

# Contents

<b>Contents</b> _____	1		
<b>Getting Started</b> _____	3		
1.1 Unpacking _____	3		
1.2 Storage _____	3		
1.3 Operational Environment _____	3		
1.4 Registration _____	3		
<b>Powering Your Scout</b> _____	7		
2.1 Alkaline Battery Pack _____	7		
2.2 Lithium Ion Battery Pack _____	8		
2.3 Inductive Battery Charger _____	8		
<b>Rules of Operation</b> _____	9		
<b>Operator Alerts &amp; Messages</b> _____	11		
3.1 Gas Warnings and Alarms _____	11		
3.2 Low Battery _____	11		
3.3 Over-Range Conditions _____	12		
3.4 Negative Gas Readings _____	12		
3.5 Remote Sampling Mode Leak Test _____	12		
3.6 Low Flow Alarm _____	13		
3.7 Shutter Error _____	14		
3.8 Sensor Marginal _____	14		
		3.9 Replace Sensor _____	14
		<b>Operation</b> _____	15
		4.1 Scout's Modes of Operation _____	15
		4.2 Instrument Turn ON / Turn OFF _____	18
		4.2.1 Turning On the Instrument _____	18
		4.2.2 Turning OFF the Instrument _____	19
		4.3 Functional Test _____	20
		4.3.1 Zero Calibration & Oxygen Span	
		Calibration _____	20
		4.3.2 Gas "Bump" Test _____	21
		4.4 Instrument Calibration _____	23
		4.4.1 Zero Calibration & Oxygen Span	
		Calibration _____	24
		4.4.2 Gas Calibration Preparation _____	24
		4.5 Remote Sampling _____	27
		4.5.1 The Sample Probe _____	28
		4.5.2 Sample Tubing _____	28
		4.5.3 Sample Draw Hand Aspirator _____	29
		4.5.4 Integral Sample Pump _____	29

4.5.5 Remote Sampling Procedure \_\_\_\_ 29

4.5.6 Low Flow Alarm \_\_\_\_\_ 31

4.6 STEL / TWA \_\_\_\_\_ 32

4.6.1 What are STEL and TWA Values? 32

4.6.2 Displaying STEL and TWA Alarms 32

4.6.3 About STEL Alarms \_\_\_\_\_ 32

4.6.4 About TWA Alarms \_\_\_\_\_ 33

4.7 Air Free CO Feature \_\_\_\_\_ 33

4.8 Dual-Range Combustibles Sensor \_\_\_\_ 34

4.9 Combustible Leak Detection Mode \_\_\_\_ 35

**Maintenance** \_\_\_\_\_ 37

5.0 General Maintenance \_\_\_\_\_ 37

5.1 Sensor Replacement \_\_\_\_\_ 37

5.1.1 Sensor Replacement Procedure \_ 37

5.2 Pump Installation \_\_\_\_\_ 38

5.3 Pump By-Pass \_\_\_\_\_ 39

**Scout Advanced Users Section** \_\_\_\_\_ 41

6.0 Navigating Scout Menus \_\_\_\_\_ 42

6.1 Scout Login \_\_\_\_\_ 43

6.2 Scout Menu Flow Diagram \_\_\_\_\_ 44

6.3 Scout Menu Item Descriptions \_\_\_\_\_ 47

6.4 % Gas (% by volume) Calibration \_\_\_\_ 53

6.5 Scout Troubleshooting \_\_\_\_\_ 55

**Appendices** \_\_\_\_\_ 57

Appendix 1 - Technical Specifications \_\_\_\_ 58

Appendix 2 - Gas Interferences \_\_\_\_\_ 61

Appendix 3 - Combustible K-Factors \_\_\_\_ 62

**Parts List** \_\_\_\_\_ 63

**Service and Repair** \_\_\_\_\_ 67

# Getting Started



**BEFORE THE INSTRUMENT IS PUT INTO SERVICE, IT MUST BE CALIBRATED WITH APPROPRIATE CALIBRATION GASES.**

## ***1.1 Unpacking***

All **Scout** Instruments are packaged individually with Sensors and appropriate Battery Pack installed. Accessories are packaged separately.

Carefully, open each box and remove the items. Identify all items as shown in Figure 2, and reference your Order and Packing List for completeness.

Examine for external damage. If any is found, or if any item is missing, notify Scott Instruments Customer Service immediately at:

251 Welsh Pool Road, Exton PA 19341  
Phone: 610-363-5450 (8:30 AM to 5 PM EST)  
Fax: 610-363-0167  
Email: [info@scottinstruments.com](mailto:info@scottinstruments.com)

## ***1.2 Storage***

If the Instrument is to be put into storage and not put into service immediately, the Batteries or Battery Pack should not be removed from the Instrument.

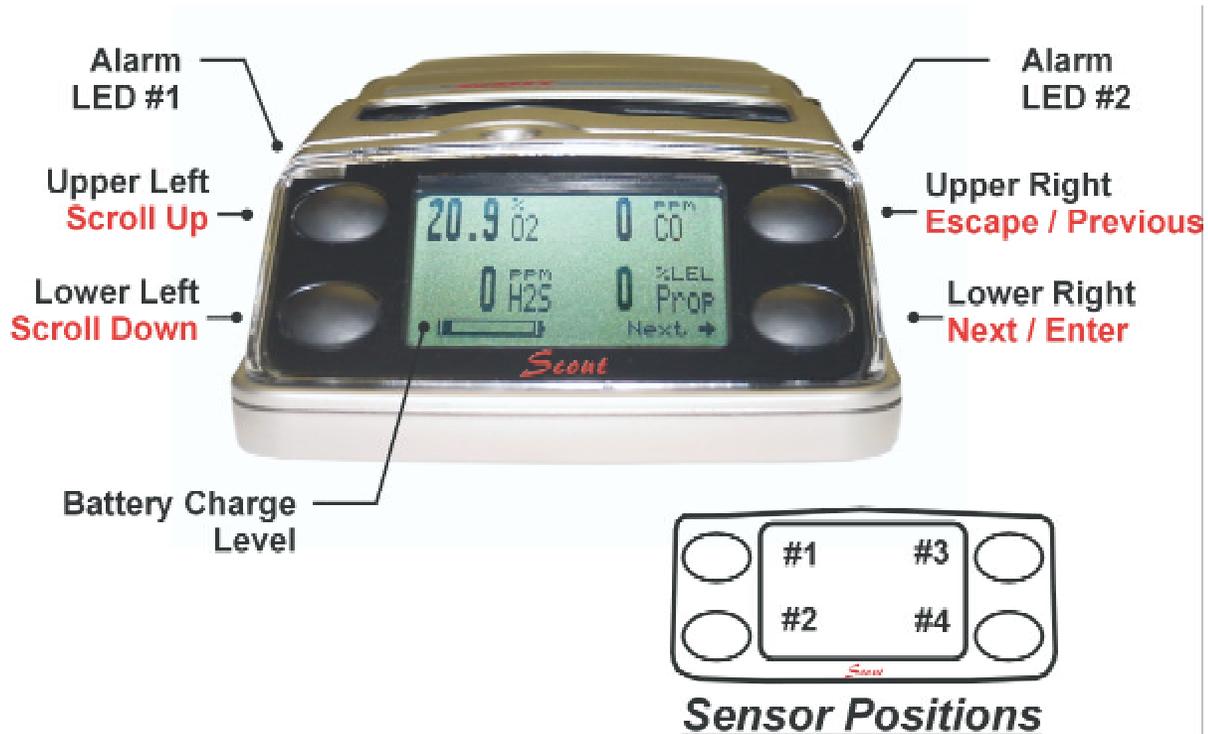
## ***1.3 Operational Environment***

The **Scout** is approved to be Intrinsically Safe, suitable for operation in Class 1, Division 1, Groups A, B, C, and D hazardous locations.

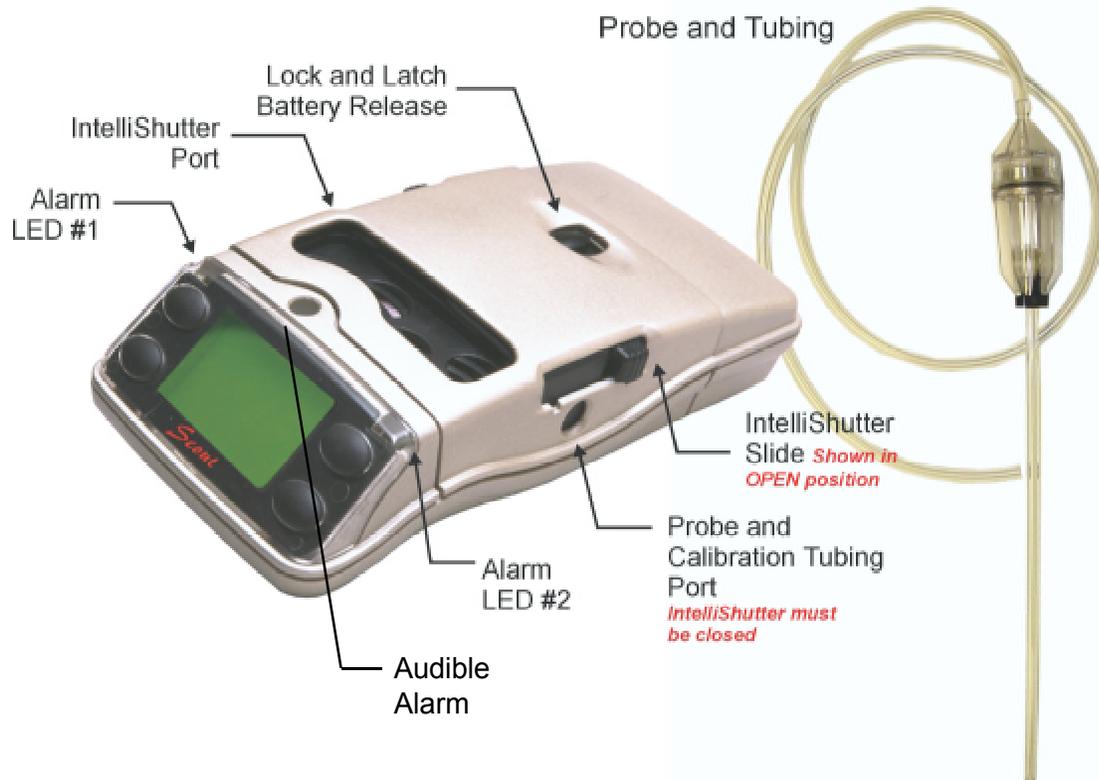
## ***1.4 Registration***

Register your **Scout** visit the Scott Instruments web site at [www.scottinstruments.com](http://www.scottinstruments.com) or fill out and mail the enclosed card. Registration will enable Scott Instruments to notify you of future software enhancements and/or upgrades that may become available.

