



VEEDER-ROOT
SYSTEM OPERATING
INSTRUCTIONS

Technical Manual
Issued: 9/92
Supersedes 6/92

ILS-350 UST MONITORING SYSTEM

Manual Number 576013-772



VEEDER-ROOT 
Environmental Products

125 POWDER FOREST DR., SIMSBURY, CT 06070-2003 U.S.A. (203) 651-2700



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WARNING: THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY, AND IF NOT INSTALLED IN ACCORDANCE WITH THE ILS-350 "SITE PREPARATION AND INSTALLATION INSTRUCTIONS," MANUAL NO. 576013-773, AND USED IN ACCORDANCE WITH THE INSTRUCTIONS FOUND IN THIS MANUAL, MAY CAUSE INTERFERENCE TO RADIO COMMUNICATIONS. IT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS A COMPUTING DEVICE PURSUANT TO SUBPART J OF PART 15 OF THE FCC RULES, WHICH ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST SUCH INTERFERENCE WHEN OPERATED IN A COMMERCIAL ENVIRONMENT. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE INTERFERENCE IN WHICH CASE THE USER AT HIS OWN EXPENSE WILL BE REQUIRED TO TAKE WHATEVER MEASURES WILL BE REQUIRED TO CORRECT THE INTERFERENCE.

SECTION 1. INTRODUCTION

IMPORTANT: This product will be operated near the highly combustible environment of an underground fuel storage tank.

Leaking underground tanks can create serious environmental and health hazards. It is your responsibility to operate this product according to the instructions found in this manual.

1. This manual describes operating procedures for the ILS-350 UST Monitoring System designed and manufactured by the Veeder-Root Company, 125 Powder Forest Drive, Simsbury, CT 06070-2003.
2. When a vertical bar | appears adjacent to text or illustrations, information has been added or revised in this printing.
3. The instructions in this manual describe the procedures to operate **all** of the monitoring and control functions that can be installed in an ILS-350. The exact functions installed in the system you are operating were selected according to the monitoring requirements of your site. They can vary from system to system.

IF SOME FUNCTIONS WERE NOT INSTALLED IN THIS SYSTEM, it will skip those functions during the operating process.

In order to correctly and effectively operate this system, **YOU MUST KNOW** what leak detection, alarm and data communications functions have been installed.

SECTION 2. PRODUCT DESCRIPTION

The ILS-350 UST Monitoring System provides interstitial, sump liquid sensing and vapor sensing capabilities in up to 16 sensor locations at a site. Designed for simple operation, the ILS-350 steps the operator through each run mode feature with concise display commands.

A. MONITOR FEATURES

Operation of the system is performed using buttons and the display on the ILS-350 monitor front panel (see Figure 1, "ILS-350 Front Panel Features"). Depending on the features your system is equipped with, you can review the system status information, review the status of all installed sensors, test all relays and reset a corrected sensor condition.

The ILS-350 monitor includes the following features (see Figure 1, "ILS-350 Front Panel Features"):

- A two-line, 24-character-per-line liquid crystal display.
- A six-button keyboard with control functions for programming, operating and reporting.
- Three lamps to provide power-on, warning and alarm indications.
- An audible warning and alarm indicator.

1. Monitoring Functions.

Monitoring functions, such as interstitial leak sensing and vapor sensing, are provided by interstitial sensors located between the walls of double-wall tanks, sensors in the sumps of double-wall piping systems, and sensors in vapor monitoring wells.

The system you are operating may have a combination of these functions installed.

2. Output Functions

Output functions are provided by relays installed in the system. They are able to control external alarm devices when an alarm condition is sensed by any of the sensors installed in the ILS-350. Relays may also be used to control sumps.

IMPORTANT: Read the **WARNING** found on page 1 of this manual regarding the use of this product!

B. SENSORS

An ILS-350 system can incorporate sensors that detect liquids in interstitial spaces of double-wall tanks, and piping sumps, as well as sensors that can detect hydrocarbon vapors in dry monitoring wells and hydrocarbons flowing on top of the water table in wet monitoring wells.

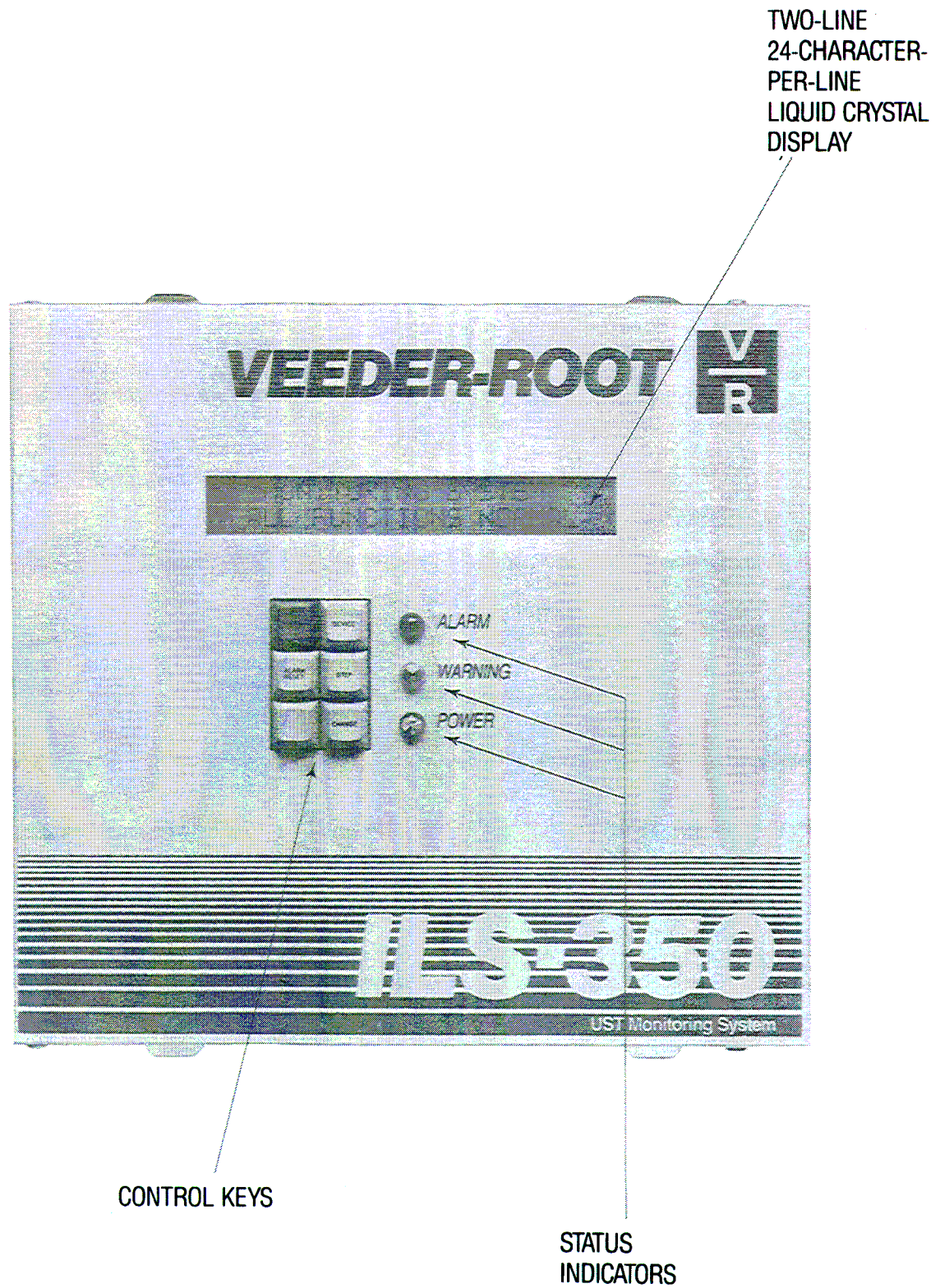


Figure 1. ILS-350 Front Panel Features.



