Contents

1.0 Purpose/Scope

This procedure provides a standardized method of operation for the *Scott Scout*® Multi-Gas Monitor. It provides a method for easy and accurate analysis of up to four atmospheric hazards, typically: Oxygen Level, Combustible Gas, Carbon Monoxide, and Hydrogen Sulfide. Some instruments have also been set up for monitoring diesel exhaust contaminants including: Oxygen Level, Carbon Monoxide, Sulfur Dioxide and Nitrogen Dioxide.

The *Scott Scout*® should be used in conjunction with the IH procedure IH75180: *Atmospheric Testing Using Direct Reading Instruments.* These meters are often used in Confined Space testing and should be used in conjunction with appropriate IH procedures for confined space testing protocols.

2.0 Responsibilities

Personnel that perform exposure monitoring with this instrument are responsible to:

- Have demonstrated the competency to satisfactorily use the meter as evidenced by experience and training, to the satisfaction of their supervision's qualification criteria.
- Follow all steps in this procedure.
- Have an appropriate evaluation of the hazard and risk on the data collected using this

meter by a knowledgeable professional.

3.0 Definitions

- ***ACGIH TLV**:* American Conference of Governmental Industrial Hygienist, Threshold Limit Value. An occupational exposure limit set by the ACGIH. Can be either eight-hour time weighted average (TWA); 15 minute short term exposure limit (STEL); or Ceiling (C) (value not to be exceeded at any time).

- ***Flooding:*** Exposure of the sensor(s) to an excessive concentration of a gaseous substance to the point that the linearity of the sensor response becomes invalid and the meter will not indicate the correct concentration.

- ***Interferences**:* chemicals that can cause the meter to give a false response. Example, hydrogen gas causes the carbon monoxide sensor to indicate the presence of CO even when none is present.

- ***OSHA PEL**:* Occupational Safety & Health Administration, Permissible Exposure Limit. An eight-hour TWA, 15 minute Short Term Exposure Limit (STEL), or Immediately Dangerous to Life and Health (IDLH) level.

Meter Readings:

- ***Alarm**:* High pitched, fast oscillating tone and strobing LED.

- ***Low Battery**:* A low battery condition will be indicated at instrument start up. Upon operator acknowledgment, the instrument will continue to audibly remind the operator with a group of 3 short beeps every 5 seconds.

- ***Over_Range:*** "+++++" is displayed as the concentration if the instrument detects a concentration of gas over the range of the sensor.

- ***TWA & STEL alarms:*** The unit is set to calculate average concentrations over the sample period. This average is compared to the TWA and STEL alarm set points set in the memory of the unit. The calculated average readings are lost when the instrument is turned off and restarted when it is turned back on. The unit alarms when these average readings reach the allowable levels.

- ***Warn:*** Low pitched slow beeping and LED flashing 1 time per second.

- **???%LEL:** Combustible sensors require oxygen for accurate detection. "???" is displayed when oxygen goes below 10% - this means the combustible sensor can no longer be relied upon to provide accurate readings.

4.0 Prerequisites

4.1 **Area Access:**
- Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas, if applicable. Verify if a Work Permit or Radiological Permit is needed or is in effect. If so, review and sign the permit.
- Use appropriate PPE for the area and check with the ESH Coordinator or FS representative for other appropriate training.

4.2 **Qualification:** The use of the *Scott Scout* is limited to persons who have demonstrated competency as determined by Section 7 of this procedure.

4.3 **Confined Space Use**:
- If meter is to be used for confined space purposes, *Confined Spac*e training and *Confined Space Atmosphere Monitoring* qualification is required.
- If respiratory protection is required for personal protection, the operator must be in full compliance with the BNL *Respiratory Protection Program.*

5.0 Precautions

5.1 Hazard Determination:

5.1.1 The operation of this meter does not cause exposure to any chemical, physical, or radiological hazards.

5.1.2 The meter design does not cause significant ergonomic concerns in routine use.

5.1.3 **Environmental Impact and Waste Disposal**: This sampling does not have adverse impact on the environment or create waste for disposal. The meter does not generate Hazardous Waste.

5.1.4 By its very nature as a toxic gas monitor, this meter may be used in areas where

atmospheric hazards are known or suspected to be present. Inhalation of toxic gases or oxygen deficient atmospheres can have significant health consequences. There may be significant chemical or radiological hazards in areas where this meter is used. These hazards must receive a hazard evaluation by a cognizant ESH professional.