Figure 1 - Scout Operator Interface



**Figure 2 - Scout Features**



NOTES



# Powering Your Scout

## 2.1 Alkaline Battery Pack

Each Alkaline Battery Pack is shipped with a new complement of three (3) C-Cells installed. These Battery Packs can hold their electrical potential for long periods of time, however the following is recommended before the Instrument is put into operation:

With the Scout's display facing away from you, remove the battery pack from the instrument by pushing the battery release to the right while sliding out the battery pack.



***Remember the Battery Pack Should Not Be Removed From The Instrument for More than 30 Minutes.***



Turn the battery pack upside down and identify the latch on the front center of the cover plate.

Push the latch in, towards the back of Battery Pack, while grasping the exposed corners of the cover plate. Raise and remove the cover plate to expose the 3 C-Cell Batteries.

Leaving the batteries in place, rotate each battery in turn, to locate the expiration date of each cell. If the date listed indicates at least one year until expiration, then replace the cover plate, which will snap into place, sealing the Battery Pack. Replace the pack.

~~The instrument is now ready to~~ “Turn-On.”



**! USE ONLY APPROVED BATTERIES !**

***If battery replacement is required, only the following approved batteries must be used. Using batteries other than the approved Batteries will violate the Intrinsic Safety Approvals.***

*Duracell MN1400*

*Energizer EN93, E93 or X93*

*Panasonic AM-2PI*

*Rayovac 814*

Replace all three (3) batteries with new, identical alkaline cells, of one of the types listed observing the correct polarity stamped on the battery holder. Never mix old batteries with new ones. Replace the cover on the pack and the pack on the instrument. It is now ready for “Turn-On.” See Section 4.2.

## 2.2 Lithium Ion Battery Pack

The Lithium Ion Battery Pack is shipped with a partial charge that will operate the instrument for a few hours. It requires a minimum of four (4) hours charging time for full operating time.

## 2.3 Inductive Battery Charger

The Scout uses an Inductive Charging System that requires no connections between the instrument and charger. The inductive charger will charge the lithium ion battery pack while connected to the Instrument or separated from the instrument. This feature allows the user to keep a spare battery pack continually charged and ready for use.





# Rules of Operation

It is absolutely critical that this or any gas detector be used and maintained properly. Failure to do so could jeopardize the people whose lives depend on its operation.

## **PERFORM A DAILY FUNCTIONAL TEST**

Before each day's use, all sensors must be tested using a known concentration of calibration gas. The instrument must indicate a gas concentration within 10% of the actual gas listed on the calibration cylinder label. When the gas indication is outside the 10% limit calibration should be performed.

## **USE IT CORRECTLY**

Do not use the Scout to detect mixtures other than combustible gases or vapors or toxic gases in air or inert atmospheres.

## **WATCH OUT FOR POISONED COMBUSTIBLE SENSORS**

Operation of catalytic type combustible gas sensors may be seriously affected by silicones, free halogens, halogenated hydrocarbons and metallic oxides present in the ambient air being monitored. If the presence of any of these substances is

suspected, increased frequency of calibration verification is recommended.

## **BE SAFE!**

Any alarm or any indication on the instrument screen denoting the presence of a combustible gas or vapor, a lack or enrichment of oxygen or the presence of a toxic gas or gases demands that the user must follow all company established safety procedures.

## **CALIBRATION IS CRITICAL!**

Calibration should be performed using a self determined schedule that takes into account instrument use and environment conditions. Additionally the Scout should always be re-calibrated after exposure to high concentrations of combustible gases or vapors or toxic gases.

## **WATCH OUT FOR ALARMS AND OUT-OF-RANGE CONDITIONS.**

Operators should be aware of conditions where the

concentration of the gas is outside the detectable range of the instrument. See Section 3.3 for additional details.

NOTES

# Operator Alerts & Messages

Knowing how the Scout alerts operators to environmental and/or instrument conditions is critical to safety.

## 3.1 Gas Warnings and Alarms

When a gas alarm condition occurs, the Scout will notify the user in one of several ways, depending on the type of alarm or message the instrument has encountered.

**WARNING:** Beeping tone and LED flashing once per 2 seconds

**ALARM:** Whooping and LED strobing twice per second.



*The Scout's alarm levels and features are configurable by the user. The Scout comes configured from the factory with WARN and ALARM levels set to the same value. Operators should always verify the WARN and ALARM setpoints before operating the instrument.*

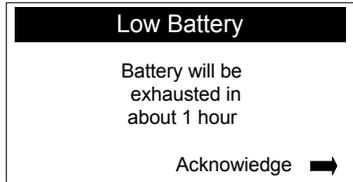
Factory Default Alarm Set points for typical sensors shown are:

Oxygen Low Alarm	<b>19.5 %</b>
Oxygen High Alarm	<b>23.5%</b>
Hydrogen Sulfide Alarm	<b>10 ppm</b>
Carbon Monoxide Alarm	<b>35 ppm</b>
Combustible Gas Alarm	<b>10% LEL</b>

## 3.2 Low Battery

A low battery condition will be indicated when less than 5% of full charge remains. After acknowledgment by the operator, the instrument will

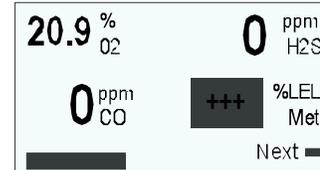
continue to audibly remind the operator with a group of three short beeps every few seconds.



### 3.3 Over-Range Conditions

The Scout indicates an over-range gas concentration by flashing "+++". If the instrument is equipped with a dual-range combustible sensor (part# 096-2549) and the instrument is in sample draw mode (shutter closed) when an over range % LEL concentration is detected, the Scout will show the "+++", then automatically range from % LEL to % Gas. See Section 4.8 for additional information on dual-range combustible sensors.

The following flashing display indicates an Over Range combustibles condition. The pulsating audible alarm is energized as well as the flashing LED.



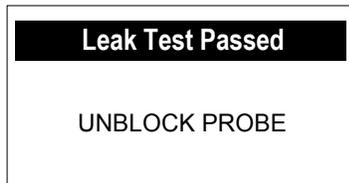
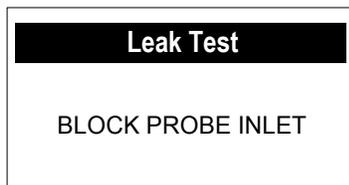
### 3.4 Negative Gas Readings

Some sensors respond to gases other than those they are designed to measure ("interferents"). Interfering gases can potentially cause a negative reading or zero drift. Any significant, negative reading will produce a warning indication, which causes the display to blink slowly after acknowledgement. If a negative reading occurs in clean air, the instrument should be zeroed.

### 3.5 Remote Sampling Mode Leak Test

Whenever the remote sampling mode of operation is started, the instrument will start the internal pump and prompt the user to perform a leak test by blocking the probe inlet. When the leak test is

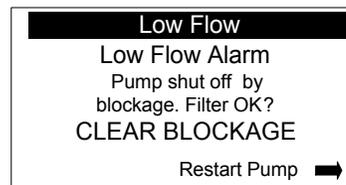
successful, the instrument will prompt the user to unblock the probe. Removing the blockage will change the display to show measurements of remotely sampled gas. If a gas alarms during this leak test, the test will terminate. Cycle the shutter to initiate a test of the inlet tubing.



### 3.6 Low Flow Alarm

Blockages caused by kinked tubing, water, saturated filters, or pump failure can cause a LOW FLOW

condition and prevent a gas from reaching the sensor so that accurate detection can take place. Scouts equipped with an integral pump automatically detect LOW FLOW conditions, sound and flash an alarm, and display the following screen until proper corrective action is taken.



### 3.7 Shutter Error

The following screen will be displayed, along with an audible and flashing alarm, when the Scout's IntelliShutter is not in the fully OPEN or fully CLOSED position



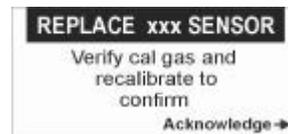
### 3.8 Sensor Marginal

The following screen may appear at power up or on completion of calibration or zero. When a sensor nears the end of its useful life, its response declines. If the response is within 20% (default limit, which may be changed by setup) of the minimum response acceptable for reliable calibration, this screen appears. On acknowledgement, the instrument operates normally.



### 3.9 Replace Sensor

The following screen may appear at power up or on completion of calibration or zero, along with an audible and flashing alarm. When a sensor reaches the end of its useful life, its response declines. If the response is below the minimum response acceptable for reliable calibration, this screen appears. The screen also appears if a sensor failure is detected. The "xxx" will be replaced by the gas symbol for the affected sensor. On acknowledgement, the instrument operates normally, except that the display of the affected sensor reading alternates slowly between normal and complemented contrast (inverse video). Once per minute, the Replace Sensor alarm repeats, until corrective action is taken.



# Operation

## 4.1 Scout's Modes of Operation

Scout operates in any of three modes, providing three levels of access to the features of the instrument.

1. General User (no password required)
2. Technical User (password required)
3. Setup User (password required)

**General User:** The instruments are supplied from the factory in this default mode. The default settings from the factory make only two (2) screens available to the General User:

1. Main Display - indicates live, numeric display of all gas concentrations
2. CAL – ZERO Display.

Other screens can be made available to the General User via "Set-Up".

**Technical User:** Logging in as a Technical User, under password protection, gains access to additional features. The Technical User sees the

MASTER MENU and a different set of gas displays. The default settings from the factory make five (5) screens available to the Technical User:

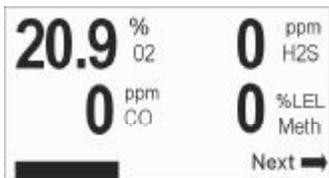
1. Main display - indicates live, numeric display of all gas concentrations.
2. CAL – ZERO display.
3. Hold Peaks display, similar to the live, numeric display, but maintaining the maximum excursions of gas concentrations.
4. STEL/TWA display, with live gas concentrations plus the timed accumulations.
5. MASTER MENU which provides access to additional features, such as data logging and STEL/TWA control.

Other screens can be made available to the Technical User via "Set-Up".