SECTION 3. BASIC OPERATING INFORMATION

The ILS-350 functions in two modes — Run (Operating) and Setup.

A. RUN MODE

The Run Mode contains day-to-day functions that are essential to on-site operation of the system. Within the Run Mode you can review the configuration of all the system devices, clear corrected sensor alarm or warning condition, and test any original relay, if so desired.

During normal operation, the display will show the current system status message.

B. SETUP MODE

The ILS-350 was programmed to operate according to the requirements of this site using procedures in the Setup Mode. Unless functions are added to the system or application requirements change at the site, no changes should be made to setup parameters.

If changes must be made to the setup parameters, toggle the Setup/Run Switch in the power section of the monitor to the Setup position.

IMPORTANT!

Only qualified persons following instructions outlined in the "ILS-350 System Setup Instructions," Manual No. 576013-774 should enter or revise setup parameters!

C. RUN MODE ORGANIZATION

The Run Mode has been organized to make accessing data simple and logical (see Figure 2, "Run Mode Organization"). In most cases, only a few keystrokes are required to perform a particular procedure.

1. Functions

The Run Mode is broken down into DEVICES or general categories of information or procedures. There are five DEVICES:

- ILS-350 Self-Test
- Software Version
- Timed Alarm Relay
- Sensor Status
- Relay Test

The exact functions installed in the system you are operating were selected according to the requirements of your site. They can vary from system to system.

IF SOME DEVICES WERE NOT INSTALLED IN THIS SYSTEM, those devices will be skipped during the operating process.

To correctly and effectively operate this system, **YOU MUST KNOW** what sensor, and alarm devices have been installed.

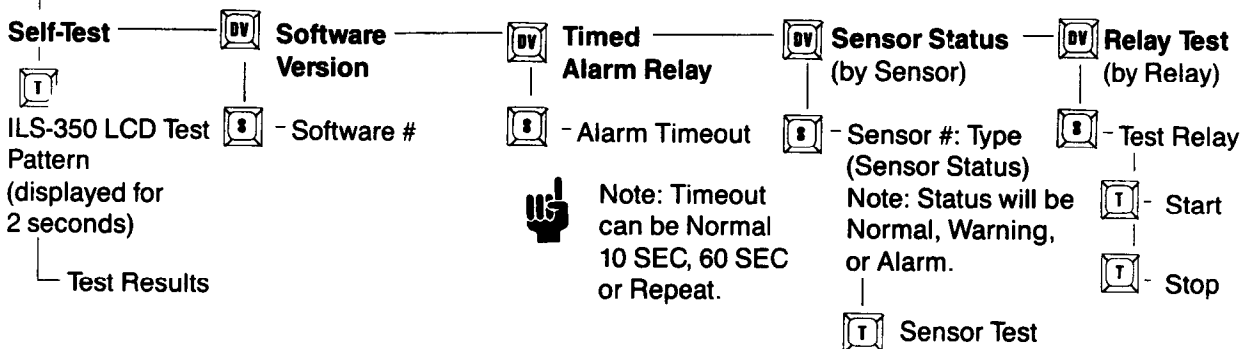
2. Steps

Within each DEVICE are STEPS where particular types of information are accessed or procedures carried out.

3. Tests

The unit can be self-tested by pressing the TEST button. In addition, assigned relays can also be self-tested along with individual sensors. Thus, TEST button initiates and terminates testing at certain steps.

SWITCH TO RUN



LEGEND

- | | |
|---------------|----------|
| = TEST | = STEP |
| = DEVICE | = CHANGE |
| = ALARM RESET | |

Figure 2. Run Mode Organization

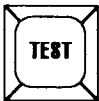




SECTION 4. HOW TO USE THE KEYBOARD

A. GENERAL

The keyboard consists of six buttons. The functions of each button have been designed to make operation of the ILS-350 as simple as possible.

The buttons allow you to access the system data.

B. OPERATING BUTTON FUNCTIONS

BUTTON	RUN MODE	SETUP MODE
TEST 	<p>In the Run Mode, TEST activates self-test features.</p> <ol style="list-style-type: none"> 1. In the Sensor Status Submode, TEST measures the displayed sensor and resets an alarming sensor when the alarm condition has been corrected. 2. In the Relay the Test Submode, TEST initiates and terminates testing of the displayed relay. 	<p>In the Setup Mode, only when used in conjunction with ALARM RESET, TEST clears the EEPROM. Both buttons must be held down simultaneously for at least 3 seconds.</p>
DEVICE 	<p>In the Run Mode, DEVICE allows the operator to enter and view all devices (such as Timed Alarm Relay, Sensor Status, etc.), and return to the normal operating mode display.</p>	<p>In the Setup Mode, DEVICE causes the LCD to display for configuration any system device.</p>
ALARM RESET 	<p>In the Run Mode, ALARM RESET resets one or more existing audible alarm. It will not shut off visual display conditions. Each new alarm condition reactivates the audible alarm.</p>	<p>In the Setup Mode, only when used in conjunction with TEST, ALARM RESET clears the EEPROM. Both buttons must be held down simultaneously for at least 3 seconds.</p>
STEP 	<p>In the Run Mode, STEP is active only in submodes.</p> <ol style="list-style-type: none"> 1. In the Timed Alarm Relay Status Submode, STEP displays the timeout duration period for the timed alarm relay. 2. In the Sensor Status Submode, STEP displays status of sensors assigned a type during the Setup Mode. Sensors without type assignments will not be displayed. 3. In the Relay Test Submode, STEP displays the next available relay for test and terminates the current relay test. 	<p>In the Setup Mode, STEP advances the display to the next setup parameter of a device.</p>
CHANGE 	<p>Not active in Run Mode.</p>	<p>In the Setup Mode, CHANGE displays and allows the operator to select choices for device parameters. Changes are saved only when the Setup Mode is exited.</p>