The meter readings must be observed continuously when entering areas of potential hazards. The user should leave the area if:

- **the OSHA PEL or ACGIH TLV levels are exceeded, or**
- **10% LEL is exceeded, or**
- **the meter alarms, or**
- **the meter indicates "flooding" (an explosive concentration may have been reached.)**

5.2 Personal Protective Equipment (PPE): The use of this meter typically does not require PPE. The following considerations may be necessary based on hazards of an area:

- **Hand:** Use of this meter in areas of known or suspected surface contamination requires the use of disposable gloves. Exam-style, splash gloves are acceptable in: Nitrile, Neoprene, PVC, Butyl, Natural Rubber, Viton, and PEVAL (SilverShield®).
- **Body:** If contact of the body with contaminated surfaces is anticipated, a disposable suit should be used. Acceptable CPC materials include: Tyvek®, KleenGuard®, and cotton. Disposable garments must be discarded as waste if contact with contamination has occurred. If personal clothing items become contaminated, they must be surrendered for BNL cleaning or disposal.
- **Foot:** If contact of the feet with contaminated surfaces is anticipated, disposable shoe coverings, boots or booties should be used. Acceptable CPC material include: Tyvek®, KleenGuard®, and vinyl, and rubber. If personal shoes become contaminated, they must be surrendered for BNL cleaning or disposal.
- **Respiratory:** If airborne levels of hazards exceed the OSHA PEL or ACGIH TLV, respirators are required. A respirator complying with BNL's Respiratory Protection Selection and Issuance SOPs must be used.
- **Eye:** Safety Glasses with side shields are required in laboratories, general industry areas, and construction areas.

5.3 Instrument protection:

- The *Scott Scout* is intended for vapor use only. Do NOT allow the probe or the

meter to come in contact with liquids, dust or other foreign material.

- Operation of catalytic type combustible gas sensors may be seriously affected by silicones, free halogens, halogenated hydrocarbons and metallic oxides present in the ambient atmospheres being monitored. If the presence of these substances is suspected, increased frequency of calibration verification is recommended.
- The electrochemical sensors require a small amount of electrical current to keep them in their best state of readiness to detect gas when the instrument is turned on. Scott instruments recommends:
  - The Scout's battery should not be removed for more than 30 minutes.
  - Do NOT store the instrument with the battery disconnected.

5.4 Job Risk Assessment: Consult the *Job Risk Assessment* SHSD-JRA-05 for the risk analysis of this operation based on the hazards and controls of this SOP.

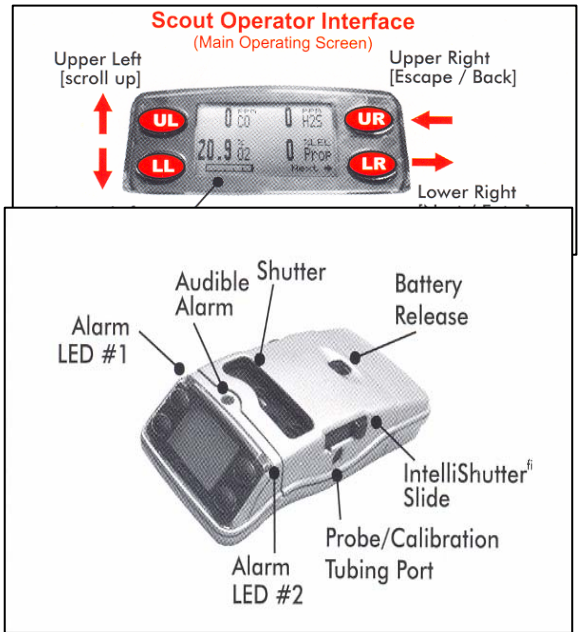
6.0 Procedure

6.1 **Equipment: (See Attachment 9.1 for photo)**

- Meter Body
- Sample Probe
- Optional: Remote sampling tubing. Up to 100 feet of Teflon® or Tygon® tubing (3/16 inch ID) may be inserted into the probe fitting.

6.2. **Alarms:** The alarm points have been set by the IH Lab. Operators should always verify the WARN and ALARM set points with the IH lab before operating the instrument. The factory default set points for typical sensors are:

- Oxygen Low Alarm 19.5%
- Oxygen High Alarm 23.5%
- Hydrogen Sulfide 10 ppm
- Carbon Monoxide 35 ppm
- Combustible Gas 10% LEL



6.3. **Turning on the meter:** Press any one of the 4 interface buttons (UL,LL,UR,LR).

