while this screen is displayed. Each time the "DOWN" pushbutton is depressed, the setpoint will be decreased by 0.1%. If the "UP" pushbutton had been chosen, the value would be increased by 0.1% each time the pushbutton was depressed.

The operation of the "HI" setpoint is exactly the same as for the "LO". Remember the "Oxygen LOW ALARM SETPOINT" is adjustable in increments of 0.1% from 0% to 21.0%, and the "Oxygen HIGH ALARM SETPOINT" is adjustable in increments of 0.1% from 21.0% to 25.0%.

For all sensors, when the desired setpoint is reached, depress the "SET" pushbutton. If the "SET" pushbutton is not depressed while in this screen, after fifteen (15) seconds the unit will automatically revert back to the previous setpoint.

If the "SET" pushbutton is depressed, the "ALARM SETPOINT" screen will reappear and display the new setpoints in one of the following screens:

For Toxic Gases

```
┌─────────────────────────────┐
│     <gas> ALARM SETPOINT    │
│      HI ALARM = <_>  ppm     │
│      CHANGE          OK      │
└─────────────────────────────┘
```

For O_2

```
┌─────────────────────────────┐
│      O₂  ALARM SETPOINT     │
│     HI ALARM = 22.0%        │
│     LO ALARM = 18.5%        │
│     CHANGE          OK      │
└─────────────────────────────┘
```

28

Depressing the "OK" pushbutton will display one of the following screens:

For Toxic Gases

```
        <gas> ALARM


      NON-LATCHING
   LATCH              OK
```

For O$_2$

```
         O$_2$ ALARM


      NON-LATCHING
   LATCH               OK
```
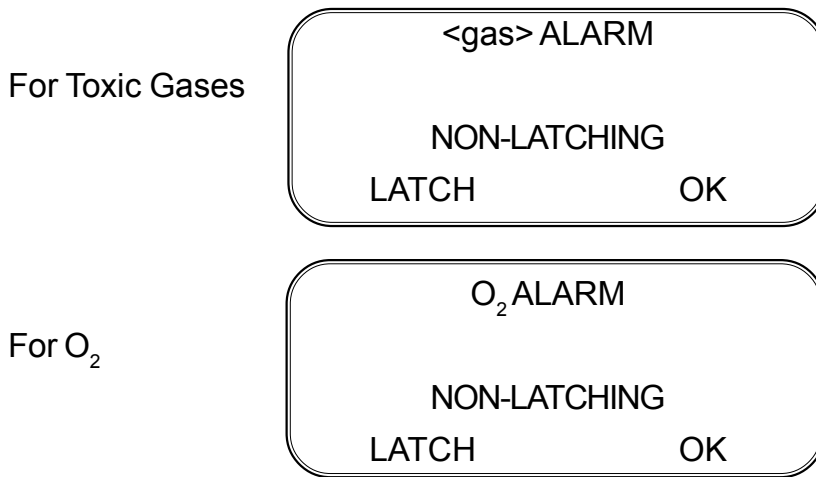
The status of the alarms will be displayed as "NON-LATCHING" or "LATCHING". Status can be changed by depressing the left pushbutton. Depress the "OK" pushbutton to leave the status as indicated. If neither pushbutton is selected, after fifteen (15) seconds the unit will automatically return to the Operating Mode with the new alarm setpoints in effect and the alarms at the status indicated.

Note: The instrument will not operate using any new setpoint for determining an alarm condition until it returns to the operating mode after a setpoint has been changed.

While in the setpoint menu the instrument remains operational. If an alarm condition occurs, the instrument will override the setpoint menu and display the alarm as appropriate. The changed setpoint will not take effect and the previous settings will be reestablished.

No user menu's can be accessed when a instrument is in an alarm condition until the unit is turned "OFF". When turned back "ON", if an alarm state occurs during the first minute of operation, all user menu's are accessible.

6.8 TWA / STEL MENU (TOXIC GASES ONLY)

The SCOTT INSTRUMENTS MINI-SA has factory preset "TWA/STEL" alarms. When the values for these alarms are exceeded, the instrument alarm will activate as described in Section 4.0. The TWA (Time Weighted Average) function of the instrument averages the level of toxic gas over an eight (8) hour period and alarms when the preset TWA value of in parts per million is exceeded.