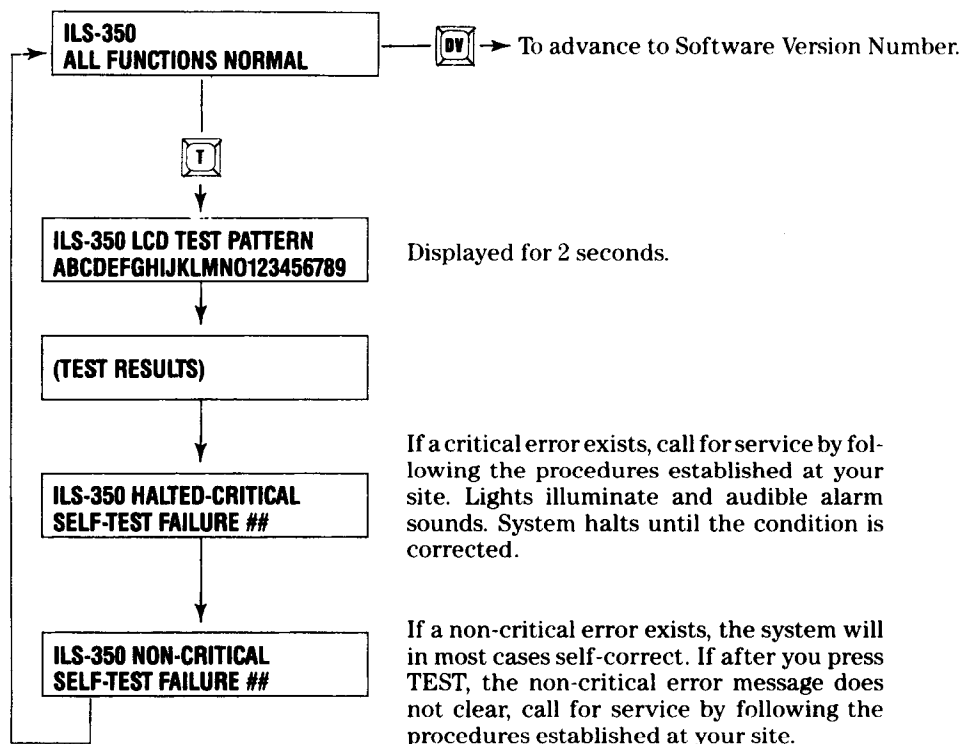


SECTION 5. HOW TO RUN THE ILS-350

A. HOW TO CONDUCT A SELF-TEST

In the RUN mode, the LCD will display either "ALLFUNCTIONSNORMAL" or it will scroll through error or sensor alarm messages at 1 second intervals. Sensor alarm messages or critical system errors must be corrected manually. The system can usually correct non-critical error messages on its own. Both critical and non-critical messages are displayed for your record. Pressing the test button will clear messages if the error conditions have been corrected. Sensor alarms are deactivated within the sensor status submode.

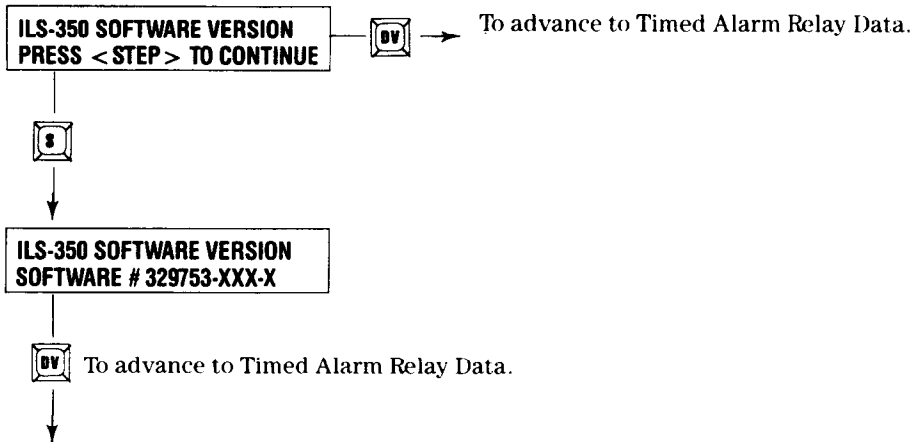
To advance to the Software Version Number, press DEVICE.



B. HOW TO IDENTIFY SOFTWARE VERSION

To identify the Software Version, from normal RUN mode display, press DEVICE once. Press STEP to display the Software #.

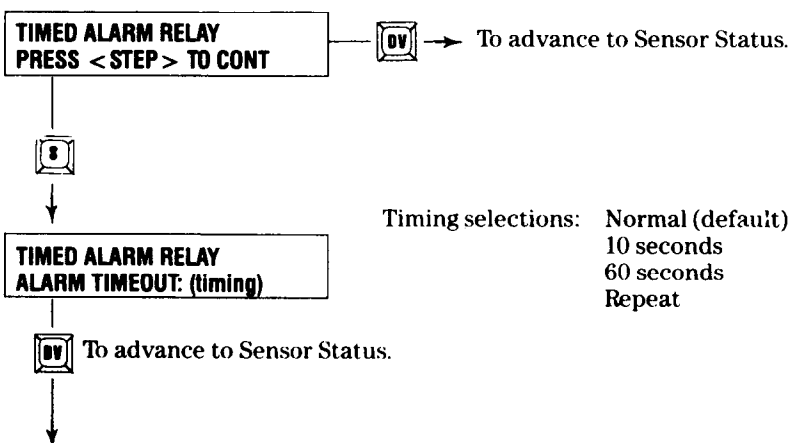
To advance to Timed Alarm Relay data, press DEVICE.



C. HOW TO REVIEW TIMED ALARM RELAY DATA

To review Timed Alarm Relay data, from the normal RUN mode display press DEVICE until "TIMED ALARM RELAY" appears in the display. The information in this display shows the time duration that the timed relay will be de-energized when an alarm condition exists on an assigned sensor. If ALARM TIMEOUT is NORMAL, the timed relay functions as other relays. It may also be programmed for a timeout duration of 10 seconds, 60 seconds or repeat for use with timed alarm devices.

To advance to Sensor Status, press DEVICE.

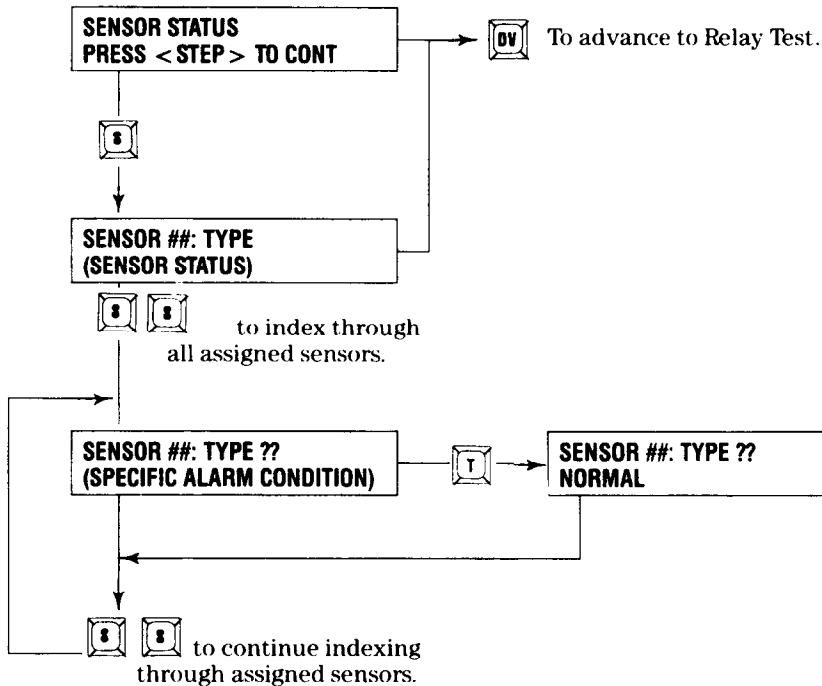




D. HOW TO REVIEW SENSOR STATUS

To review Sensor Status, from the normal RUN mode display press DEVICE until "SENSOR STATUS" appears in the display. You must enter sensor status, and run a test, as shown in the diagram below, to clear any sensor alarm or error message from the display after the alarm condition is corrected. If the alarm condition is not cleared for a particular sensor after running a test, call for service by following the procedures established at your site.