- Observe start up screen to determine battery charge state. If

the battery is low replace it. Slide the Battery Release switch over while pulling the battery pack away from the instrument. Immediately replace the battery and ensure that replacement battery pack is properly re-seated.

- Change from Diffusion to Sampling Mode. Slide the IntelliShutter forward (closed). The pump will automatically start if the instrument is so equipped. A message "**Leak Test – block Probe Inlet**" will appear. Insert probe tubing and block flow with finger. A message "**leak test passed – unblock probe**" will appear. The Scout is ready for remote sensing.

6.4. **Calibration:** All sensors become insensitive to the gases they monitor over time. Loss of sensitivity can be caused by normal degradation, exposure to high gas concentrations or sensor poisoning.

- Obtain the proper calibration gas for the instrument and prepare the calibration accessories by attaching the regulator to calibration gas cylinder. Attach one end of the hose to the regulator.
- From the main screen, press [Lower Right] button to enter the Cal/Zero menu.
- Press [Upper Left] [Cal] button.
- A message "Apply Gas" will appear. Close the IntelliShutter by sliding it forward.
- Ensuring the calibration gas is flowing, insert tubing into the Sample/Calibration Port.
- The Scout will display "calibrating". After about 60 seconds the message "remove gas" will be displayed.
- Press [Upper Right] button 2 times and remove tubing. Instrument may momentarily be in alarm until the calibration gas diffuses from the instrument's chamber.

6.5. **Lag time:** This delay in meter reading could prove to be extremely important if a high gas condition is encountered and escape procedures are to be implemented.

- The Integral pump draws at a flow rate of 0.5 LPM and ***one second per foot of tubing*** should be estimated for sample draw time. Check the meter with the tubing in-line to determine the time delay due to the transit of the sample vapor in the tubing.
- Each sensor has a characteristic response time for its target gas. This sensor response time must also be considered when calculating the initial time required for the remote sample to reach the instrument and provide a stable gas concentration display.

6.6. **Negative Gas Readings:** Interfering gases can potentially cause a negative reading or zero drift. If a negative reading occurs in clean air, the instrument should be zeroed.

6.7. **Observe and Record Readings:** The reading for each of the four sensors is visible during testing.

- The TWA/STEL and Peak readings can be observed on the screen. From the main menu press the [lower right] button (next) and scroll through the screens. These readings are not saved when the instrument is turned off.
- Record readings on a BNL *Direct Reading Instrument* Form (or Confined Space Permit, if applicable).

6.8. **Turning off the meter:** Press the [lower left] and [lower right] buttons at the same time. Hold for 3 seconds. Press the [upper left] button to complete the turn off sequence.

6.9. **Document Sampling Results**

- Return meter and original copy of the *Direct Reading Instrument* sampling form to the SHSD IH Laboratory.
- Note and mention any problems with the meter.

6.10. **Results interpretation**:

- A competent person should write a hazard evaluation report evaluating the monitoring if it evaluated the potential for occupational exposure and indicates the status of compliance with OSHA and ACGIH Occupational Exposure Limits.
- Ensure all forms and reports are distributed in accordance with *Reporting Personnel Exposure Monitoring Results* IH60500.

7.0 Implementation and Training

Prior to using this meter, the operator:

7.1 Demonstrates proper operation of this instrument to the satisfaction of the employee's supervision.

7.2 Other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).

7.3 For the SHSD IH Group personnel:

- Qualification on this JPM is required on a 3 year basis, providing the professional is monitoring frequently.

- Personnel are to document their training using the Attachment 9.2 with its *Job Performance Measure Completion Certificate* for this meter.

8.0 References

8.1 *Scott Scout* Personal Gas Monitor Installation/Operation/Maintenance Instruction

9.0 Attachments

9.1 Photo of the meter
9.2 Qualification Criteria Record for SHSD personnel
9.3 Calibration Record

10.0 Documentation

Document Development and Revision Control Tracking		
PREPARED BY: *(Signature and date on file)* **John W. Peters** **Date 12/14/2004**	**REVIEWED BY:** *(Signature and date on file)* **R. Selvey** **Date 12/14/2004**	**APPROVED BY:** *(Signature and date on file)* **R. Selvey IH Manager** **Date 12/16/2004**
ESH Coordinator/ Date: *none*	Work Coordinator/ Date: *none*	SHSD Manager / Date *none*
QA Representative / Date: *none*	Training Coordinator / Date: *none*	Filing Code: **IH52**
Facility Support Rep. / Date: *none*	Environ. Compliance Rep. / Date: *none*	Effective Date: **12/16/04**
ISM Review - Hazard Categorization ☐ High ☒ Moderate ☐ Low/Skill of the craft	Validation: ☐ Formal Walkthrough ☐ Desk Top Review ☐ SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 05/21/07 Hard Copy files updated: 05/21/07 Document Control on forms: 05/21/07