The STEL (Short Term Exposure Level) function measures the level of toxic gas during a fifteen (15) minute interval and alarms when the preset STEL value in parts per million is exceeded. The alarm levels are as follows:

	STEL	TWA
Ammonia	35 ppm	25 ppm
Carbon monoxide	100 ppm	25 ppm
Chlorine	1 ppm	0.5 ppm
Chlorine Dioxide	0.3 ppm	0.1 ppm
Hydrogen Cyanide	4.0 ppm	2.0 ppm
Hydrogen sulfide	15 ppm	10 ppm
Nitrogen Dioxide	5.0 ppm	3.0 ppm
Phosphine	1 ppm	0.3 ppm
Suphur Dioxide	5 ppm	2 ppm

To enter the TWA/STEL Menu, depress the "SELECT" pushbutton as described in Section 6.2 when the TWA/STEL Menu screen is displayed. The instrument will display one of the following screens:

For Toxic Gases

```
       <gas> TWA/STEL MENU
     STEL = 0 ppm
     TWA =  0 ppm @ 0:05
    RESET              SHOW
    DISABLE        TWA/STEL
```

STEL and TWA values are calculated. STEL averages exposure for the latest fifteen (15) minutes. TWA shows the eight-hour average exposure. Both measures start from zero when the instrument is turned on. The TWA reading accumulates total exposure since turn-on or "RESET" and is calculated as if the total exposure occurred in a standard eight-hour shift.

The "RESET/DISABLE" pushbuttons allows the user to reset the values and time on the display to "0". One of following screens will be displayed when the "RESET/DISABLE" pushbuttons are depressed:
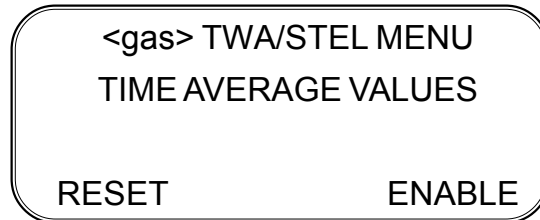
For Toxic Gases

```
       <gas> TWA/STEL MENU
       TIME AVERAGE VALUES


    RESET              DISABLE
```

30

Depressing the "RESET" pushbutton will reset the TWA value, the STEL value, and time all to "0". The instrument will automatically go back into the Operating Mode and begin collecting measurement data.

The "DISABLE" pushbutton turns off the TWA/STEL functions. If the TWA/STEL functions are off, one of the following screens will be displayed:
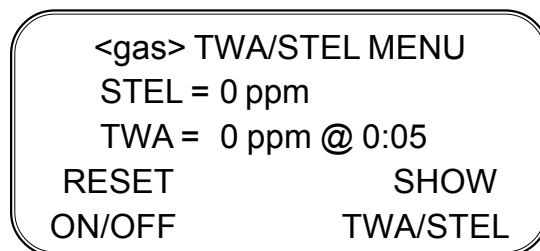
For Toxic Gases

```
┌─────────────────────────────────┐
│      <gas> TWA/STEL MENU         │
│       TIME AVERAGE VALUES        │
│                                  │
│                                  │
│   RESET              ENABLE      │
└─────────────────────────────────┘
```

Depress the "RESET" pushbutton to go back to the Operating Mode. Depress the "ENABLE" pushbutton to turn on the TWA/STEL functions.

When the TWA/STEL functions are enabled, selecting the TWA/STEL Menu as described in Section 6.2 will display one of the following screens:
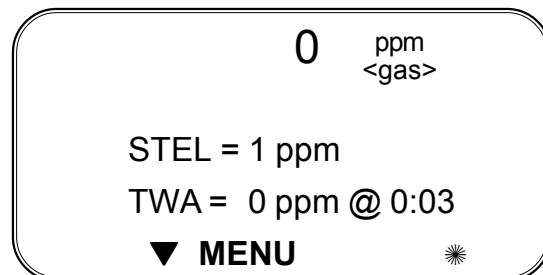
For Toxic Gas

```
┌─────────────────────────────────┐
│      <gas> TWA/STEL MENU         │
│       STEL = 0 ppm               │
│        TWA =  0 ppm @ 0:05       │
│     RESET             SHOW       │
│    ON/OFF           TWA/STEL     │
└─────────────────────────────────┘
```

Depress the "SHOW TWA/STEL" pushbutton to display the STEL and TWA values on the Operating Mode screen in real time in one of the following screens:

For Toxic Gases

```
┌─────────────────────────────────┐
│             0     ppm            │
│                  <gas>           │
│                                  │
│       STEL = 1 ppm               │
│       TWA =  0 ppm @ 0:03        │
│        ▼ MENU          ※         │
└─────────────────────────────────┘
```

To turn off the TWA/STEL display, go back to the TWA/STEL MENU. The screen will now show "HIDE TWA/STEL" over the right pushbutton. Select this pushbutton and the standard Operating Mode screen will appear.