To advance to Relay Test, press DEVICE.



TEST clears an LCD alarm indication, only if alarm condition has been remedied. If sensor tests "NORMAL," alarm is removed. Otherwise, it is unchanged. See tables below for sensor status indicators.

or

to advance to Relay Test.

1. Description of Interstitial and Sump Liquid Sensor Status Indicators

SENSOR INDICATOR	CAUSE	ACTION
NORMAL	The sensor is functioning properly and no alarm conditions exist.	None.
UNRELIABLE	The system cannot read the connection, sensor was installed in wrong location, or sensor assignment is incorrect.	Reexamine sensor location and sensor assignment. Or call for service by following the procedures established at your site. Enter SETUP mode and correct sensor parameters.
SETUP ERROR	The sensor type was not assigned during SETUP mode.	Enter SETUP mode, assign correct sensor type.
SENSOR OUT	Sensor has been disconnected or is not functioning properly.	Correct sensor problem or replace sensor. Call for service by following the procedures established for your site.
FUEL ALARM	Fuel or liquid is present in the area monitored by the sensor.	Immediately follow the alarm reporting procedures established for your site.



2. Description of Vapor Sensor Status Indicators

SENSOR INDICATOR	CAUSE	ACTION
NORMAL	The sensor is functioning properly and no alarm conditions exist.	None.
UNRELIABLE	The system cannot read the connection, sensor was installed in wrong location, or sensor assignment is incorrect.	Reexamine sensor location and sensor assignment. Or call for service by following the procedures established at your site. Enter SETUP mode and correct sensor parameters.
SETUP ERROR	The sensor type was not assigned during SETUP mode.	Enter SETUP mode, assign correct sensor type.
SENSOR OUT	Sensor has been disconnected or is not functioning properly.	Correct sensor problem or replace sensor. Call for service by following the procedures established for your site.
WATER ALARM	The sensor is immersed in water and is unable to detect fuel vapors.	Call for service following the procedures established for your site.
SENSOR SHORT	An internal short has occurred in the sensor.	Call for service following the procedures established for your site.
FUEL ALARM	Vapor levels present in the observation well exceed the Vapor Alarm Threshold established for that well.	Immediately follow the alarm reporting procedures established for your site.

3. Description of Groundwater Sensor Status Indicators

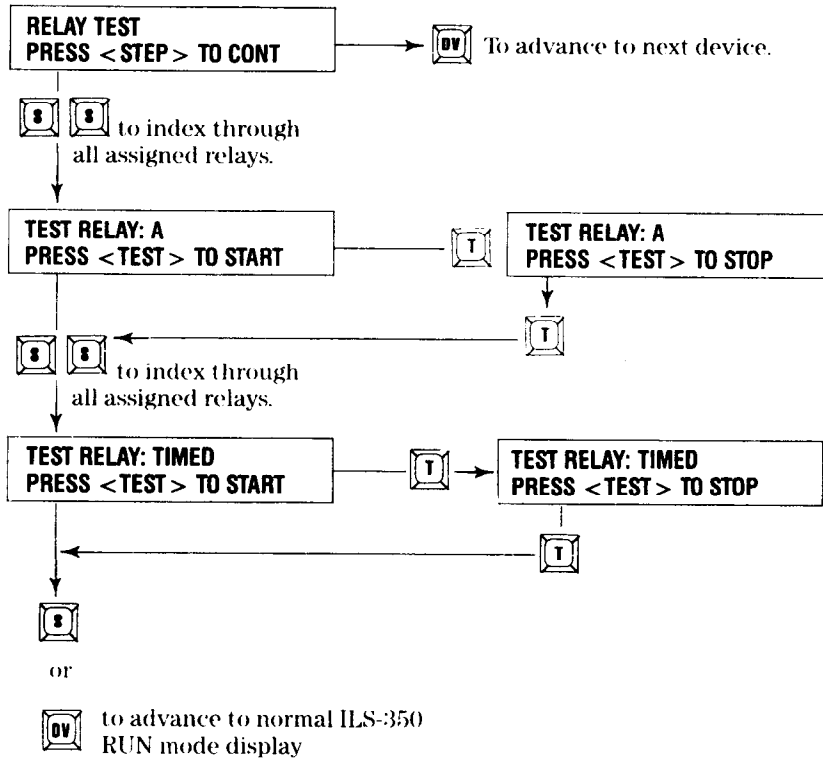
SENSOR INDICATOR	CAUSE	ACTION
NORMAL	The sensor is functioning properly and no alarm conditions exist.	None.
UNRELIABLE	The system cannot read the connection, sensor was installed in wrong location, or sensor assignment is incorrect.	Reexamine sensor location and sensor assignment. Or call for service by following the procedures established at your site. Enter SETUP mode and correct sensor parameters.
SETUP ERROR	The sensor type was not assigned during SETUP mode.	Enter SETUP mode, assign correct sensor type.
SENSOR OUT	Sensor has been disconnected or is not functioning properly.	Correct sensor problem or replace sensor. Call for service by following the procedures established for your site.
WATER OUT	Water level is below the float switch rendering the groundwater sensor ineffective.	Call for service following the procedures established for your site.
SENSOR SHORT	An internal short has occurred in the sensor.	Call for service following the procedures established for your site.
FUEL ALARM	A groundwater sensor in a monitoring well has detected fuel on top of the water table.	Immediately follow the alarm reporting procedures established for your site.



E. HOW TO TEST ASSIGNED RELAYS

To test an assigned relay and confirm it is active, from the normal RUN mode, press DEVICE until "RELAY TEST" appears in the display. Only relays assigned to sensors, and the external relay appear on the display.

Press DEVICE at any time to exit RELAY TEST and advance to the normal RUN mode display.



NOTE: TIMED always appears while scrolling through the relays.



SECTION 6. WARNING AND ALARM MESSAGES AND WHAT THEY MEAN

A. HOW THE ILS-350 DETECTS WARNING AND ALARM CONDITIONS

The ILS-350 constantly monitors its entire system for warning and alarm conditions including fuel leaks and equipment problems.

During normal operation when the system is functioning properly and no warning or alarm conditions exist, the "All FUNCTIONS NORMAL" message will appear in the system status (bottom) line of the display. If a warning or alarm condition is present, the type and sensor number of the warning or alarm will be indicated by a message on the system status line. If more than one condition exists, the display will alternately flash the appropriate System Status Messages.