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division **INDUSTRIAL HYGIENE GROUP** Standard Operating Procedure: Field Procedure	NUMBER **IH75505** REVISION **Final Rev1**
SUBJECT: INSTRUMENT OPERATION: **_Scott Scout_® Multi-Gas Monitor**	DATE **05/21/07** PAGE **9** OF 12

Revision Log

Purpose: ☐ Temporary Change ☐ Change in Scope ☒ Periodic review ☐ Clarify/enhance procedural controls

Changed resulting from: ☐ Environmental impacts ☐ Federal, State and/or Local requirements ☐ Corrective/preventive actions to non-conformances ☒ none of the above

Section/page and Description of change: Revised Section 4 and 5 with JRA information. Added document control to Attachment 9.2.

R. Selvey 05/21/07 (signature on file) SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	NUMBER **IH75505**
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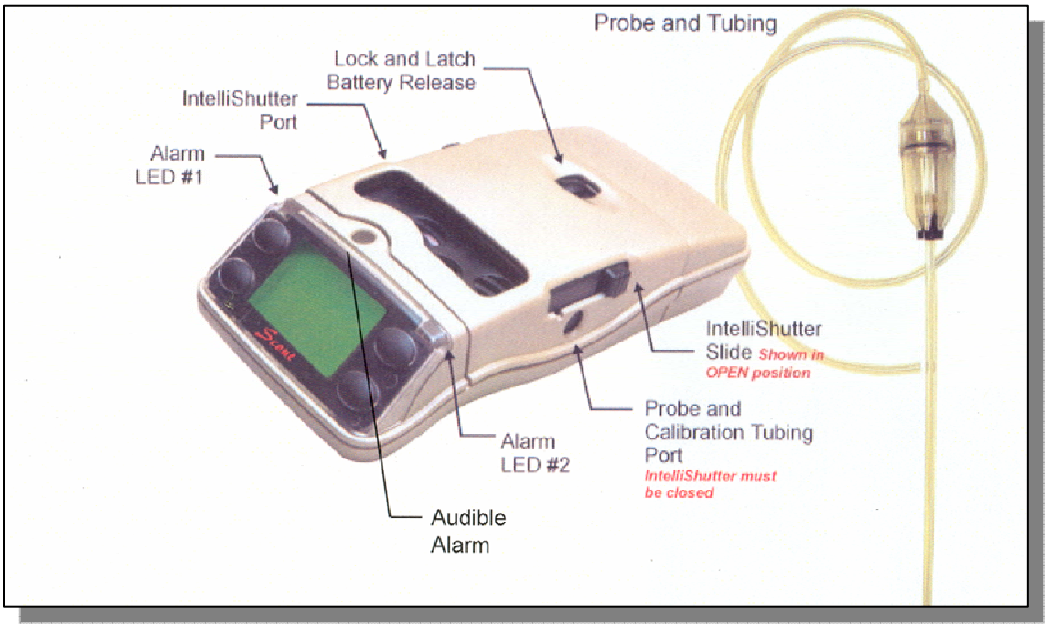
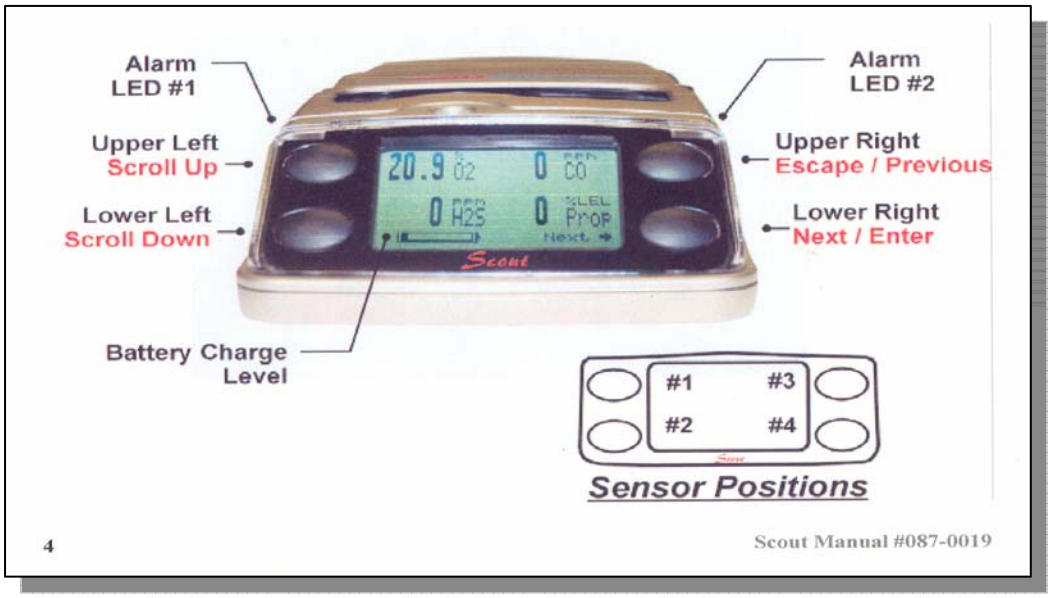
Attachment 9.1