The TWA/STEL data measurement functions will be reset by turning off the instrument whether the function is enabled or disabled.

6.9 CONFIGURATION MENU

The CONFIGURATION menu of the SCOTT INSTRUMENTS MINI-SA provides the user with the following two (2) optional features:

- BATTERY SAVER mode can extend operational battery life to several hundred hours by turning off the instrument graphic display during normal non-alarm operation.

- PASSWORD PROTECTION menu can be used to lock out all menus except ZERO CALIBRATION for toxic gas sensors or AUTO CALIBRATION for an oxygen sensor, preventing unauthorized users from changing instrument settings.

6.9.1 BATTERY SAVER MODE

The BATTERY SAVER mode extends the operational life of the batteries by turning off the graphic display when it is not needed. To use this feature, depress the "SELECT" pushbutton when the CONFIGURATION menu screen is displayed as described in section 6.2. The following screen will appear:

```
           CONFIGURATION

    BATTERY        PASSWORD
     SAVER           MENU
```
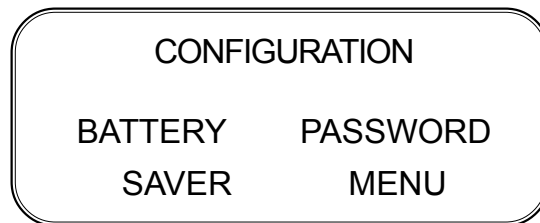
Depress the "BATTERY SAVER" pushbutton and the following screen will appear:

```
          CONFIGURATION
        ENABLE BATTERY
          SAVER MODE?
       YES            NO
```
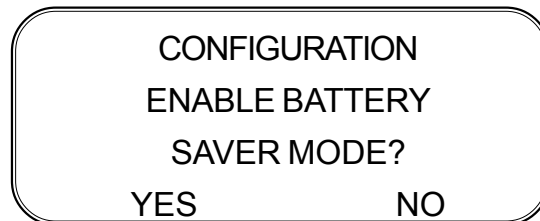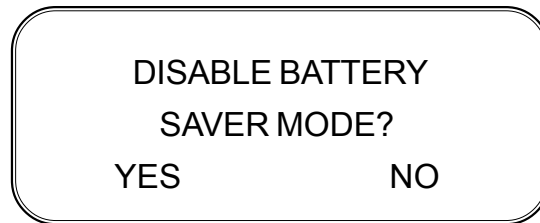
Depress the "YES" pushbutton to enable the BATTERY SAVER mode. When the BATTERY SAVER mode is enabled, the MINI-SA will beep once and the Operating Mode screen will appear. To the right of the the battery level indicator three (3) vertical plus signs (+) will appear, which signify that the BATTERY SAVER mode is enabled. After thirty (30) seconds, the instrument will beep once and the graphic display will go blank. While the graphic display is blank, the Green Status LED will flash at an increased rate of once every five (5) seconds.

While the BATTERY SAVER mode is on, depressing either pushbutton will turn on the graphic display for thirty (30) seconds.

If an alarm condition occurs while in the BATTERY SAVER mode, the graphic display will come on automatically and remain on until the alarm is reset. After the alarm indication clears, the graphic display will remain on for thirty (30) seconds and then the display will go blank as described above.