B. HOW TO RECOGNIZE WARNING AND ALARM CONDITIONS

Warning and alarm conditions detected while the ILS-350 is in its normal operating mode are indicated by a combination of an audible beep, warning and alarm lights on the front panel and a message on the display.

Display messages will tell you the sensor number and type of warning or alarm. For example, this display:

**SENSOR: 04 TYPE: INT
LIQUID ALARM**

indicates that liquid is leaking into the tank interstice that Sensor Number 4 is monitoring. (Refer to your sensor location label).

The charts in Section 6.E. provide explanations of each warning or alarm you can encounter during normal operation.

C. WHAT TO DO WHEN A WARNING OR ALARM OCCURS

Specific response instructions for each type of warning or alarm condition should be established and clearly posted by the person responsible for your site. **BE SURE YOU ARE FAMILIAR WITH THE WARNING AND ALARM RESPONSE PROCEDURES ESTABLISHED FOR YOUR SITE!**

D. HOW TO SHUT OFF WARNING AND ALARM INDICATORS

1. Audible Alarm

Push the ALARM RESET button to silence the audible alarm.

2. Red Alarm and Yellow Warning Lights

Warning and Alarm lights cannot be turned off until the cause of the warning or alarm has been corrected. If caused by a sensor condition, the operator must TEST the sensor from the Sensor Status Submode of the Run mode only when the warning or alarm condition has been eliminated. If multiple sensor alarm or warning conditions exist, each must be corrected. The lights will go off if TEST is "Normal."

3. Warning and Alarm Display Messages

Display Warning and Alarm Messages will appear on the display until the cause of the message(s) has been eliminated. If caused by a sensor condition, the operator must TEST the sensor from the Sensor Status Submode of the Run mode. Message is cleared if TEST is "Normal." When the cause(s) of the message(s) is eliminated, the "ALL FUNCTIONS NORMAL" message will appear on the display.



E. WARNING AND ALARM MESSAGES

1. System Status Messages.

DISPLAY MESSAGE	AUDIBLE/VISUAL INDICATORS	CAUSE
ILS-350 HALTED-CRITICAL SELF-TEST FAILURE ##	Fast audible beep. Red flashing light. System shuts down.	Hardware failure.
ILS-350 NON-CRITICAL SELF-TEST FAILURE ##	Slow audible beep. Yellow flashing light.	Self-correcting software failure.
ILS-350 ALARM MISSING PROTECTIVE COVER	Red light flashing quickly. Yellow light flashing slowly.	Protective cover over power area is not properly installed.

2. Interstitial and Sump Liquid Sensor Warning and Alarm Messages.

DISPLAY MESSAGE	AUDIBLE/VISUAL INDICATORS	CAUSE
UNRELIABLE	Slow audible beep. Yellow flashing light.	The system cannot read the con- nection, sensor installed in wrong location, or sensor assignment is incorrect.
SETUP ERROR	Slow audible beep. Yellow flashing light.	The sensor type was not assigned during SETUP mode.
SENSOR OUT	Slow audible beep. Yellow flashing light.	Sensor has been disconnected or is not functioning properly.
FUEL ALARM	Fast audible beep. Red flashing light.	Fuel or liquid is present in the area monitored by the sensor.



3. Vapor Sensor Warning and Alarm Messages.

DISPLAY MESSAGE	AUDIBLE/VISUAL INDICATORS	CAUSE
UNRELIABLE	Slow audible beep. Yellow flashing light.	The system cannot read the connection, sensor installed in wrong location, or sensor assignment is incorrect.
SETUP ERROR	Slow audible beep. Yellow flashing light.	The sensor type was not assigned during SETUP mode.
SENSOR OUT	Slow audible beep. Yellow flashing light.	Sensor has been disconnected or is not functioning properly.
WATER ALARM	Slow audible beep. Yellow flashing light.	The sensor is immersed in water and is unable to detect fuel vapors.
SENSOR SHORT	Slow audible beep. Yellow flashing light.	An internal short has occurred in the sensor.
FUEL ALARM	Fast audible beep. Red flashing light.	Vapor levels present in the observation well exceed the Vapor Alarm Threshold established for that well.

4. Groundwater Sensor Warning and Alarm Messages.

DISPLAY MESSAGE	AUDIBLE/VISUAL INDICATORS	CAUSE
UNRELIABLE	Slow audible beep. Yellow flashing light.	The system cannot read the connection, sensor installed in wrong location, or sensor assignment is incorrect.
SETUP ERROR	Slow audible beep. Yellow flashing light.	The sensor type was not assigned during SETUP mode.
SENSOR OUT	Slow audible beep. Yellow flashing light.	Sensor has been disconnected or is not functioning properly.
WATER OUT	Slow audible beep. Yellow flashing light.	Water level is below the float switch rendering the groundwater sensor ineffective.
SENSOR SHORT	Slow audible beep. Yellow flashing light.	An internal short has occurred in the sensor.
FUEL ALARM	Fast audible beep. Red flashing light.	A groundwater sensor in a monitoring well has detected fuel on top of the water table.



SECTION 7. WARRANTY CONDITIONS AND LIMITATIONS OF LIABILITY

A. LIMITATIONS OF LIABILITY. We warrant that this product shall be free from defects in material and workmanship for a period of one (1) year from the date of installation or fifteen (15) months from the date of invoice, whichever occurs first. During the first ninety (90) days of this warranty period, we will repair or replace the product, if determined by us to be defective, at the location where the product is in use and at no charge to the purchaser. After the first ninety (90) days of the warranty period, we will repair or replace the product if it is returned to us, transportation prepaid, within the warranty period and is determined by us to be defective. We will not be responsible for any shipping expenses incurred by the user.

This warranty applies only when the product is installed in accordance with Veeder-Root's specifications, and a Warranty Registration and Checkout Form has been filed with Veeder-Root by an authorized Veeder-Root Distributor. This warranty will not apply to any product which has been subjected to misuse, negligence, or accident; or misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; or improperly installed.

B. INSPECTION. You shall inspect the product promptly after receipt and shall notify us at our Simsbury office, in writing, of any claims, including claims of breach of warranty, within thirty days after you discover or should have discovered the facts upon which the claim is based. Your failure to give written notice of a claim within the time period shall be deemed to be a waiver of such claim.

C. LIMITATION OF REMEDY AND WARRANTY. The provisions of Paragraph A are our sole obligation and exclude all other remedies or warranties, express or implied, including warranties of MERCHANTABILITY

and FITNESS FOR A PARTICULAR PURPOSE, whether or not purposes or specifications are described herein. We further disclaim any responsibility whatsoever to you or to any other person for injury to person or damage to or loss of property or value caused by any product which has been subjected to misuse, negligence, or accident; or misapplied; or used in violation of product manuals, instructions, or warnings; or modified or repaired by unauthorized persons; or improperly installed.

D. LIMITATION OF DAMAGES. Under no circumstances shall we be liable for any incidental, consequential or special damages, losses or expenses arising from this contract or its performance or in connection with the use of, or inability to use, our product for any purpose whatsoever.

E. LIMITATION OF ACTIONS. No action regardless of form arising out of this contract may be commenced more than one year after the cause of action has accrued, except an action for nonpayment.