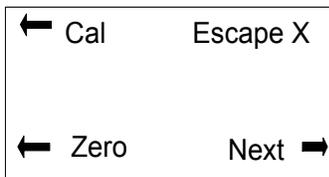
**Setup User:** Logging in as a Setup User, under password protection, gains access to the same features as for a Technical User. In addition, the Setup User can change the instrument configuration,

## Scout User Screens

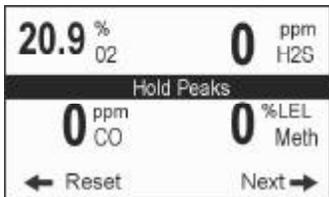
**Main Display**



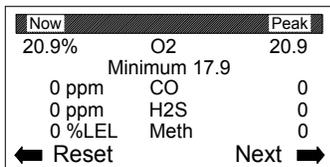
**Cal - Zero Display**



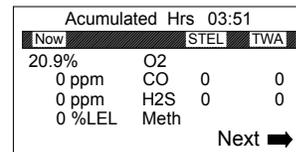
**Hold Peaks**



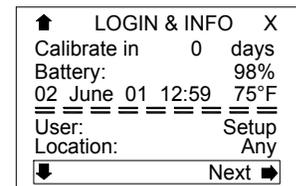
**Now/ Peaks**



### STEL/TWA



### Login & Info



### MASTER MENU

(Technical or Setup Mode only)



including alarm thresholds, calibration-gas concentrations, and many others. The Setup User can change the displays available to the General User and Technical User.

If desired, individual users may be identified by name, initials, or any desired code, using a function available to the Setup User. When a named or coded user is defined in the setup, they also have defined access privileges identical to General User, Technical User, or Setup User. Log-in and log-out times of individual users are recorded in the instrument data log. Each user has an individually assigned password, if desired. See Section 6.1 for login directions.

The following list shows the displays available. Any of the displays can be enabled or disabled for General or Technical/setup Users, separately, via Setup.

**Gas Readings** - Main Display” in this manual, which includes large digits, a battery icon showing charge status, and text indicating special condition (factory default enabled).

**Zoom into Alarm** - Very large digits for one gas in alarm.

**Zero and Cal** - Access to routine calibration (factory

default enabled).

**Hold Peaks** - Large digits showing maximum readings for each gas and minimum oxygen below 20.9%, with Reset.

**Live with Peaks** - Current readings and maximum readings, in tabular layout, with Reset.

**Live, STEL/TWA** - Current readings and accumulated averages, in tabular layout (enabled for Technical User by factory default).

**Leak Bars** - Graphic display of very small changes in combustible concentration (enabled for Technical User by factory default).



See **“Scout Advanced Users Section”** of this guide for additional information.

## 4.2 Instrument Turn ON / Turn OFF

At power on, the instrument maintains the user that was active at shut-down. However, if the instrument was shut down with Setup User access, it reverts to General User, to prevent accidental changes to the instrument configuration.

### 4.2.1 Turning On the Instrument

To turn the Instrument **On** press and hold any of the four Function Buttons. The instrument will sound multiple “beeps” while the two (2) Alarm LED’s alternately flash. The first screen will display.



**Version (V)** indicates the revision level of the software operating in the instrument.

**Serial Number** should match the number printed on the bottom label. It identifies the instrument in data logs and for Scott Instruments Customer Service.

**Initializing:** After a few seconds, the Initializing screen replaces the Version/SN screen. The Initializing screen stays in place while the sensors stabilize. Separating the instrument from its battery pack for more than a half hour, storing the instrument at a very low temperature, installing a new sensor, or (rarely) a sensor failure may result in the initializing screen persisting more than a few seconds. The display shows which sensor is causing the delay. After the initialization period, the instrument commences normal operation to monitor gases. A count-down in the lower-right corner shows the maximum seconds remaining for initialization. If one or more sensors don't fully stabilize during this time, the gas reading may be invalid until the sensor fully recovers from extended separation from the battery-pack or until the sensor is recalibrated for zero and span.

**Sensor Warnings:** If sensor diagnostics indicate a problem, one of the screens described in sections 3.7 and 3.8 will appear, after initializing.

**Calibrate in X Days:** Indicates when the calibration should be performed as determined by the user. New instruments and new sensors should have an initial

calibration by the user before use, regardless of this display. See "Scout Advanced Users Section" for additional information on setting the calibration reminder display interval.

**User:** Indicates what user is logged onto the instrument. See "Scout Advanced Users Section" for additional information.



Normal Mode Screen  
(Four gas Instrument shown)



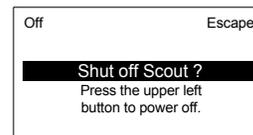
***If any sensor doesn't fully stabilize during power-up initialization or if a displayed message indicates a sensor problem, such as shown above, do not use the instrument until the specific sensor problem has been corrected. Recalibrate, allow additional settling time, or see the troubleshooting section if necessary. The sensor may need replacement.***

Acknowledge the Sensor Warning condition by pushing the **Lower Right** function button. This stops the audible and LED alarms. Push **Lower Right** button again, if needed, to show the Main Display screen as shown.

### 4.2.2 Turning OFF the Instrument

To turn the Instrument **Off** depress the lower left and lower right Function Buttons simultaneously and hold for approximately 3 seconds. The following screen will then appear.

Press the upper left Function Button to complete the turn off sequence.



Press the upper right Function Button (**Escape**) to revert back to the previous display.

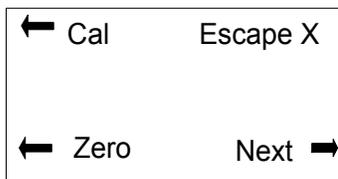
If the upper left **OFF** or the upper right **Escape** function buttons are not pressed, the screen will automatically return to the previous display after about 30 seconds.

## 4.3 Functional Test

The functional test helps ensure the Scout is prepared to safely assist in detecting the gases it is equipped to detect. The following procedure uses a Scout equipped with four gases (hydrogen sulfide, oxygen, carbon monoxide, and combustibles) as the example. The functional test also confirms alarm activation when the set point for a gas is reached.

### 4.3.1 Zero Calibration and Oxygen Span Calibration

Zero Calibration is performed from the following Display screen.

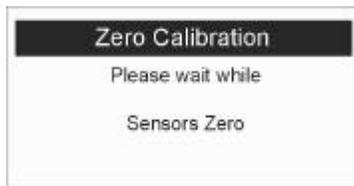


***This procedure should never be performed if the atmosphere being monitored is not free from combustible and/or toxic gases. That condition would program calibration errors into the instrument.***

Before Test Gas is applied to the instrument a Zero Calibration should be performed. Zero is inhibited if the displayed reading is greater than half the alarm set-point for the sensor. When sensor zero is inhibited, a warning screen directs the user to zero the sensors in clear air only. If the user verifies that the air is fresh, by pressing the upper-left Function Button, the automatic zero procedure executes. Otherwise, the instrument returns to normal operation.

Note: Scouts with software versions below 3.2.2 do not apply the inhibit during the first minute of operation.

- 1.) Press the lower left Function Button to start the automatic Zero calibration procedure. The following screen will display:



- 2.) When the Zero Calibration has been completed, the Main Display screen will automatically be displayed. A warning display will indicate the problem if any sensor fails to zero correctly. After acknowledgement, the gas reading for a failing sensor alternates slowly between dark and light.

#### 4.3.2 Gas "Bump" Test

The gas bump test exposes the instrument to a known concentration of gas to test to see if it measures the gas within 10% of the actual gas concentration. An instrument that fails this test should be calibrated.

### Components Required

#### A.) Calibration Gas

Ensure cylinders contain the appropriate gas mixtures for the instrument's sensors. As an example if the instrument is configured for Oxygen, H<sub>2</sub>S, CO and Combustible operation, a suitable mixture is:

19% Oxygen  
 25 ppm Hydrogen Sulfide  
 50 ppm Carbon Monoxide  
 1.62% Methane (32 %LEL)  
 Balance Nitrogen



*Be sure the expiration date on the gas cylinder has not exceeded.*

#### B.) 2 ft. of 3/16" ID Tygon™ Tubing

#### C.) Regulator providing a flow rate of 0.5 liter/minute

All the above components are available in kit form. Refer to the Accessories Section for a complete listing of calibration and test gas available for the Scout.

### Bump Test Procedure

- 1) Thread the Regulator/Pressure gauge to the calibration gas cylinder by turning it clockwise until hand tight.



*If the instrument is equipped with a pump, a demand flow regulator may be used if desired. If it is not equipped with a pump use a 0.5 lpm regulator.*

- 2) Check the cylinder pressure - **Do Not Use** if the pressure is low. Change the cylinder if required.
- 3) Connect the Tygon™ Tubing to the Regulator outlet.
- 4) Close the Intellishutter™ by pushing the shutter slide forward [towards the display]. This exposes the probe and calibration inlet port and automatically turns on the pump (if so equipped).
- 5) **Instruments Equipped with Pump:** The following screen will come on indicating a leak test requirement. The leak test is performed to ensure the pump is operating correctly.

#### Leak Test

BLOCK PROBE INLET

Block the inlet port COMPLETELY by connecting the other end of the Tygon™ tubing to the instrument inlet port with the regulator valve shut off.

The “Leak Test Passed” screen will display as long as the cylinder regulator remains connected and blocking off flow.



#### Performing Leak Test

*The example shows the standard accessory probe, with tubing being blocked by the user's thumb.*

- 6) Open the Regulator valve to start the gas flow to the instrument. Note that the display indicates the gases being delivered to the instrument.
- 7) The screen indicates the applied gas concentration which may be either increasing or decreasing, depending on the sensor. When each sensor passes through the Alarm set point, an alarm sounds and flashes. The gas concentration display flashes to indicate an Alarm condition.
- 8) After the Gas displays have stabilized, they must all be noted, to establish if they fall within the  $\pm 10\%$  criteria. If any display falls outside the  $\pm 10\%$  criteria a full calibration must be performed. See "Instrument Calibration" Section 4.4.
- 9) Remove the Tygon™ tubing from the instrument inlet port, turn off the gas regulator, and open the shutter.
- 10) The Main Display screen is now displayed and the gas readings will return to normal levels.

## 4.4 Instrument Calibration

All sensors, Oxygen, Toxic or Combustible gas/vapor become insensitive to the gases they monitor over a period of time. Loss of sensitivity can be caused by normal degradation, exposure to high gas concentrations, or sensor poisoning.

To provide the user with a safe, reliable, and accurate monitoring and alarming instrument, the sensors must be exposed to a calibration gas or gases of known concentration for the specific gases the Scout will monitor. This procedure will determine

the sensors or Instrument usability. Calibration Gas concentrations must be selected to be within the monitoring range of the specific sensor for toxic and combustible gases. The oxygen sensor zero may be calibrated using nitrogen, if needed to verify oxygen exclusion.



***Instrument calibration must only be performed by competent individuals who have read this manual and understand the calibration procedure.***

#### 4.4.1 Zero Calibration and Oxygen Span Calibration

Refer to Section 4.3.1

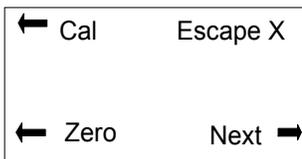
#### 4.4.2 Gas Calibration Preparation

**Components Required** - Same as “Gas “Bump” Test

- Refer to Section 4.3.2

#### Gas Calibration Procedure

- 1) Connect gas regulator and connect tubing to regulator and instrument, and perform the “Leak Test” per Steps 1 through 5 of the **“Bump” Test Procedure** (Section 4.2.2)
- 2) From the Main Display screen press the **lower right** Function Button **[Next]**. The following screen will display.