If the BATTERY SAVER mode had already been enabled , the graphic display will show the following:
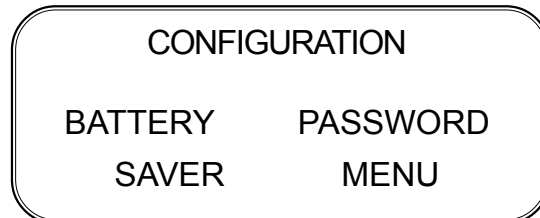
```
 _____
|                                |
|        DISABLE BATTERY         |
|         SAVER MODE?            |
|     YES              NO        |
|_____|
```

Depressing the "YES" pushbutton will turn off the BATTERY SAVER mode.
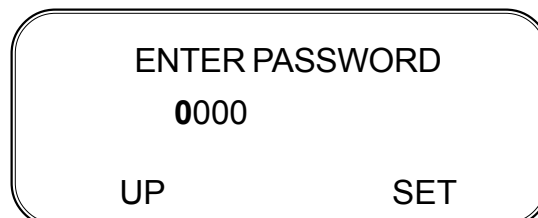
6.9.2 PASSWORD PROTECTION

The PASSWORD PROTECTION menu is intended to be used by authorized personnel for the purpose of locking out the menus to prevent changes to the instrument settings. A four digit numeric password can be set up to restrict access to all menus except AUTO CALIBRATION or ZERO CALIBRATION. To use this feature, depress the "SELECT" pushbutton when the CONFIGURATION MENU screen is displayed as described in section 6.2. The following screen will appear:

```
 _____
|                                |
|        CONFIGURATION           |
|                                |
|   BATTERY       PASSWORD       |
|    SAVER          MENU         |
|_____|
```

Depress the "PASSWORD MENU" pushbutton and the following screen will appear:

```
 _____
|                                |
|        ENTER PASSWORD          |
|           0000                 |
|                                |
|    UP               SET        |
|_____|
```

Use the "UP" and "SET" push-buttons to enter the correct password. (The MINI-SA comes from the factory with the default password: 1234.) Entering an incorrect password will display an INCORRECT PASSWORD message and allow the user to enter the password again. When the correct password

has been entered, the instrument will display the following screen:

```
┌─────────────────────────────────┐
│      PASSWORD PROTECTION         │
│      FOR ADVANCED MENUS          │
│   TURN              CHANGE       │
│   ON                PASSWORD     │
└─────────────────────────────────┘
```

The MINI-SA is shipped from the factory with password protection off. The "TURN ON" pushbutton will bring up the following display:

```
┌─────────────────────────────────┐
│      PASSWORD PROTECTION         │
│       LOCK OUT ACCESS TO         │
│        ADVANCED MENUS?           │
│     YES              NO          │
└─────────────────────────────────┘
```

Pressing "NO" returns the instrument to normal operation with no password required to use all menu functions. Pressing "YES" returns the instrument to normal operation with the password required to access any menu except ZERO CALIBRATION for toxic gas sensors or AUTO CALIBRATION for an oxygen sensor. Until the instrument is turned off and then on, all menus will remain accessible.

After the instrument is turned off and then on, when scrolling through the menus as described in section 6.2, the following screen will appear after the AUTO CALIBRATION or ZERO CALIBRATION menu:

```
┌─────────────────────────────────┐
│      PASSWORD REQUIRED           │
│      FOR ADVANCED MENUS          │
│                     ENTER        │
│    EXIT             PASSWORD     │
└─────────────────────────────────┘
```

To disable the PASSWORD PROTECTION choose the "ENTER PASSWORD" pushbutton when the above screen appears. The instrument will display the following screen:

```
┌─────────────────────────────────┐
│       ENTER PASSWORD             │
│          0000                    │
│                                  │
│     UP              SET          │
└─────────────────────────────────┘
```

Use the "UP" and "SET" push-buttons to enter the correct password. Entering the incorrect password will display an INCORRECT PASSWORD message and allow the user to enter the password again. When the correct password has been entered, the instrument will display the following screen:

```
╭─────────────────────────────────╮
│     PASSWORD PROTECTION          │
│     FOR ADVANCED MENUS           │
│   TURN            CHANGE          │
│   OFF             PASSWORD        │
╰─────────────────────────────────╯
```

Depress the "TURN OFF" pushbutton and the instrument will display the menus as described in section 6.2.