F. COLLATERAL PROMISES. There are no representations, warranties, or conditions, express or implied, statutory or otherwise except those herein contained, and no agreement or waivers collateral hereto shall be binding on either party unless in writing and signed by you and accepted by us at our Simsbury office.

G. INTERPRETATION. Rights and liabilities arising out of any contract with us shall be determined under the Uniform Commercial Code as enacted in Connecticut.

Warranty revised January 1, 1992



APPENDIX A: RESULTS OF THIRD PARTY STANDARD EVALUATION OF POINT SENSOR LIQUID CONTACT AND VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTORS

**Results of Third Party Standard Evaluation
 Point Sensor Liquid Contact Product Detectors**

This form documents the performance of the cable sensor liquid contact leak detection system described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the Third Party Procedures developed according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."¹

Tank owners using this leak detection system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to verify that this form satisfies their requirements.

Method Description

Name 350 Series UST Monitoring Systems: Models ILS 350 (serial #Beta 013) & TLS 350

Version with Liquid Sensor for Sumps (0794390-206)

Vendor Veeder-Root Environmental Products

125 Powder Forest Drive

(street address)

Simsbury,

CT

06070-2003

(800) 873-3313

(city)

(state)

(zip)

(phone)

Detector output type: ☒ Qualitative

Detector operating principle: ☐ Electrical Conductivity ☐ Capacitance Change

☐ Interface Probe ☐ Product Permeable ☐ Product Soluble ☐ Thermal Conductivity

☐ Pressure Switch ☐ Magnetic Switch ☒ Other (Float Switch)

Detector sampling frequency: ☐ Intermittent ☒ Continuous

Evaluation Results

The detector described above was tested for its ability to detect test liquids in contact with the point sensor. The following parameters were determined:

- Detection Accuracy - The measure of sensor response to the presence of liquids.
- Response Time - Amount of time the detector must be exposed to liquid before it responds.
- Recovery Time - Amount of time that passes before the detector returns to its baseline reading after the test liquid is removed.
- Lower Detection Limit - The smallest liquid concentration that the detector can reliably detect.
- Product Activation Height - The height of liquid to cause sensor activation.
- Specificity - Indicates the level of response, of the detector, to several different liquids.

¹ Carnegie Mellon Research Institute. Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems: Final Report - November 11, 1991.

Liquid Contact Product Detector UST Monitoring System: Models ILS 350 (Beta 013) & TLS 350
Version with Liquid Sensor for Sumps (0794390-206)

Evaluation Results (continued)

> Compiled Test Results for Qualitative Detector

Test Product Flow Rate: 0.14 ± 0.004 gal/hr.

	Detection Accuracy	Product Activation Height	Response Time at a Flow Rate of 0.14 ± 0.004 gal/hr	Recovery Time
Accuracy and Response Time				
Regular Unleaded Commercial Gasoline (6 tests)	100%	1.56 ± 0.02 in (3.95 ± 0.05 cm)	8.49 ± 0.13 min	< 1 min
Specificity				
Synthetic Fuel (3 tests)	100%	[99%]* 1.54 ± 0.0 in (3.90 ± 0.0 cm)	7.78 ± 0.06 min	< 1 min
Diesel Fuel (3 tests)	100%	[95%]* 1.47 ± 0.02 in (3.73 ± 0.06 cm)	7.66 ± 0.11 min	< 1 min
Home Heating Oil #2 (3 tests)	100%	[94%]* 1.46 ± 0.0 in (3.70 ± 0.0 cm)	7.84 ± 0.04 min	< 1 min
Water (3 tests)	100%	[88%]* 1.36 ± 0.02 in (3.47 ± 0.06 cm)	7.39 ± 0.06 min	< 1 min

* Specificity Reference: Regular Unleaded Commercial Gasoline

Test Fuel	Product Activation Height - Calculated Lower Detection Limit for 95% / 5% Condition
Regular Unleaded Commercial Gasoline	1.71 in (4.36 cm)

> Safety disclaimer: This test procedure only addresses the issue of the method's ability to detect the presence of liquid product. It does not test the equipment for safety hazards.

Certification of Results

I certify that the point sensor liquid contact product detector was operated according to the vendor's instructions and that the evaluation was performed according to the Third Party Procedures developed according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."¹ I also certify that the results presented above are those obtained during the evaluation.

Margaret Nasta, Ph.D.
(printed name)

Margaret Nasta
(signature)

July 17, 1992
(date)

Carnegie Mellon Research Institute **
(organization performing evaluation)

Pittsburgh, PA 15213
(city, state, zip)

(412) 268-3475
(phone number)

** Consultant to the Manufacturer

**Test Procedures for Evaluating Leak Detection Methods:
Liquid Contact Point Sensors - Out of Tank Product Detectors**

November 1991

**Test Results for
Veeder-Root UST Monitoring System: Model ILS 350
with Liquid Sensor for Sumps 0794390-206
July 1992**

Monitor: Veeder-Root UST Monitoring System: Model ILS 350 (serial # Beta 013)

Probe Diameter = 4.85 cm

Test Chamber Diameter = 5.8 cm

The Detection System described above was tested for its ability to detect test liquids in contact with the point sensor. The following parameters were determined:

- Detection Accuracy - The measure of sensor response to the presence of liquids.
- Response Time - Amount of time the detector must be exposed to liquid before it responds.
- Recovery Time - Amount of time that passes before the detector returns to its baseline reading after the test liquid is removed.
- Lower Detection Limit - The smallest liquid concentration that the detector can reliably detect.
- Minimum Sensitive Height - The minimum sensor length required to be in contact with the liquid product to cause sensor activation.
- Product Activation Height - The height of liquid to cause sensor activation.
- Specificity - Indicates the level of response, of the detector, to several different liquids.

ACCURACY AND RESPONSE

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
 Sensor = Liquid sensor for sumps 0794390-206
 Probe Diameter = 4.85 cm; Std. Dev. = 0.02

NA=not applicable

NR=no response

Minimum Sensitive Height = 1.6 in (40 mm) + 20% = 48 mm

TEST PRODUCT = UNLEADED GASOLINE

Test Distance = 30 ft

Trial#	Probe#	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	11	21.4	8.50	<1	3.9	8.9	76
2	11	21.4	8.60	<1	4.0	8.8	76
3	11	21.3	8.38	<1	4.0	8.9	75
4	11	21.4	8.47	<1	3.9	9.0	76
5	11	21.7	8.33	<1	3.9	9.0	75
6	11	21.7	8.67	<1	4.0	8.9	77
Average			8.49	<1	3.95	8.9	76
Std. Dev.			0.13	NA	0.05	0.1	1

Detection Accuracy (%) 100.0

Calculated Lower Detection Limit

Product Activation Height (cm) 4.36



SPECIFICITY

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
Sensor = Liquid sensor for sumps 0794390-206
Probe Diameter = 4.85 cm; Std. Dev. = 0.02

NA=not applicable
NR=no response

Minimum Sensitive Height = 1.6 in (40 mm) + 20% = 48 mm

TEST PRODUCT = Water

Test Distance = 30 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	11	21.0	7.45	<1	3.4	8.6	64
2	11	21.0	7.33	<1	3.5	8.6	63
3	11	21.0	7.38	<1	3.5	8.7	64
Average			7.39	<1	3.47	8.6	64
Std. Dev.			0.06	NA	0.06	0.0	1

Detection Accuracy (%) 100.0

Specificity Calculations
Product Activation Height (%) 87.8

TEST PRODUCT = HEATING OIL

Test Distance = 30 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	11	22.4	7.83	<1	3.7	8.7	68
2	11	22.2	7.88	<1	3.7	8.9	70
3	11	22.3	7.80	<1	3.7	8.7	68
Average			7.84	<1	3.70	8.8	69
Std. Dev.			0.04	NA	0.00	0.1	1

Detection Accuracy (%) 100.0

Specificity Calculations
Product Activation Height (%) 93.7



SPECIFICITY (cont.)