- 3) Press the **upper left** function button **[Cal]** to initiate the gas calibration procedure. The

following screen will display. If calibration gases other than the values shown are to be used, refer to the “*Scout Advanced Users*” section for a description of how to change the calibration gas values for auto calibration.

The shaded area on the screens denotes a flashing display.

APPLY GAS		
Exit →		
Gas	Concen	Status
CO	50 ppm	Apply
H2S	25 ppm	Apply
COMB	50% LEL	Apply

- 4) With the calibration gas cylinder and tubing all connected, turn on the regulator to begin the flow of gas to the instrument.
- 5) After gas has been flowing for several seconds, the screen will change to the following display denoting that the gas has been detected and calibration is to begin.

DETECTING		
Exit →		
Gas	Concen	Status
CO	50 ppm	Sensed
H2S	25 ppm	Sensed
COMB	50% LEL	Sensed

- 6) After several seconds the screen will again change to the following display showing values for each of the gases applied. These values will be based upon the last calibration of the Instrument.

CALIBRATING		
Exit →		
Gas	Concen	Status
CO	50 ppm	41
H2S	25 ppm	15
COMB	50% LEL	40

The displayed values indicate any loss of sensitivity for each sensor since the previous calibration. These values should be noted as they indicate the accuracy of recent measurements, before calibration. *Large*

*losses in sensitivity indicate that the frequency of calibration needs to be increased.*

- 7) After calibration is complete (several seconds to a few minutes, depending on sensors) the screen will change to the following display:

REMOVE GAS		
Exit →		
Gas	Concen	Status
CO	50 ppm	Weak
H2S	25 ppm	Passed
COMB	50% LEL	Failed

The “Remove Gas” display will indicate the status of the sensor as shown above. At this point in the calibration procedure, the sensitivity of each sensor has automatically been matched to the calibration gas concentration applied.

Specific **error messages**, as shown below, will be displayed if a sensor(s) does **not pass** the Calibration procedure.

***If a sensor fails calibration, do not use the instrument!***

Follow the remaining steps to complete the calibration procedure, then reference the Maintenance and Troubleshooting Sections of this Manual. The most common reason for calibration failure is a mismatch between the calibration gas configuration, shown in the calibration screens, and the gas actually applied. Make sure the gas source matches the configuration, that it has not expired, and that the connections are correct.

**Weak** :Denotes that the sensor Calibrated ,but should be considered for replacement. The sensor may not pass the next calibration. The Weak sensor threshold is determined by the programmable **Minimum Span Reserve** value selected.

**Not Zeroed**: Denotes that the Zero Calibration procedure was not completed successfully for the specific sensor.

**Failed** :**The sensor should be replaced.** Even though it may show the correct reading, it is likely to lose its remaining sensitivity rapidly and unpredictably. See the Maintenance and Troubleshooting Sections.

**NoMix**: Denotes that this sensor must be calibrated with a single gas cylinder, a mixture cannot be used.

- 8) Turn the gas flow off and remove the Tygon™ tubing from the inlet port.
- 9) Open the Intellishutter™ . The pump will automatically shut off (for instruments so equipped).
- 10) Press the **upper right** Function Button (**Exit**) to move to the next screen.

GAS PREVIOUS CAL		
		Reserve
CO	0 days	98
H2S	0 days	102
COMB	0 days	129

The above screen indicates the remaining sensor life, determined by comparing the output of the sensor to the minimum value in the smart sensor program software. A sensor with reserve less than 20 (factory default) will be

reported as “Marginal.” An indication of greater than 100 is not unusual with a new sensor and is not to be interpreted as meaning a particular sensor will last beyond the warranty period.

The Oxygen reserve is based on the automatic span calibration of the oxygen sensor to 20.9% Oxygen during the Zero procedure, see Section 4.3.1.

Reserve information is viewable only during the day the instrument calibration has been performed. Since the reserve information is valid only immediately after calibration, the data is available only on that day.

- 11) Press the lower right Function Button (**Done**), to complete the Calibration procedure. This will return to the Main Display screen and show gas readings. If residual cal gas above an alarm set point is present, the instrument will alarm.

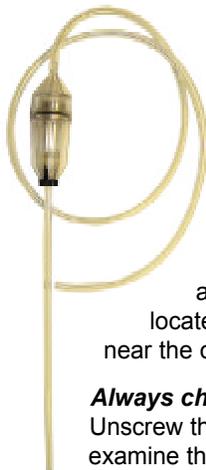
## 4.5 Remote Sampling

The Scout provides the capability of monitoring remote atmospheres. This is accomplished by drawing a sample from the remote atmosphere by means of a sample line probe, 3/16" ID sample line tubing and either a **Sample Pump** which is mounted internally in the Instrument or an external **Hand Aspirator Assembly**.

Most Instruments are shipped with the internal pump installed, however the instrument is available without the pump. In this case the hand aspirator would be used for remote sampling, if required.

Note: An optional Sample Pump Kit is available to upgrade the Scout to an automatic remote sampling instrument.

### 4.5.1 The Sample Probe



The sample probe provides the interface between the remotely sampled environment and the sample line tubing, while establishing the first line of protection for the Scout against moisture and particulates being drawn from the remote environment.

This protection is provided by a special replaceable filter, located in the top area of the probe near the outlet.

***Always check the probe prior to use.***

Unscrew the top section of the probe and examine the filter for any contamination, if found change out the filter. Also make sure that moisture has not been trapped in the probe, if so, completely drain and dry it out before use.

### 4.5.2 Sample Tubing

The tubing ID should be no greater than 3/16". Tubing length should not be longer than necessary, as sample lag time to the instrument will be

unnecessarily long. Lag time could prove to be extremely important if a high gas condition is encountered and escape procedures are to be implemented. As a general rule, most sensors require the time for drawing an atmospheric sample to the instrument to be:

**Integral Pump:** one (1) second per foot of sample line.

**Hand Aspirator:** one (1) ft per squeeze cycle

However, each sensor has a characteristic response time for its target gas. This sensor response time must also be considered when calculating the total time required for the remote sample to reach the instrument and provide a stable gas concentration display.

#### 4.5.3 Sample Draw Hand Aspirator

The Hand Aspirator consists of a rubber squeeze bulb, a 12" length of neoprene hose and 10 feet of sample line tubing. To pull a sample the squeeze bulb must be deflated then allowed to inflate, thus pulling a sample into the sample line. For the standard accessory squeeze bulb, each squeeze and release can fill about a foot of tubing.



The aspirator would only be used if the Scout is purchased without a Sample Pump or in the event of a pump failure (see the Troubleshooting Section). The aspirator is connected to the sample draw port.



*An instrument must be equipped, either with an integral sample pump or with a pump by-pass tube (part# 077-0314)*

#### 4.5.4 Integral Sample Pump

The Scout can be equipped with an internal plug-in pump that will pull an atmospheric sample from up to 100 ft. away. The sample flow rate is set for 0.5 liters / minute. The Scout monitors the sample flow rate and provides an alarm if the flow rate can not be sustained by the pump. A replaceable internal filter is provided at the pump inlet for additional moisture and particulate protection.



#### 4.5.5 Remote Sampling Procedure

- 1.) To enter sample draw mode, close the IntelliShutter by simultaneously pressing the shutter slide buttons and pushing forward. If the instrument is equipped with an integral pump the pump will start automatically. The sample draw inlet is now exposed to permit connecting the tubing/probe to the instrument.
- 2.) Connect the sample tubing and probe (and hand aspirator if instrument is not equipped with an

integral pump).



**Switching between diffusion and sample draw modes**



**Attaching sample tubing to sample inlet port**

- 3.) When the Scout is placed into Sample Draw mode by sliding the IntelliShutter forward, the instrument prompts the user, either to perform a "LEAK TEST" or to use an external pump. The leak test must be performed with sampling equipment attached to the instrument inlet port so as to insure that the sampling equipment is free from leaks that may dilute a sample and cause incorrect, unsafe gas readings.

**Scout with Pump:** To conduct the Leak Test,

place your finger over the end of the probe to test for leaks. If no leaks are found the following will display. The display “UNBLOCK PROBE” will be flashing. If a leak is found the above display will not change until the leak is corrected and a successful leak test is performed.



**Scout with Hand Aspirator:** To test for leaks, squeeze the Aspirator bulb until fully deflated, and hold deflated, then place your finger over the end of the Probe and release the bulb. The bulb will remain deflated if no leaks are found. Remove your finger from the end of the probe and the aspirator bulb will inflate.

- 4.) *Check the probe prior to use.* Unscrew the top section of the probe and examine the filter for any contamination, if found change out the filter. Also make sure that moisture has not been trapped in the probe, if so, completely drain and dry it out before use.

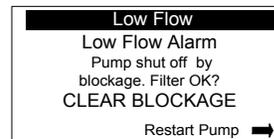
- 5.) Begin sampling. The probe should be held in a vertical position if a liquid could be encountered.



***Gas concentration displays are only meaningful as long as the aspirator bulb is repeatedly squeezed. Recommend PEAK Display mode be used when using a hand aspirator as readings will oscillate as bulb repeatedly inflates/deflates.***

#### 4.5.6 Low Flow Alarm

If the instrument is equipped with an integral pump a “Low Flow” alarm may occur if the probe or sample line becomes plugged for any reason. The following display and alarms will be activated. Check line for kinks, water, or other obstructions. If a gas alarm is active when the low flow condition occurs, the lower left corner of the Main Display will show “Low Flow” as an added alarm.



## 4.6 STEL / TWA

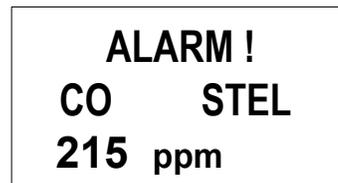
### 4.6.1 What are STEL and TWA Values?

Standards have been developed by various agencies to protect workers from overexposure to hazardous atmospheres. Gas concentration is averaged over an exposure time to assure a safe environment for workers. The terms used for the standards that have been set by these agencies are **STEL** (Short Term Exposure Limit) and **TWA** (Time Weighted Average).

Users logged in with Technical User access can view instrument STEL/TWA alarm values and reset STEL/TWA accumulations, via the Master Menu. (refer to the "Scout Advanced Users Section" of this guide).

### 4.6.2 Displaying STEL and TWA Alarms

By default, STEL/TWA calculations start when the instrument is turned on and stop at instrument turn off. The Scout will alert the user when a STEL or TWA alarm level has been reached.