The PASSWORD menu in the CONFIGURATION menu will still require that the password be properly entered to change the password and/or turn on the PASSWORD PROTECTION feature after it has been turned off.
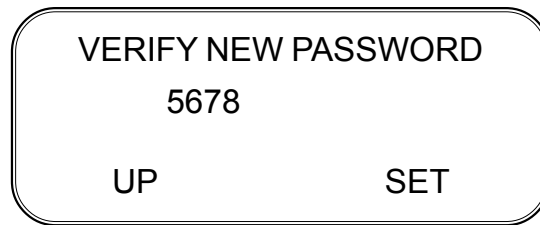
To change a password, navigate through the CONFIGURATION menu to the PASSWORD menu:

```
╭─────────────────────────────────╮
│     PASSWORD PROTECTION          │
│     FOR ADVANCED MENUS           │
│   TURN            CHANGE          │
│   ON              PASSWORD        │
╰─────────────────────────────────╯
```

Depress the "CHANGE PASSWORD" pushbutton. The following display will appear with the first digit flashing:

```
╭─────────────────────────────────╮
│     ENTER NEW PASSWORD           │
│          0000                    │
│                                  │
│     UP              SET          │
╰─────────────────────────────────╯
```

Depressing the "UP" pushbutton will increase the value of the flashing digit from 0 through 9. Depressing the "SET" pushbutton will set the digit and advance to the next digit. For example, we will set the password to "5678". When the fourth digit (number 8) has been set by depressing the "SET" pushbutton, the display will change to the following screen:

```
┌─────────────────────────────────┐
│      VERIFY NEW PASSWORD        │
│            5678                 │
│                                 │
│      UP              SET        │
└─────────────────────────────────┘
```

Note: If the pushbutton is not depressed within fifteen (15) seconds, the instrument will beep once and automatically go back to the operating mode and the password will be unchanged.

If you wish to change the password shown in the VERIFY NEW PASS-WORD screen, depress the "CHANGE" pushbutton. The previous ENTER NEW PASSWORD screen will appear and changes can be made. **Be sure to record the password in a safe pace for future use.**

NOTES:

1.   The MINI-SA comes from the factory with the default password "1234".

2.   To insure the integrity of the PASSWORD PROTECTION feature of the MINI-SA, only SCOTT INSTRUMENTS Sales Representatives and Service Departments will be authorized to enter a master password to access the MINI-SA menus in the event the password entered by the user is lost. If assistance is required, contact your SCOTT INSTRUMENTS Sales Representative or Service Department with the serial number of the instrument in question.

7.0 ERROR MESSAGES

WARNING

A SCOTT INSTRUMENTS MINI-SA INSTRUMENT THAT DISPLAYS ANY ERROR MESSAGE MUST BE REMOVED FROM SERVICE IMMEDIATELY AND THE FAILURE DIAGNOSED AND REPAIRED BY AUTHORIZED PERSONNEL. DO NOT ASSUME THAT A PROBLEM HAS CORRECTED ITSELF IF A PREVIOUSLY DISPLAYED ERROR MESSAGE DOES NOT APPEAR A SECOND TIME.

During calibration, if the SCOTT INSTRUMENTS MINI-SA detects a sensor with insufficient output to be calibrated, the following screen will appear:

For Toxic Gases

```
        <gas> SENSOR
      SPAN CALIBRATION
            FAILURE
   TURN OFF       RECAL
```

For O$_2$

```
       OXYGEN SENSOR
      SPAN CALIBRATION
            FAILURE
   TURN OFF       RECAL
```

If one of these screens appears, verify that the proper gas is flowing to the instrument and all fittings are properly connected. Then press "RECAL" to attempt the calibration again. If calibration is not successful, press "TURN OFF" and service the instrument as needed.

On subsequent power on, the INITIALIZING line on the first screen displayed (SCOTT INSTRUMENTS MINI-SA...) will be replaced with CALIBRATION REQUIRED, until the instrument is successfully recalibrated. This may require replacing the sensor.

8.0 CALIBRATION GASES

Contact your SSCOTT INSTRUMENTS distributor, sales representative, or the SCOTT INSTRUMENTS Service Center for information regarding availability of Calibration Gases and accessories for the SCOTT INSTRUMENTS MINI-SA Portable Gas Detection Instrument.

Calibration eguipment from SCOTT INSTRUMENTS:

Calibration Kits (Including gas cylinder, regulator, cal adapter and tubing)

P/N 096-2389   25 ppm H_2S
P/N 096-2390   50 ppm CO
P/N 096-2391   18.5% O_2
P/N 096-2656   5 ppm Cl_2
P/N 096-2658   1 ppm PH_3
P/N 096-2660   25 ppm NH_3
P/N 096-2662   10 ppm SO_2
P/N 096-2893   10 ppm HCN
P/N 096-2894   5 ppm NO_2