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
Sensor = Liquid sensor for sumps 0794390-206
Probe Diameter = 4.85 cm; Std. Dev. = 0.02

NA=not applicable
NR=no response

Minimum Sensitive Height = 1.6 in (40 mm) + 20% = 48 mm

TEST PRODUCT = **DIESEL FUEL**

Test Distance = 30 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	11	23.7	7.53	<1	3.7	9.3	70
2	11	23.4	7.73	<1	3.7	9.2	71
3	11	23.7	7.72	<1	3.8	9.2	71
Average			7.66	<1	3.73	9.2	71
Std. Dev.			0.11	NA	0.06	0.1	1

Detection Accuracy (%) 100.0

Specificity Calculations

Product Activation Height (%) 94.5

TEST PRODUCT = **SYNTHETIC GASOLINE**

Test Distance = 30 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	11	20.6	7.83	<1	3.9	9.1	71
2	11	20.7	7.78	<1	3.9	9.3	72
3	11	20.9	7.72	<1	3.9	9.2	71
Average			7.78	<1	3.90	9.2	71
Std. Dev.			0.06	NA	0.00	0.1	1

Detection Accuracy (%) 100.0

Specificity Calculations

Product Activation Height (%) 98.7



Results of Third Party Standard Evaluation Point Sensor Liquid Contact Product Detectors

This form documents the performance of the cable sensor liquid contact leak detection system described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the Third Party Procedures developed according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."¹

Tank owners using this leak detection system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to verify that this form satisfies their requirements.

Method Description

Name 350 Series UST Monitoring Systems: Models ILS 350 (serial #Beta 013) & TLS 350

Version with Interstitial Liquid Sensor for Fiberglass Tanks (0794390-401)

Vendor Veeder-Root Environmental Products

125 Powder Forest Drive

(street address)

Simsbury.

CT

06070-2003

(800) 873-3313

(city)

(state)

(zip)

(phone)

Detector output type: ☒ Qualitative

Detector operating principle: ☐ Electrical Conductivity ☐ Capacitance Change

☐ Interface Probe ☐ Product Permeable ☐ Product Soluble ☐ Thermal Conductivity

☐ Pressure Switch ☐ Magnetic Switch ☒ Other (Float Switch)

Detector sampling frequency: ☐ Intermittent ☒ Continuous

Evaluation Results

The detector described above was tested for its ability to detect test liquids in contact with the point sensor. The following parameters were determined:

- Detection Accuracy - The measure of sensor response to the presence of liquids.
- Response Time - Amount of time the detector must be exposed to liquid before it responds.
- Recovery Time - Amount of time that passes before the detector returns to its baseline reading after the test liquid is removed.
- Lower Detection Limit - The smallest liquid concentration that the detector can reliably detect.
- Product Activation Height - The height of liquid to cause sensor activation.
- Specificity - Indicates the level of response, of the detector, to several different liquids.

¹ Carnegie Mellon Research Institute. Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems: Final Report - November 11, 1991.

Liquid Contact Product Detector UST Monitoring System: Models ILS 350 (Beta 013) & TLS 350
Version with Interstitial Liquid Sensor for Fiberglass Tanks (0794390-401)

Evaluation Results (continued)

> Compiled Test Results for Qualitative Detector

Test Product Flow Rate: 0.19 ± 0.010 gal/hr.

	Detection Accuracy	Product Activation Height	Response Time at a Flow Rate of 0.19 ± 0.010 gal/hr	Recovery Time
Accuracy and Response Time				
Regular Unleaded Commercial Gasoline (6 tests)	100%	0.50 ± 0.02 in (1.27 ± 0.05 cm)	3.45 ± 0.11 min	< 1 min
Specificity				
Synthetic Fuel (3 tests)	100%	[100%]* 0.50 ± 0.02 in (1.27 ± 0.06 cm)	3.89 ± 0.09 min	< 1 min
Diesel Fuel (3 tests)	100%	[97%]* 0.49 ± 0.02 in (1.23 ± 0.06 cm)	3.70 ± 0.12 min	< 1 min
Home Heating Oil #2 (3 tests)	100%	[100%]* 0.50 ± 0.02 in (1.27 ± 0.06 cm)	3.78 ± 0.07 min	< 1 min
Water (3 tests)	100%	[92%]* 0.46 ± 0.02 in (1.17 ± 0.06 cm)	3.25 ± 0.19 min	< 1 min

* Specificity Reference: Regular Unleaded Commercial Gasoline

Test Fuel	Product Activation Height - Calculated Lower Detection Limit for 95% / 5% Condition
Regular Unleaded Commercial Gasoline	0.65 in (1.65 cm)

> Safety disclaimer: This test procedure only addresses the issue of the method's ability to detect the presence of liquid product. It does not test the equipment for safety hazards.

Certification of Results

I certify that the point sensor liquid contact product detector was operated according to the vendor's instructions and that the evaluation was performed according to the Third Party Procedures developed according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."¹ I also certify that the results presented above are those obtained during the evaluation.

Margaret Nasta, Ph.D.
(printed name)

Margaret Nasta
(signature)

July 17, 1992
(date)

Carnegie Mellon Research Institute **
(organization performing evaluation)

Pittsburgh, PA 15213
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(412) 268-3475
(phone number)

** Consultant to the Manufacturer



Page 1 July 17, 1992

**Test Procedures for Evaluating Leak Detection Methods:
Liquid Contact Point Sensors - Out of Tank Product Detectors
November 1991**

**Test Results for
Veeder-Root UST Monitoring System: Model ILS 350
with Interstitial Liquid Sensor for Fiberglass Tanks 0794390-401
July 1992**

Monitor: Veeder-Root UST Monitoring System: Model ILS 350 (serial # Beta 013)		
Probe Size	=	3.45 x 5.65 x 1.90 cm
Test Chamber Diameter	=	7.6 cm

The Detection System described above was tested for its ability to detect test liquids in contact with the point sensor. The following parameters were determined:

- | |
|--|
| • Detection Accuracy - The measure of sensor response to the presence of liquids. |
| • Response Time - Amount of time the detector must be exposed to liquid before it responds. |
| • Recovery Time - Amount of time that passes before the detector returns to its baseline reading after the test liquid is removed. |
| • Lower Detection Limit - The smallest liquid concentration that the detector can reliably detect. |
| • Minimum Sensitive Height - The minimum sensor length required to be in contact with the liquid product to cause sensor activation. |
| • Product Activation Height - The height of liquid to cause sensor activation. |
| • Specificity - Indicates the level of response, of the detector, to several different liquids. |