If an alarm condition should be encountered, the alarm display screen is activated in a flashing mode, showing which gas is in alarm and the accumulated average gas concentration. Alarm LED's and Audible Alarm will also be energized.

See the "Setup and Programming" section for additional STEL and TWA programming and features.

### 4.6.3 About STEL Alarms

A short term exposure limit or STEL is the maximum concentration for a continuous exposure time of 15 minutes. Each such exposure should be followed by a 60 minute interval without exposure. There should not be more than four (4) STEL exposures in an eight (8) hour shift.



**When a STEL alarm is activated the area should be vacated immediately to avoid overexposure to Toxic gases which could result in a serious injury or death.**

**STEL Calculation Example:** Instrument turned on 9 minutes ago with a 5 minute exposure at 25 ppm and a 4 minute exposure at 10 ppm.

$(5 \text{ minutes} \times 25 \text{ ppm}) + (4 \text{ minutes} \times 10 \text{ ppm}) + (6 \text{ minutes} \times 0 \text{ ppm}) / 15 \text{ minutes} = 11 \text{ ppm}$

#### 4.6.4 About TWA Alarms

A time weighted average or TWA is the maximum average exposure for a worker calculated for an 8 hour workday.



**When a TWA alarm is activated the area should be vacated immediately to avoid over exposure**

**to Toxic gases which could result in a serious injury or death.**

#### TWA Calculation Example:

**4 hour exposure of 75 ppm**  
 4 hour exposure of 100 ppm  
 $(4 \text{ hours} \times 75 \text{ ppm}) + (4 \text{ hours} \times 100 \text{ ppm}) / 8 \text{ hours} = 88 \text{ ppm}$

## 4.7 Air Free CO Feature

*For Air-Free CO Measurement, the instrument must be used in the remote sampling mode.*

The Scout can provide air-free CO measurements. "Air-Free" values, rather than "as measured" values, indicate the actual Carbon Monoxide content of the combustion product, as it occurs before dilution in the surrounding air.

The Scout can be configured to automatically calculate and display Carbon Monoxide concentrations as "Air-Free" CO readings when the proper conditions exist. This mode of monitoring automatically displays Air-Free CO on the Normal Gas Display screen. **To display Air Free CO,**

**Carbon Monoxide and Oxygen sensors must be installed in the instrument, “Air-Free” must be enabled in the CO parameters configuration (in Setup), and the following three conditions must occur:**

- **Shutter closed, for remote sampling**
- **Oxygen below 16.0%**
- **Carbon Monoxide above 5ppm.**

Air-Free measurement of Carbon Monoxide calculates the displayed CO reading by taking into account the amount of excess air and adjusting the as-measured ppm value of CO. By measuring in the Air-Free CO Mode, users can check carbon monoxide emissions from gas ovens, range top burners and similar devices to check for compliance to US National Standard ANSI.Z21.1.

The formula used to calculate and display an Air-Free CO value is:

$$\text{COAFppm} = 20.9\% / (20.9\% - \text{O}_2) \times \text{CO ppm}$$

The following example illustrates the above formula:

- *Oxygen level has fallen from 20.9 to 15%.*

- *Carbon Monoxide has increased from 0 to 10ppm.*

$$\begin{aligned} \text{COAFppm} &= 20.9/(20.9-15) \times 10 \\ &= 20.9/5.9 \times 10 \\ &= 3.5 \times 10 \\ &= 35 \text{ ppm air-free} \end{aligned}$$

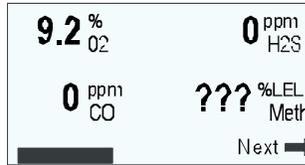
## 4.8 Dual-Range Combustibles Sensor

If properly equipped, the Scout can automatically range from %LEL to % Gas when detecting combustible gases. The dual-range feature is only available:

- with instruments equipped with the dual-range combustible gas sensor (part# 096-2549), an oxygen sensor, and an integral pump.
- when % Gas is enabled in the combustible sensor parameters configuration (in Setup).
- when the instrument is in Sample Draw mode (shutter closed).

**! IMPORTANT !**

*The combustible sensor requires oxygen to operate properly. When a normal Oxygen level of 20.9% decreases to below 10% and the Combustible gas alarm is not activated, a potentially combustible hazard still could exist. When the oxygen is below 10%, the combustible sensor can no longer be relied upon to indicate that a combustible gas is present.*



The above screen denotes that a dangerous condition may exist as the LEL gas concentration is unknown.

## 4.9 Combustible Leak Detection Mode

All Scouts are capable of using the combustible leak detection mode. This feature must be enabled in the General Display or Technical Display Menus. When this feature is enabled you will be able to use the Scout in conjunction with the pump and remote sampling system to find low concentration gas leaks quickly.

To find the source of a leak place your probe in suspected leak locations and move the probe slowly until the highest concentration is located. The Scout shows the % LEL in the upper left corner of the "Leak Bars" screen.

An audible "Geiger-counter" tick-rate indicates the gas concentration. The lower, left Function Button cycles the tick volume through TICK 0 (off), TICK 1 (default), and TICK 2 (louder).

Note: Some sensor noise will be present and reading up to 150 ppm with clean air is not uncommon.

Note: The backlight normally is disabled in leak detection mode to reduce the sensor noise. The

upper, left Function Button switches the backlight on and off.

NOTES

# Maintenance

## 5.0 General Maintenance

Due to unique microprocessor circuitry design and proven reliability of the Scout, a set maintenance schedule is not required. Only a visual inspection before each days usage of the following:

### **Diffusion mode of operation:**

Filter covering the sensors, check for dirt contamination and/or discoloration. This filter is visible in the sensor cavity area located on the top of the instrument behind the display section.

### **Remote sampling mode of operation:**

Filter located in the sample probe, check for dirt, moisture and/or discoloration.

Intellishutter operation, check for dirt contamination in the button track and on top of the shutter.

See the Troubleshooting Section for filter replacement and shutter cleaning instructions.

## 5.1 Sensor Replacement

Sensors are typically expected to last up to 2 years. Many factors contribute to sensor life such as but not limited to exposure levels, operating temperature, calibration frequency, humidity exposure levels, and ppm hours.

Scott Instruments recommends replacing all sensors at the 2 year period.

When any or all sensors are replaced it is recommended that the rubber manifold, pump inlet filter and the sensor filter be replaced.

See the Troubleshooting Section for filter replacement and shutter cleaning instructions.

### ***5.1.1 Sensor Replacement Procedure***

1.) Turn instrument power off (Removing the battery pack is unnecessary and detrimental.)

2.) Turn over the Scout's housing and remove the (4) four Phillips Head Screws. With the screws removed take off the Scout's shutter assembly.



3.) Lift the rubber sensor gasket assembly away from the sensor chamber. Inspect the sensor filter material located on top of the rubber sensor gasket replace the sensor gasket assembly if dirty or deformed.



4.) Remove and replace the plug-in sensor.



## 5.2 Pump Installation

**Note: Do not attempt pump installation without access to pump calibration kit.** To install a Scout pump begin by following Steps 1 through 3 of Section 5.1.1 then proceed as follows:

1.) Un-plug the sensor two wire connection



- 2.) Carefully remove the pump from the rubber sensor gasket.
- 3.) Carefully install the new pump, following the preceding steps in reverse order.
- 4.) Calibrate the pump flow rate using the Remote Sampling Parameters setup menu as described in the Scout Advanced Users Section 6.3 of this guide.



### 5.3 Pump By-Pass

- 1.) Scouts without pumps are supplied with bypass tubes in place.

- 2.) If a pump were to fail, an external pump would operate through the failed pump. Further, if a pump fails, it's a little more difficult to replace and recalibrate it than to obtain and install a bypass tube. Either action requires a visit to the instrument shop. It should never be attempted in the field.



Pump By-Pass Tube part #077-0314

NOTES

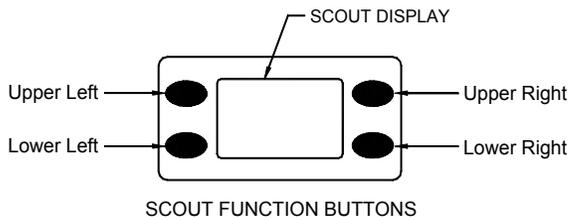
# Scout Advanced Users Section

## 6.0 Navigating Scout Menus

The four buttons surrounding the display (See Figure on next page) select the various menus. The specific function of each button depends on the operating mode of the Scout. Generally, an arrow or legend

displayed adjacent to the button indicates the specific function of the button for the active mode. The procedures in this manual refer to the buttons as Upper Left, Lower Left, Upper Right, and Lower Right.

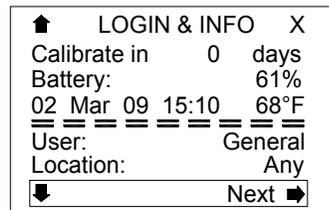
Button	Displayed Legend	Action
Upper Left	Up Arrow	<ol style="list-style-type: none"> <li>1. Highlight the next higher selection on a menu screen.</li> <li>2. Adjust a selected value upscale (when highlighted line has been activated by pressing Lower Right).</li> </ol>
	Left Arrow	Take the action indicated by the adjacent text.
	None	Activate back light.
Lower Left	Down Arrow	<ol style="list-style-type: none"> <li>1. Highlight the next lower selection on a menu screen.</li> <li>2. Adjust a selected value downscale (when highlighted line has been activated by pressing Lower Right).</li> </ol>
	Left Arrow	Take the action indicated by the adjacent text.
Upper Right	X, Esc, or Escape	<ol style="list-style-type: none"> <li>1. Revert to the previous screen.</li> <li>2. If an adjustment is active, cancel the adjustment and revert.</li> </ol>
Lower Right	Right Arrow or Enter	<ol style="list-style-type: none"> <li>1. If the highlighted item is another menu, switch to it.</li> <li>2. Activate an adjustable, highlighted item. Highlighting disappears while the item is adjustable by Upper Left and Lower Left.</li> <li>3. Enter the adjusted value for the activated item.</li> <li>4. Some menu items are set by choosing from a sequence of values. Pressing Lower Right immediately applies the next available selection for the highlighted item.</li> </ol>
	Next	Choose the next available display screen.
	Done	Revert to the menu where the display was activated or enter gas measurement.



## 6.1 Scout Login

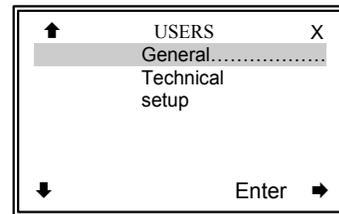
Advanced, menu-operated features of the Scout are accessible only to **“Technical”** and **“Setup”** users. Review Section 4.1 for a description of the three levels of access to Scout.