Replacement Cylinders

P/N 077-0272   25 ppm H_2S
P/N 077-0273   50 ppm CO
P/N 077-0274   18.5% O_2
P/N 077-0276   10 ppm SO_2
P/N 077-0277   25 ppm NH_3
P/N 077-0278   10 ppm HCN
P/N 077-0279   5 ppm Cl_2
P/N 077-0280   5 ppm NO_2
P/N 077-1239   1 ppm PH_3

9.0 SPECIFICATIONS

HYDROGEN SULFIDE SPECIFICATIONS

Range:
        0 to 100 ppm (for H_2S 100)
        0 to 500 ppm (for H_2S 500)
Response Time:
        T90 < 30 seconds
Operating Temperature Range:
        -40 to +50 $^\circ$C
        (-40 to +122 $^\circ$ F)
Graphic Display Temperature Range:
        -10 to +60 $^\circ$C
        (+14 to +140 $^\circ$ F)
Operating Humidity:
        15 to 90% RH, Non-Condensing
Recommended Storage Temperature:
        0 to 20 $^\circ$C
        (32 to 68 $^\circ$F)
Sensor Accuracy:
        ±3% of Applied Gas
Linearity:
        ±3% of Full Scale
Battery Life:
        About 100 Hours - Non-Alarming
        About 800 Hours in Battery Save Mode
Sensor Cross Sensitivity:
        Carbon Monoxide at 300 ppm: < 2 ppm
        Sulfur Dioxide, 5 ppm: $\approx$ - 1 ppm
        Nitric Oxide, 35 ppm: < 0.7 ppm
        Hydrogen, 10000 ppm: < 10 ppm
        Nitrogen Dioxide, 5 ppm: $\approx$ - 1 ppm

Consult Factory for additional information.

CARBON MONOXIDE SPECIFICATIONS

Range:
> 0 to 500 ppm (for CO 500)
> 0 to 999 ppm (for CO 999)

Response Time:
> T90 < 25 seconds

Operating Temperature Range:
> -20 to +50 $^{\circ}$C
> (-4 to +122 $^{\circ}$F)

Graphic Display Temperature Range:
> -10 to +60 $^{\circ}$C
> (+14 to +140 $^{\circ}$F)

Operating Humidity:
> 15 to 90% RH, Non-Condensing

Recommended Storage Temperature:
> 0 to 20 $^{\circ}$C
> (32 to 68 $^{\circ}$F)

Sensor Accuracy:
> ±3% of Applied Gas

Linearity:
> ±3% of Full Scale

Battery Life:
> About 100 Hours - Non-Alarming
> About 800 Hours in Battery Save Mode

Sensor Cross Sensitivity:
> Filtered against H_2S, 15 ppm: < 0.5 ppm
> Filtered against SO_2, 5 ppm $\approx$ 0 ppm
> Nitric Oxide, 35 ppm: < 3 ppm
> Nitrogen Dioxide, 5 ppm: $\approx$ - 1 ppm
> Chlorine, 1 ppm $\approx$ 0 ppm
> Hydrogen, 100 ppm: < 40 ppm
> Ethylene, 100 ppm: < 50 ppm
> Ethanol, 200 ppm: $\approx$ 0 ppm

Consult Factory for additional information.

SULPHUR DIOXIDE SPECIFICATION

Range:
　　　　0.0 to 99.9 ppm
Response Time:
　　　　T90 < 35 seconds
Operating Temperature Range:
　　　　-20 to +50 $^{\circ}$C
　　　　(-4 to +122 $^{\circ}$F)
Graphic Display Temperature Range:
　　　　-10 to +60 $^{\circ}$C
　　　　(+14 to +140 $^{\circ}$F)
Operating Humidity:
　　　　15 to 90% RH, Non-Condensing
Recommended Storage Temperature:
　　　　0 to 20 $^{\circ}$C
　　　　(32 to 68 $^{\circ}$F)
Sensor Accuracy:
　　　　±3% of Applied Gas
Linearity:
　　　　±3% of Full Scale
Battery Life:
　　　　About 100 Hours - Non-Alarming
　　　　About 800 Hours in Battery Save Mode
Sensor Cross Sensitivity:
　　　　Carbon Monoxide at 300 ppm: < 3 ppm
　　　　Hydrogen Sulfide, 15 ppm: 0 ppm
　　　　Nitric Oxide, 35 ppm: 0 ppm
　　　　Nitrogen Dioxide, 5 ppm: $\approx$ - 5 ppm

Consult Factory for additional information.