Photo of the Meter





BROOKHAVEN NATIONAL LABORATORY

HP-IHP-75505

IH75505 Attachment 9.2

Environmental, Safety, Health & Quality Directorate
SHSD Industrial Hygiene

Scott Scout Multi-Gas Monitor Qualification

Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:

Topic	Criteria	Not Qualified	Recov-ered	Satis-factory
Hazard Analysis	Can show how to perform (or who to request to perform) the hazard analysis of the sampling area and potential exposure to the sampler.			
Personal Protective Equipment	Understands the need to be aware of the potential surface contamination and airborne levels of contaminants and knows how to determine the need for PPE and how to obtain the correct PPE for the hazard.			
Sampling Equipment	Can show where equipment needed for the procedure is located and how to properly sign it out.			
Sampling Protocol	Understands the exposure monitoring logic necessary to appropriately select sampling locations to accurately measure worker, public and environmental exposure potential.			
Meter Operation	Can show how to correctly run the meter on/off, warm-up, bump check, operate, and check readings with the meter. • Turn the unit on & off • Perform adequate warm-up of the unit • Bump check the unit sensors • Operate the unit in passive mode • Assemble the sample pump • Simulate monitoring an atmosphere			
Record forms	Can show how to correctly and completely fill out all forms associated with this SOP.			
Analysis of data	Can show how to perform (or who to request to perform) the data analysis on the sampling data to access potential exposure to the sampler, worker, public and environment. ▪ Can determine acceptable atmospheric conditions			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:

I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:

DESCRIPTION of PERFORMANCE ITEM	ACCEPTANCE CRITERIA
Perform start-up & warm-up of the unit ▪ Energize the unit ▪ Obtain data and verify instrument calibration ▪ Check backlight display function	Based on *Scott Scout* Personal Gas Monitor operating instructions: warm up is 15 minutes Depress any menu button to start Record: ▪ Instrument Serial Number ▪ Calibration Date ▪ **After automatic backlight function de-energizes, demonstrate how to re-energize function by momentarily pressing any button**
Bump check the unit sensors ▪ Locate check gas	Breathe into sample hose ▪ Observe decrease in oxygen and wait for alarm to sound. ▪ Explain expected response time of 1 second per foot of sample line and sensor diffusion Introduce check gas into sample line ▪ Observe TLV and LEL indication
Operate unit in PASSIVE Mode ▪ Observe oxygen level indication	Test unit with Breath into the sensor intake port Indication should decrease from exhaled breath and alarm should sound ▪ Explain PASSIVE mode operation without sample assembly ▪ This mode is used primarily for continuous real-time personal monitoring
Assemble sample pump ▪ Locate and attach probe assembly	Obtain accessories from storage case Attach hose from assembly to sample inlet Attach sample tube to the probe ▪ Verify sensor pre-filter is in place Explain that battery power must be conserved
Monitor atmosphere and determine acceptable atmospheric condition	Simulate and explain obtaining atmospheric samples from various areas of space ▪ Determine acceptable atmospheric conditions: defaults are ➢ O_2 must be >19.5% and <23.5% ➢ LEL <10% ➢ CO <35% ➢ H_2S <10 ppm
Document results of survey ▪ Complete all applicable sections of the form	Use "Direct Reading Instrument" Data Sheet. ▪ Original copy of form goes to the IH Laboratory ▪ Other copies in accordance with IH60500
Turn off ▪ Disassemble and return all components to storage case ▪ Complete appropriate documentation for signing in the unit	Depress and hold until and LR buttons for 3 seconds then press UL button Return unit the IH Laboratory Sign instrument back into the IH system