At power on, the previous user of the Scout is automatically logged in. By default, that user is **“General”**. To log in as a different user, press and hold the Lower Left and Upper Right buttons together. The following screen should appear:



Press the upper left button two times to move the highlighted cursor to the **“User: General”** line. Press the lower right button (Next).”

You will see the following screen:



Press the lower left button two times and press the lower right button labeled “Enter”

Press the Lower Left and Upper Left (up and down arrow) buttons as needed to select the desired user. Then press Lower Right (Enter). *To change from "General" to "Setup", press Lower Left twice and Lower Right once.*

The password screen will appear. The Upper Left and Lower Left buttons scroll through the alphabet, numerals, and some special characters. The password is case sensitive. Upper-case letters appear while scrolling up through the alphabet; lower-case while scrolling down. Press the Lower Right button to enter each character of the password. Press it again after entering the final letter. **The factory default password is "A". To enter it, press the Upper Left button once, then the Lower Right button twice.**

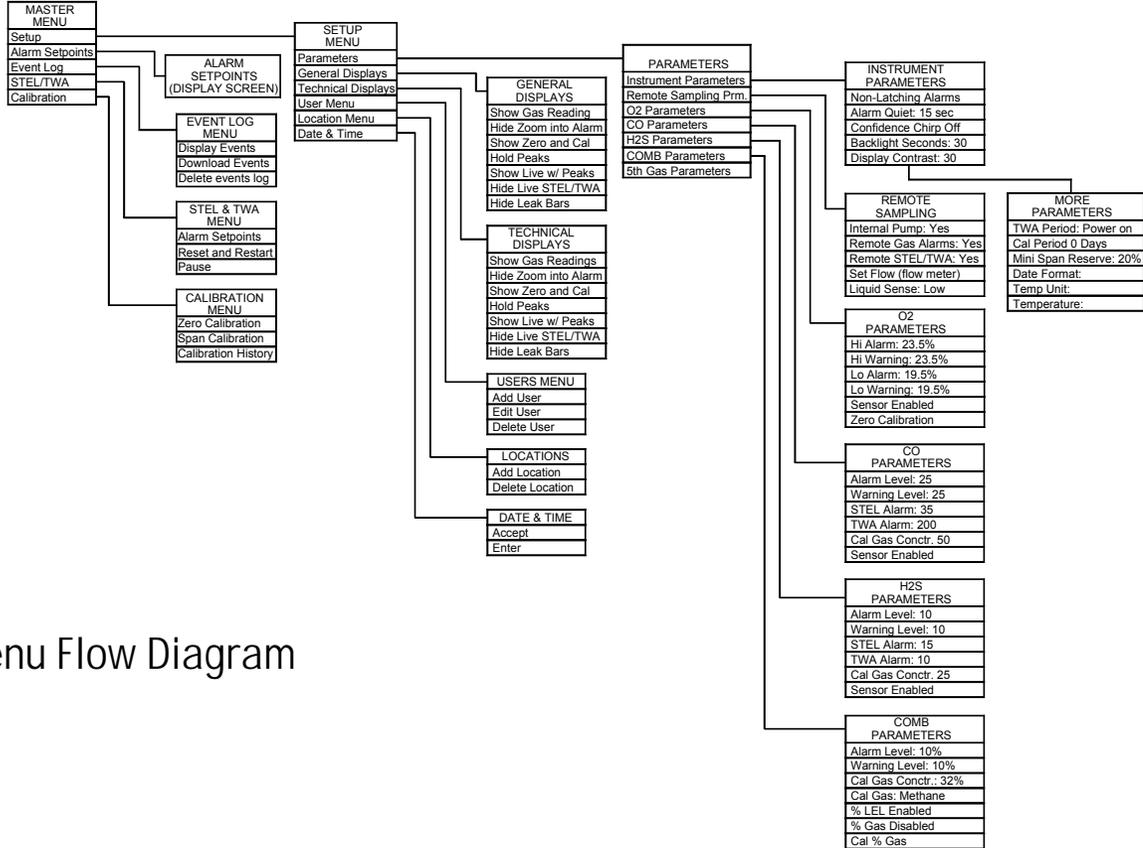
Assuming you selected the "Setup" user, the "LOGIN & INFO" screen will show "User: Setup". This gives you access to all menus, including "Setup".

Following the "Menu Flow Diagram" in Section 6.2, you can make any changes you need in Scout Settings. If you power off Scout without logging in a different user, the "General" user will be logged in by default at power on.

## 6.2 Scout Menu Flow Diagram

To use the menus, log in to Scout as described in Section 6.1. The diagram (see next page) shows the path to reach each menu selection. For example, to change CO calibration gas concentration:

1. Log in as setup user.
2. Press the Lower Right (Next) button to see the MASTER MENU.
3. Press and hold the Upper Left (up arrow) button to select Setup...
4. Press the Lower Right (Next) button to see the SETUP MENU.
5. The "Parameters..." selection is highlighted.
6. Press the Lower Right (Enter) button to see the PARAMETERS MENU.
7. Press the Lower Left (down arrow) button as needed to select CO Parameters...
8. Press the Lower Right (Enter) button to see the CO PARAMETERS menu.
9. Press the Lower Left (down arrow) button as needed to select Cal Gas: nn ppm.
10. Press the Lower Right (right arrow) button to activate the Cal Gas adjustment. The highlight of Cal Gas: nn ppm will disappear.
11. Press or press and hold the Upper Left and Lower Left (up and down arrows) buttons until the desired



# Menu Flow Diagram

calibration gas concentration appears in the display.  
12. Press the Lower (right arrow) button to record the new Cal Gas: nn ppm setting. The highlight of Cal Gas: nn ppm will reappear.

## 6.3 Scout Menu Item Descriptions

<b>MASTER MENU</b>	
Setup...	To configuration menus
Alarm Setpoints	View summary of alarm settings
Event Log...	To event menu
STEL/TWA...	To STEL/TWA Menu
Calibration...	To Calibration Menu
<b>SETUP MENU</b> ( <i>Master Menu</i> )	
Parameters...	Select menus to adjust instrument and sensors
General Displays...	Show or hide available displays for General users
Technical Displays...	Show or hide available displays for Technical users
Users...	Add to or edit list of users available to log in
Locations...	Add to or edit list of locations available to record in log
Date & Time...	Set calendar & clock for data log & calibration schedule
<b>EVENT LOG MENU</b> ( <i>Master Menu</i> )	
	Heading shows how many events were captured and the earliest and latest dates of the events.
Display events...	View a scrollable list of events, abbreviated descriptions
Download events...	Display PC information
Delete event log...	Access to clear events from memory

<b>STEL &amp; TWA</b> ( <i>Master Menu</i> )	
Alarm Setpoints	Heading shows when accumulation of reading began.
Reset and Restart	Show all toxic-gas alarm levels, including STEL/TWA
Pause [or] Resume	Clears accumulation and restarts from present time Pause to exclude current conditions from accumulations

<b>CALIBRATION MENU</b> ( <i>Master Menu</i> )	
Zero Calibration...	Initiate sensor zero process
Span Calibration...	Initiate sensor span process
Calibration Histry...	Display calibration status of all sensors

<b>PARAMETERS MENU</b> ( <i>Setup Menu</i> )	
Instrument Params...	To menu to set instrument properties
Remote Sampling...	To menu to adjust pump and related properties
O2 Parameters...	To menu to adjust sensor properties (e.g. O2)
CO Parameters ...	To adjust sensor properties (e.g. CO)
...	...
COMB Parameters ...	e.g. combustible

<b>GENERAL DSPLY</b> ( <i>Setup Menu</i> )	
<b>Include or exclude displays in General user selections</b>	
Show/Hide Gas Readings S/H Zoom into Alarm S/H Zero and Cal S/H Hold Peaks S/H Live with Peaks S/H Live with STEL/TWA S/H Leak Bars	Main Gas Display Expanded display of a single gas with alarm condition Direct user access to sensor zero and span processes Similar to main gas, hold extreme readings until reset Tabular list of current and extreme readings, with reset Tabular list of current and accumulated readings Graphic display of small concentrations of combustible gas, including %LEL

<b>TECH DISPLAYS</b> ( <i>Setup Menu</i> )
<b>Identical function to General Displays Menu, for Technical and setup user</b>

<b>USERS MENU</b> ( <i>Setup Menu</i> )	
Add User...	Define name, password, and access level of a new user
Edit User...	Modify password or access level of an existing user
Delete User...	Remove a user from the list of users available at log in

<b>LOCATIONS</b> ( <i>Setup Menu</i> )	
Add Location...	Define the name of a new location
Delete Location ...	Remove a location from the list available at log in

<b>DATE &amp; TIME</b> ( <i>Setup Menu</i> ) <b>Accept displayed date and time or adjust as needed</b>	
Year:	Year of century
Month:	3-letter abbreviation
Day:	
Hour:	24-hour format
Minute:	
Accept	Activate any highlighted item; then enter each. Accept all items when bottom line highlighted.

<b>INSTRUMENT PARAMS</b> ( <i>Parameters Menu</i> )	
Latching Alarms	Choose Latching or Non-Latching Alarms
Alarm Quiet:	0 to 99 seconds after acknowledging, or Silent alarms
Confidence Chirp:	Alternately switch chirp On/Off
Backlight Secnds:	Set 5 to 99 seconds, or On continuously
Display Contrast:	Set for optimum display appearance
more Params	Brings up the following screen with more options
TWA Period:	Number of hours to accumulate toxic exposure
Cal. Period:	0 to 99 days
Min. Span Reserve:	Margin above limit for calibration failure to warn user, 20 is the default
Date Format:	Choose yyMmmdd, yy.mm.dd, or dd/mm/yy
Temp unit:	Choose Celsius/Fahrenheit
Temperature:	Shows interior temperature, within 10 degrees F

<b>REMOTE SAMPLING</b> ( <i>Parameters Menu</i> )	
Internal Pump:	Choose Yes/No pump operation
Remote Gas Alarm:	Choose Yes/No audible alarms with closed shutter
Remote STEL/TWA:	Yes/No exposure accumulation with closed shutter
Set Flow(flow meter)	Set pump flow rate using a filter stack and flow meter
Liquid Sense:	Low/Med/Hi sensitivity to sudden flow restrictions

<b>O2 PARAMETERS</b> ( <i>Parameters Menu</i> ) <b>Example of sensor parameters</b>	
High Alarm:	Concentration giving immediate alarm response
High Warning:	Active if set lower than High Alarm
Low Alarm:	Oxygen depletion level giving immediate alarm response
Low Warning:	Active if set higher than Low Alarm
Sensor:	Select Disabled/Enabled /Diffusion Disabled: Suppress readings Enabled: Show gas readings Diffusion: Show readings only when shutter is open
Zero Calibration...	Activate process to calibrate for zero oxygen, using N <sub>2</sub>