PHOSPHINE SPECIFICATIONS

Range:
  0.00 to 9.99 ppm
Response Time:
  T90 < 30 seconds
Operating Temperature Range:
  -20 to +50 $^\circ$C
  (-4 to +122 $^\circ$F)
Graphic Display Temperature Range:
  -10 to +60 $^\circ$C
  (+14 to +140 $^\circ$F)
Operating Humidity:
  15 to 90% RH, Non-Condensing
Recommended Storage Temperature:
  0 to 20 $^\circ$C
  (32 to 68 $^\circ$F)
Sensor Accuracy:
  ±3% of Applied Gas
Linearity:
  ±3% of Full Scale
Battery Life:
  About 100 Hours - Non-Alarming
  About 800 Hours in Battery Save Mode
Sensor Cross Sensitivity:
  Arsine at 150 ppb: 100 ppb
  Silane, 1000 ppb: 900 ppb
  Diborane, 300 ppb: 105 ppb
  Germane Dioxide, 600 ppb: 550 ppb
  Sulphur Dioxide, 5 ppm: 1 ppm
  Hydrogen, 1000 ppm: 1 ppm
  Ethylene, 100 ppm: 1 ppm
  Carbon Monoxide, 1000 ppm: 5 ppm

Consult Factory for additional information.

CHLORINE SPECIFICATION

Range:
>0.0 to 99.9 ppm

Response Time:
>T80 < 60 seconds

Operating Temperature Range:
>-20 to +50 $^{\circ}$C
>(-4 to +122 $^{\circ}$F)

Graphic Display Temperature Range:
>-10 to +60 $^{\circ}$C
>(+14 to +140 $^{\circ}$F)

Operating Humidity:
>15 to 90% RH, Non-Condensing

Recommended Storage Temperature:
>0 to 20 $^{\circ}$C
>(32 to 68 $^{\circ}$F)

Sensor Accuracy:
>±3% of Applied Gas

Linearity:
>±3% of Full Scale

Battery Life:
>About 100 Hours - Non-Alarming
>About 800 Hours in Battery Save Mode

Sensor Cross Sensitivity:
>Carbon Monoxide at 300 ppm: 0 ppm
>Hydrogen Sulfide, 15 ppm: -3 to 0 ppm
>Sulphur Dioxide, 5 ppm: 0 ppm
>Nitric Oxide, 35 ppm: 0 ppm

Consult Factory for additional information.

AMMONIA SPECIFICATIONS

Range:
> 0 to 200 ppm

Response Time:
> T90 < 150 seconds

Operating Temperature Range:
> -25 to +30 $^{\circ}$C
> (-13 to +86 $^{\circ}$F)

Graphic Display Temperature Range:
> -10 to +60 $^{\circ}$C
> (+14 to +140 $^{\circ}$F)

Operating Humidity:
> 15 to 90% RH, Non-Condensing

Recommended Storage Temperature:
> 0 to 20 $^{\circ}$C
> (32 to 68 $^{\circ}$F)

Sensor Accuracy:
> ±3% of Applied Gas

Linearity:
> ±3% of Full Scale

Battery Life:
> About 100 Hours - Non-Alarming
> About 800 Hours in Battery Save Mode

Sensor Cross Sensitivity:
> Carbon Monoxide at 300 ppm: 0 ppm
> Hydrogen Sulfide, 15 ppm: $\approx$ 15 ppm
> Sulpher Dioxide, 5 ppm: $\approx$ 4 ppm
> Nitric Oxide, 35 ppm: $\approx$ 7 ppm
> Nitrogen Dioxide, 5 ppm: 0 ppm
> Chlorine, 1 ppm $\approx$ -0.5 ppm
> Hydrogen, 200 ppm: 0 ppm
> Hydrogen Cyanide, 10 ppm: $\approx$ 0.5 ppm
> Hydrogen Chloride, 5 ppm: 0 ppm
> Ethylene, 100 ppm: 0 ppm

Consult Factory for additional information.