<b>CO PARAMETERS</b> ( <i>Parameters Menu</i> ) <b>Example of toxic sensor parameters</b>	
Alarm Level:	Concentration giving immediate alarm response
Warning Level:	Active if set lower than Alarm Level
STEL Alarm:	15-minute average concentration limit
TWA Alarm:	8-hour average concentration limit
Cal Gas:	Set to match calibration gas concentration
Sensor:	Select Disabled/Enabled /Diffusion/Air-Free Disabled: Suppress readings Enabled: Show gas readings Diffusion: Show readings only when shutter is open Air-Free: CO only, compensate readings < 16% O2

<b>COMB PARAMETERS</b> ( <i>Parameters Menu</i> ) <b>Example of sensor parameters</b>	
Alarm Level:	Concentration giving immediate alarm response
Warning Level:	Active if set lower than Alarm Level
Cal. Gas Conctr:	Set to match calibration gas concentration
Cal. Gas:	Sequentially choose from list of available gas names
% LEL:	Choose Disabled/Enabled
% Gas:	Choose Disabled/Enabled
Cal % Gas...	Start to calibrate for 100% methane or natural gas

## 6.4 % Gas (% by Volume) Calibration

1. SAFETY FIRST: Make sure you have a well ventilated work area, preferably an explosion-proof exhaust hood.
  2. Prepare the instrument.
    - 2.1. After at least five minutes with power on, zero the sensors.
    - 2.2. Make sure that LEL calibration has been maintained.
  3. Configure the sensor.
    - 3.1. Log in as a setup user.
    - 3.2. Navigate to MASTER MENU>SETUP MENU>PARAMETERS MENU>COMB PARAMETERS>Cal % Gas, then press the Enter button (lower right).
    - 3.3. NOTE: If the combustible sensor is not set up by the factory for % Gas mode, you can not select the enable or calibrate items.
    - 3.4. If "% Gas Enabled" is not already showing, "% Gas Disabled" will change to "% Gas Enabled." Then press the Enter button again.
    - 3.5. The "CALIBRATE COMB % GAS" display appears when the instrument is ready to calibrate.
- 
4. Prepare to the calibration gas.
    - 4.1. The calibration gas should be 100% concentration of the target gas, typically methane. For good accuracy, use the same gas to calibrate as will be measured.
    - 4.2. Establish the gas flow rate by one of the following methods.
      - 4.2.1. Use a demand-flow regulator between the gas supply and the instrument. With this regulator, the instrument pump controls gas flow, just as in the measurement application.
      - 4.2.2. Use a 500 ml/minute flow regulator between the gas supply and the instrument.
      - 4.2.3. Use a manually controlled supply with an overflow tee.
        - 4.2.3.1. An EXHAUST HOOD IS ESSENTIAL FOR SAFETY when using this method.
        - 4.2.3.2. Connect 3/16-inch I.D. tubing to at least two barbs of a tee fitting.
        - 4.2.3.3. Connect one of the lengths of tubing to the gas source.
        - 4.2.3.4. Connect another length of tubing from the tee to a flow meter,

- such as a Rotameter. Make sure any flow adjustment on the flow meter is fully open, to minimize backpressure.
- 4.2.3.5. While blocking the third branch of the tee, adjust the flow rate to at least 800 ml/minute, but no more than 1 liter per minute.
  - 4.2.3.6. Move the tubing from the flow meter to the pump inlet. The shutter must be closed first.
5. Calibrate the instrument.
    - 5.1. Prepare the sensor and calibration gas as in the preceding steps.
    - 5.2. Close the Scout shutter.
    - 5.3. Connect the gas supply.
    - 5.4. After a few seconds, the “CALIBRATE COMB % GAS” display will show a gas reading, which corresponds to what would have been displayed as a measurement.
    - 5.5. After several more seconds, usually less than two minutes, the “CALIBRATE COMB % GAS” display will indicate that calibration is done and gas should be removed.
    - 5.6. Disconnect the gas supply.
    - 5.7. Connect a short length, 3 to 12 inches, of tubing to the pump inlet, so the instrument can draw fresh air, instead of recirculating its own exhaust.
    - 5.8. Exit the “CALIBRATE COMB % GAS” display and all levels of menus. (Go back to MASTER MENU.) Press the “Next” button to display gas measurements.
    - 5.9. Verify sensor recovery.
      - 5.9.1. After several seconds, the gas-measurement display will indicate 0% Gas.
      - 5.9.2. The 0% Gas display will persist for several more seconds before the instrument switches to %LEL mode.
      - 5.9.3. After the mode switches, the display will indicate a residual %LEL response.
      - 5.9.4. If you open the shutter before this point, the display will indicate “+++ %LEL.” Open the shutter now for the quickest recovery.
      - 5.9.5. Within two minutes, the LEL display should fall to or near zero.

## 6.5 Scout Troubleshooting

SYMPTON	CORRECTION
Sensor Marginal	Order a replacement sensor, as long as calibration states "weak" it is still calibrated. After the sensor calibration report "fail" it should be replaced or disabled to prevent constant warnings.
Unable to zero sensors	When the Scout is turned on you have one minute to zero sensors. You can press the upper right button to bypass the sensor initialization to take advantage of the one minute zero. You can also go into the advanced menus anytime and zero a sensor. If zero continues to fail, replace the sensor.
Calibration failure	Check calibration gas expiration date. Toxics such as Hydrogen Sulfide and Sulfur Dioxide cylinders will have pressure, but concentrations diminish after the expiration date. Check the filters in the Scout for moisture or dirt. Ensure setting in sensor parameters match your calibration.
Instrument will not turn on	Remove battery pack and replace batteries. Replace all batteries together, one dead battery will quickly kill the other batteries.
CO has high negative or positive reading	If batteries were removed for more than 30 minutes the bias will be lost on the sensor. If the batteries are installed the bias will return and the sensor can be zeroed and calibrated. This may take hours if the battery was removed for more than 24 hours.
Leak Test shows "unblock flow", but message will not go away	Check the pump flow rate with a 1 LPM flow meter. If the reading is < .5 LPM the pump should be replaced. Sometimes a pumps life can be extended temporarily by reducing the flow slightly in the "Remote Sampling" -> "Set Flow" menu.
Instrument constantly displays "0 days to calibration" event after a calibration is performed.	By default calibration period is set to 0 days. To modify this setting go to the Instrument "Parameters Menu" and Select "Cal Period".

NOTES

March 2003

# Appendices

## Appendix 1 - Technical Specifications

<b>Case Material:</b>	ABS Plastic with Nickel Plating
<b>Dimensions:</b>	7-1/2" x 2-5/8" x 4" 19 cm x 6.6 cm x 10 cm
<b>Weight:</b>	24 oz. (.7 Kg) Alkaline version with batteries
<b>Power Source:</b>	Three (3) C-cell Battery Pack or LI-Ion Battery Pack

### Instrument

<b>Temperature Range:</b>	-40° F to 122° F -40° C to +50° C Note: LCD will darken below 0° F See sensor operating temperature limits.
<b>Battery Life:</b>	50 hours typical w/o pump at 72° F 24 hours typical with continuous pump operation at 72° F

<b>Pump Flow Rate:</b>	500 ml/min
<b>Max. Hose Length:</b>	100 ft. with 3/16" I.D. tubing
<b>Max. Draw Vacuum:</b>	12" Water Column
<b>Alarm Flow Rate:</b>	400 ml/min.

### Hydrogen Sulfide Sensor Specifications

<b>Range:</b>	0 to 100 ppm
<b>Response Time:</b>	T90 < 30 sec
<b>Operating Temp:</b>	-4.0° F to +122° F / -20° C to +50° C
<b>Humidity:</b>	15% to 90% RH, Non- Condensing
<b>Storage Temp:</b>	+32° F to +68°F / 0° to 20° C
<b>Sensor Cross Sensitivity:</b>	
	Carbon Monoxide at 300 ppm: < 2 ppm
	Sulfur Dioxide, 5 ppm: approx. -1 ppm
	Nitric Oxide, 35 ppm: < 1 ppm
	Hydrogen, 10,000 ppm: < 10 ppm
	Nitrogen Dioxide, 5 ppm: approx. 1 ppm

**Carbon Monoxide Sensor Specifications**

**Range:** 0 to 500 ppm  
**Response Time:** T90 < 25 seconds  
**Operating Temp:** -4° to +122° F / -20° to +50° C  
**Humidity:** 15 to 90% RH, Non-condensing  
**Storage Temp:** +32° to +68° F  
 0 to 20 C

**Sensor Cross Sensitivity:**

Filtered against H<sub>2</sub>S, 15 ppm: < 0.5 ppm  
 Filtered against SO<sub>2</sub>, 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

**Oxygen Sensor Specifications**

**Range:** 0.0 to 25.0 %  
**Response Time:** T95 = 15 seconds  
**Operating Temp:** -4° to +122° F  
 -20° to +50° C  
**Humidity:** 0 to 99% RH, Non-condensing  
**Storage Temp:** +32° to +68° F  
 0° to 20° C

**Combustible Sensor Specifications**

**Range:** 0 to 80% LEL  
 0 to 100% v/v Gas  
**Response Time:** T50 = 10 seconds  
 T90 = 30 seconds  
**Operating Temp:** -40 to + 200 C  
**Humidity:** 0 to 99% RH, Non-condensing  
**Storage Temp:** +32° to +68° F  
 0° to 20° C

**Accuracy:**           % LEL = +/- 3% of applied gas  
                          % v/v Gas = +/- 10% of applied  
                          gas

**Linearity:**           % LEL = +/- 3% of Full Scale  
                          % v/v Gas = +/- 10% of Full  
                          Scale

## Appendix 2 - Gas Interferences

		Sensor Type									
		CO	H2S	CO	H2S	SO2	NO	NO2	CL2	NH3	PH3
<b>Applied Gas</b>				Dual Tox Sensor							
	CO		< = 0.5	~ 1	100	<1	0	< = -5	0	0	
	H2S	< 3	100	100	-20	<1		~ -8	~ -3	~ 100	
	SO2	0	~20	~ 2	< 1	100	0	0	0	~ 60	20
	NO	< 10	< 2	< 10	~ 15	< 1	100	0	0	~20	
	NO2	< = -20	~ -20	~ -20	~ -25	~ -100	< 30	100		0	
	CL2	0		~ -5	~ -5			-100	100	~ -50	
	H2	< 40		< 0.2	~30					0	<0.1
	HCN									~ 5	
	HCL									0	

**Values shown are in PPM**

*The above table shows known Gas Interferences to a limited number of chemical compounds. SCOTT INSTRUMENTS makes every effort to identify possible gas interferences to which gas sensors may be exposed, however, not all chemical compounds which presently exist have been tested and therefore the table does not show, nor should it be implied, that no additional interferences may occur. These selectivity ratios are to be used as guides only. They are not to be used as calibration factors. The gas species' actual cross-sensitivities may vary from the values shown. Refer to the Operation and Maintenance Manual for calibration instructions.*

< less than

~ approximately

## Appendix 3 - Scout Combustible K-Factors

The table lists K-factors referenced to methane calibration. The factors are the typical ratios of the response to the listed gases relative to the response to methane. The values are typical, but will vary from sensor to sensor and over the lifetime of a given sensor. When a gas other than the calibration gas is detected, divide the reading by the corresponding factor to estimate the actual gas concentration.

For example, propane may be detected by a Scout calibrated with methane. If the reading is 32% LEL: 32% LEL Methane indicated/0.65 = 49% LEL of propane, estimated.

Generally, if there is a potential for methane in the operating environment, the instrument should be calibrated with methane. If there also is a potential for other gases in the operating environment, the LEL alarm level should be adjusted according to the lowest K-factor of the expected gases. For example, if either methane or propane may be present, and the desired alarm is 25% LEL, calibrate the instrument with methane and set the alarm level at ( $25\% \times 0.65 = 16\%$  LEL).

For best accuracy, use the same calibration gas as will be detected in use. Using the COMB PARAMETERS menu, select the appropriate calibration gas name and set the corresponding concentration.

Known Gas Present	K-factor
n-Butane	0.6
Methanol	1.04
Ethane	0.8
Hydrogen	1.1
<b>Methane</b>	<b>1</b>
Propane	0.65
n-Pentane	0.5
n-Hexane	0.45
n-Octane	0.4
Ethanol	0.8
Isopropanol	0.69
Acetone	0.7
Ammonia	1.3
Toluene	0.35
Gasoline	0.6
Isobutanol	0.53
Xylene	0.49
Styrene	0.46

# Parts List

## Batteries, Backups, Chargers, & Power Supplies

096-2540	Li-Ion Battery Pack (No Charger)
096-2560	Alkaline Battery Pack
096-2581	90-264V AC IriS Charger Kit (includes IriS charger and plug-in cable)
096-2582	12V DC IriS Car Charger Kit (includes IriS charger and plug-in cable)

## Calibration Accessories

068-0015	FEP Lined Flexible Clear Tubing
077-0021	3/16 ID Clear Flexible (Tygon) Tubing
077-0272	Hydrogen Sulfide 25ppm gas cylinder (2AL) 34L
077-0273	Carbon Monoxide 50ppm gas cylinder (7HP) 34L
077-0276	Sulfur Dioxide 10ppm gas cylinder (2AL) 34 L
077-0277	Ammonia 25ppm gas cylinder (2AL) 34 L
077-0278	Hydrogen Cyanide 10ppm gas cylinder (2AL) 34L
077-0279	Chlorine 5 ppm gas cylinder (2AL) 34 L (also used for Chlorine Dioxide calibrations)
077-0280	Nitrogen Dioxide 5 ppm gas cylinder (2AL) 34 L
077-0346	Nitric Oxide 30ppm gas cylinder (2AL) 34 L

077-0351	O2/LEL/CO/H2S gas mixture cylinder (2AL) 34L
077-0352	O2/LEL/CO/H2S gas mixture cylinder (8AL) 58L
077-0353	O2/LEL/CO gas mixture cylinder (2AL) 34L
077-0354	O2/LEL/CO gas mixture cylinder (6D) 103L
077-0355	O2/LEL/H2S gas mixture cylinder (2AL) 34L
077-0356	O2/LEL/H2S gas mixture cylinder (8AL) 58L
077-0357	Methane (7HP) 34L gas cylinder 32%LEL / 1.62%v/v [50% Propane equivalent]
077-0358	Methane gas cylinder (6D) 103 L 32% LEL / 1.62%v/v [50% Propane equivalent]
077-0367	99.9% Methane gas cylinder (7HP) 34L
077-0371	25% LEL Pentane/19% O2/balance Nitrogen gas cylinder (6D) 103L
077-0372	25% LEL Pentane/19% O2/50 PPM CO/balance Nitrogen gas cylinder (6D) 103L
077-1239	Phosphine 1ppm gas cylinder (2AL) 34 L
096-2545	High Concentration Combustibles Calibration - factory Scout calibration for %v/v [Methane] applications
077-0018	2AL/8AL/6D .5 l regulator w/ gauge
077-0254	2AL/8AL/6D 1LPM Regulator w/gauge

**Calibration Accessories continued**

- 077-0342 2AL/8AL/6D Demand Flow Regulator
- 077-0343 7HP Demand Flow Regulator
- 077-1238 7HP.5 l regulator w/gauge
- 077-1268 7HP .5 l bullet
- 077-1271 2AL/8AL/6D .5 l bullet
- 096-2506-10 LEL/CO/H2S/O2 (2AL/34L) Calibration Kit w/ .5 LPM Regulator/No Knob
- 096-2506-11 LEL/CO/H2S/O2 (8AL/58L) Calibration Kit w/ .5 LPM Regulator/No Knob
- 096-2506-12 LEL/CO/O2 (7HP/34L) Calibration Kit w/ .5 LPM Bullet Regulator/No Knob or Gauge
- 096-2506-13 LEL/CO/O2 (6D/103L) Calibration Kit w/ .5 LPM Regulator/No Knob
- 096-2506-14 LEL/H2S/O2 (2AL/34L) Calibration Kit w/ .5 LPM Regulator/No Knob
- 096-2506-15 LEL/H2S/O2 (8AL/58L) Calibration Kit/ w/ .5 LPM Regulator/No Knob
- 096-2506-16 LEL/CO/H2S/O2 (2AL/34L) Calibration Kit w/ .5 LPM Regulator
- 096-2506-17 LEL/O2/CO/H2S (8AL/58L) Calibration Kit w/ .5 LPM Regulator
- 096-2506-18 LEL/O2/CO (7HP/34L) Calibration Kit w/ .5 LPM Regulator

- 096-2506-19 LEL/CO/O2 (6D/103L) Calibration Kit w/ .5 LPM Regulator
- 096-2506-20 LEL/H2S/O2 (2AL/34L) Calibration Kit w/ .5 LPM Regulator
- 096-2506-21 LEL/O2/H2S (8AL/58L) Calibration Kit w/ .5 LPM Regulator
- 096-2506-22 LEL/O2/CO/H2S (2AL/34L) Calibration Kit w/ Demand Flow Regulator
- 096-2506-23 LEL/CO/H2S/O2 (8AL/58L) Calibration Kit w/ Demand Flow Regulator
- 096-2506-24 LEL/CO/O2 (7HP/34L) Calibration Kit w/ Demand Flow Regulator
- 096-2506-25 LEL/CO/O2 (6D/103L) Calibration Kit w/ Demand Flow Regulator
- 096-2506-26 LEL/H2S/O2 (2AL/34L) Calibration Kit w/ Demand Flow Regulator
- 096-2506-27 LEL/O2/H2S (8AL/58L) Calibration Kit w/ Demand Flow Regulator

Note: All Calibration KIts include gas cylinder, regulator & tubing.

**Misc Parts & Accessories**

074-0366	Scout Case (Bottom)
077-0311	Molded Cary Case
096-2515	Scout Case (Top) - includes LCD lens, rubber buttons & visual alarm light pipes
096-2583	Pelican Case
062-0007	Scout Quick Reference Card
062-0008	Scout Programmer's Guide
076-0104	Torxs Screws
076-0105	Screws, Retains sensor cover
077-0308	Rubber Scout protective boot
077-0309	Scout Leather Holster
077-0314	Pump Bypass for instruments without pumps
077-0315	Scout IR Transceiver
077-0316	Data-cable (connects IRIS charger to PC)
077-0318	Scout Acoustic Earphone
077-0322	Filters, Internal
077-0323	Barb fitting on internal filter
087-0019	Scout Manual
093-0315	8 Relay DIO Card (I.R.i.S.)
093-0316	Cradle to DIO Board Control Cable (I.R.i.S.)
096-2510	pump w/ quick connect

096-2513	Datalogging PC Board
096-2516	rubber sensor manifold/filter assy
096-2517	Sensor cover/shutter assembly
096-2536	Lens assembly includes upper portion of case
096-2566	Computer System (I.R.i.S.)
096-2584	Hand Aspirator with 10 ft clear flexible (Tygon) tubing
096-2860	Dilution Valve Assembly
096-2861	I.R.i.S. Complete System
096-2873	Multi-Cradle Docking & Cal. System (I.R.i.S.)
096-2874	Slave Docking Cradle (I.R.i.S.)
099-0010	Scout PC Software

**Probes**

0051-2516	Flue Gas Probe
077-0298	Particulate Filters for 12" probe (Qty. 100)
077-0317	Hydrophobic filter for 12" probe
093-0148	12" probe w/hydrophobic filter, particulate filter & butyrate (plastic) tube
093-0241	12" probe w/hydrophobic filter, particulate filter & stainless steel tube
093-0241	100 particulate filters for 12" probe
096-2551	30" Barholing Probe (Brass Tube)
096-2552	30" Barholing Probe (Polycarbonate Tube)

- 096-2553 10" Flue Gas Probe
- 096-2862-1 Probe Scrubber Attachment (NOX)
- 096-2862-2 Probe Scrubber Attachment (Activtd. Charcoal)

**Sensors**

- 096-2522 O2 Sensor (Oxygen)
- 096-2523 CO Sensor (Carbon Monoxide)

**Misc Parts & Accessories continued**

- 096-2524 H2S Sensor (Hydrogen Sulfide)
- 096-2525 Cl Sensor (Chlorine)
- 096-2526 NH3 Sensor (Ammonia)
- 096-2527 SO2 Sensor (Sulfur Dioxide)
- 096-2528 Value2 TM Carbon Monoxide Hydrogen Sulfide
- 096-2529 PH3 Sensor (Phosphine)

**Sensors continued:**

- 096-2530 ClO2 Sensor (Chlorine Dioxide)
- 096-2531 HCN Sensor (Hydrogen Cyanide)
- 096-2532 NO2 Sensor (Nitrogen Dioxide)
- 096-2533 NO Sensor (Nitrogen Oxide)
- 096-2534 Combustible Sensor for Scout
- 096-2535 Dummy Sensor Plug (use in all un-used sensor locations)
- 096-2549 Combustible Dual Range Sensor (LEL & %Gas)

# Service and Repair

Scott Instruments  
251 Welsh Pool Rd  
Exton, PA 19341

Phone 610-363-5450  
Fax 610-363-0167  
email: [service@scottinstruments.com](mailto:service@scottinstruments.com)  
8:30 AM to 5:00 PM EST

Part No. 087-0019  
Rev. A  
Date: 02/18/03  
NDR #2204