CHLORINE DIOXIDE SPECIFICATION

Range:
        0.00 to 2.00 ppm
Response Time:
        T80 < 60 seconds
Operating Temperature Range:
        -20° to +50 $^{\circ}$C
        (-4° to +122° F)
Graphic Display Temperature Range:
        -10 to +60 $^{\circ}$C
        (+14 to +140 $^{\circ}$ F)
Operating Humidity:
        15 to 90% RH, Non-Condensing
Recommended Storage Temperature:
        0 to 20 $^{\circ}$C
        (32 to 68 $^{\circ}$F)
Sensor Accuracy:
        ±3% of Applied Gas
Linearity:
        ±3% of Full Scale
Battery Life:
        About 100 Hours - Non-Alarming
        About 800 Hours in Battery Save Mode
Sensor Cross Sensitivity:
        Chlorine at 3 ppm: 1 ppm
        Carbon Monoxide at 300 ppm: 0 ppm
        Hydrogen Sulfide, 15 ppm: -3 to 0 ppm
        Sulphur Dioxide, 5 ppm: 0 ppm
        Nitric Oxide, 35 ppm: 0 ppm

Consult Factory for additional information.

OXYGEN SPECIFICATIONS

Range:
        0.0 to 25.0%
Response Time:
        T95 = 15 seconds
Operating Temperature Range:
        -20 to +50 $^{\circ}$C
        (-4 to +122 $^{\circ}$F)
Graphic Display Temperature Range:
        -10 to +60 $^{\circ}$C
        (+14 to +140 $^{\circ}$F)
Operating Humidity:
        0 to 99% RH, Non-Condensing
Recommended Storage Temperature:
        0 to 20 $^{\circ}$C
        (32 to 68 $^{\circ}$F)
Sensor Accuracy:
        ±3% of Applied Gas
Linearity:
        ±2% of Full Scale
Battery Life:
        About 100 Hours - Non-Alarming
        About 800 Hours in Battery Save Mode

Consult Factory for additional information.

HYDROGEN CYANIDE SPECIFICATION

Range:
>100 ppm

Response Time:
>T90 < 200 seconds

Operating Temperature Range:
>-20° to +50 $^{\circ}$C
>(-4° to +122° F)

Graphic Display Temperature Range:
>-10 to +60 $^{\circ}$C
>(+14 to +140 $^{\circ}$ F)

Operating Humidity:
>15 to 90% RH, Non-Condensing

Recommended Storage Temperature:
>0 to 20 $^{\circ}$C
>(32 to 68 $^{\circ}$F)

Sensor Accuracy:
>±3% of Applied Gas

Linearity:
>±3% of Full Scale

Battery Life:
>About 100 Hours - Non-Alarming
>About 800 Hours in Battery Save Mode

Sensor Cross Sensitivity:
>Carbon Monoxide at 300 ppm: <15 ppm
>Hydrogen Sulfide, 15 ppm: ≈ 90 ppm
>Sulpher Dioxide, 20 ppm: <75 ppm
>Nitric Oxide, 35 ppm: <0 ppm
>Nitrogen Dioxide, 5 ppm: < -10 ppm
>Ethylene, 100 ppm: <25 ppm

Consult Factory for additional information.

NITROGEN DIOXIDE SPECIFICATIONS

Range:
        150 ppm
Response Time:
        T90 < 25 seconds
Operating Temperature Range:
        -20 to +50 $^{\circ}$C
        (-4 to +122 $^{\circ}$F)
Graphic Display Temperature Range:
        -10 to +60 $^{\circ}$C
        (+14 to +140 $^{\circ}$F)
Operating Humidity:
        0 to 90% RH, Non-Condensing
Recommended Storage Temperature:
        0 to 20 $^{\circ}$C
        (32 to 68 $^{\circ}$F)
Sensor Accuracy:
        ±3% of Applied Gas
Linearity:
        ±3% of Full Scale
Battery Life:
        About 100 Hours - Non-Alarming
        About 800 Hours in Battery Save Mode
Sensor Cross Sensitivity:
        Carbon Monoxide at 300 ppm: <15 ppm
        Hydrogen Sulfide, $\approx$ -1.2 ppm
        Sulpher Dioxide, 5 ppm: 0 ppm
        Nitric Oxide, 35 ppm: 0 ppm
        Nitrogen Dioxide, 5 ppm: 0 ppm
        Chlorine, 1 ppm: $\approx$ -1 ppm

Consult Factory for additional information.

NOTES

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

🇬🇧 UK Office
Keison Products,
P.O. Box 2124, Chelmsford, Essex, CM1 3UP, England.
Tel: +44 (0)330 088 0560
Fax: +44 (0)1245 808399
Email: sales@keison.co.uk