ACCURACY AND RESPONSE

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
 Sensor = Interstitial liquid sensor for fiberglass tanks 0794390-401
 Probe Size = 3.45 ± 0.01 (W) X 5.65 ± 0.07 (L) X 1.90 ± 0.05 (H) cm

NA=not applicable
 NR=no response

Minimum Sensitive Height = 0.8 in (20 mm) + 20% = 24 mm

TEST PRODUCT = UNLEADED GASOLINE

Test Distance = 12 ft

Trial#	Probe#	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	31	21.0	3.67	< 1	1.3	12.5	46
2	31	21.0	3.43	< 1	1.2	12.8	44
3	31	21.0	3.42	< 1	1.3	12.6	43
4	31	21.0	3.35	< 1	1.2	12.8	43
5	31	21.0	3.42	< 1	1.3	12.9	44
6	31	21.0	3.40	< 1	1.3	12.9	44
Average			3.45	<1	1.27	12.8	44
Std. Dev.			0.11	NA	0.05	0.2	1

Detection Accuracy (%) 100.0

Calculated Lower Detection Limit

Product Activation Height (cm) 1.65

SPECIFICITY

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
 Sensor = Interstitial liquid sensor for fiberglass tanks 0794390-401
 Probe Size = 3.45 ± 0.01 (W) X 5.65 ± 0.07 (L) X 1.90 ± 0.05 (H) cm

NA=not applicable
NR=no response

Minimum Sensitive Height = 0.8 in (20 mm) + 20% = 24 mm

TEST PRODUCT = Water

Test Distance = 12 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	31	21.0	3.32	< 1	1.2	11.7	39
2	31	21.1	3.03	< 1	1.1	11.9	36
3	31	21.1	3.40	< 1	1.2	11.8	40
Average			3.25	<1	1.17	11.8	38
Std. Dev.			0.19	NA	0.06	0.1	2

Detection Accuracy (%) 100.0

Specificity Calculations

Product Activation Height (%) 92.1

TEST PRODUCT = HEATING OIL

Test Distance = 12 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	31	21.7	3.70	< 1	1.2	11.4	42
2	31	21.7	3.80	< 1	1.3	11.3	43
3	31	21.7	3.83	< 1	1.3	11.0	42
Average			3.78	<1	1.27	11.2	42
Std. Dev.			0.07	NA	0.06	0.2	1

Detection Accuracy (%) 100.0

Specificity Calculations

Product Activation Height (%) 100.0



SPECIFICITY (cont.)

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
Sensor = Interstitial liquid sensor for fiberglass tanks 0794390-401
Probe Size = 3.45 ± 0.01 (W) X 5.65 ± 0.07 (L) X 1.90 ± 0.05 (H) cm

NA=not applicable
NR=no response

Minimum Sensitive Height = 0.8 in (20 mm) + 20% = 24 mm

TEST PRODUCT = DIESEL FUEL

Test Distance = 12 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	31	22.6	3.83	< 1	1.3	11.5	44
2	31	22.6	3.68	< 1	1.2	11.1	41
3	31	22.7	3.60	< 1	1.2	11.7	42
Average			3.70	<1	1.23	11.4	42
Std. Dev.			0.12	NA	0.06	0.3	2

Detection Accuracy (%) 100.0

Specificity Calculations

Product Activation Height (%) 97.4

TEST PRODUCT = SYNTHETIC GASOLINE

Test Distance = 12 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	31	20.6	3.80	< 1	1.2	12.37	47
2	31	20.5	3.98	< 1	1.3	12.06	48
3	31	20.5	3.88	< 1	1.3	11.86	46
Average			3.89	<1	1.27	12.1	47
Std. Dev.			0.09	NA	0.06	0.3	1

Detection Accuracy (%) 100.0

Specificity Calculations

Product Activation Height (%) 100.0



Results of Third Party Standard Evaluation Point Sensor Liquid Contact Product Detectors

This form documents the performance of the cable sensor liquid contact leak detection system described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the Third Party Procedures developed according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."¹

Tank owners using this leak detection system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to verify that this form satisfies their requirements.

Method Description

Name 350 Series UST Monitoring Systems: Models ILS 350 (serial #Beta 013) & TLS 350

Version with Interstitial Liquid Sensor for Steel Tanks (0794390-420)

Vendor Veeder-Root Environmental Products

125 Powder Forest Drive

(street address)

Simsbury,

CT

06070-2003

(800) 873-3313

(city)

(state)

(zip)

(phone)

Detector output type: X Qualitative

Detector operating principle: Electrical Conductivity Capacitance Change

 Interface Probe Product Permeable Product Soluble Thermal Conductivity

 Pressure Switch Magnetic Switch X Other (Float Switch)

Detector sampling frequency: Intermittent X Continuous

Evaluation Results

The detector described above was tested for its ability to detect test liquids in contact with the point sensor. The following parameters were determined:

- Detection Accuracy - The measure of sensor response to the presence of liquids.
- Response Time - Amount of time the detector must be exposed to liquid before it responds.
- Recovery Time - Amount of time that passes before the detector returns to its baseline reading after the test liquid is removed.
- Lower Detection Limit - The smallest liquid concentration that the detector can reliably detect.
- Product Activation Height - The height of liquid to cause sensor activation.
- Specificity - Indicates the level of response, of the detector, to several different liquids.

¹ Carnegie Mellon Research Institute. Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems: Final Report - November 11, 1991.

Liquid Contact Product Detector UST Monitoring System: Models ILS 350 (Beta 013) & TLS 350
Version with Interstitial Liquid Sensor for Steel Tanks (0794390-420)

Evaluation Results (continued)

> Compiled Test Results for Qualitative Detector

Test Product Flow Rate: 0.12 ± 0.003 gal/hr.

	Detection Accuracy	Product Activation Height	Response Time at a Flow Rate of 0.12 ± 0.003 gal/hr	Recovery Time
<u>Accuracy and Response Time</u>				
Regular Unleaded Commercial Gasoline (6 tests)	100%	1.42 ± 0.03 in (3.62 ± 0.08 cm)	6.51 ± 0.06 min	< 1 min
<u>Specificity</u>				
Synthetic Fuel (3 tests)	100%	[104%]* 1.48 ± 0.02 in (3.77 ± 0.06 cm)	5.85 ± 0.11 min	< 1 min
Diesel Fuel (3 tests)	100%	[98%]* 1.39 ± 0.02 in (3.53 ± 0.06 cm)	5.81 ± 0.05 min	< 1 min
Home Heating Oil #2 (3 tests)	100%	[98%]* 1.39 ± 0.02 in (3.53 ± 0.06 cm)	5.88 ± 0.06 min	< 1 min
Water (3 tests)	100%	[87%]* 1.23 ± 0.02 in (3.13 ± 0.06 cm)	5.48 ± 0.04 min	< 1 min

* Specificity Reference: Regular Unleaded Commercial Gasoline

Test Fuel	Product Activation Height - Calculated Lower Detection Limit for 95% / 5% Condition
Regular Unleaded Commercial Gasoline	1.64 in (4.17 cm)

> **Safety disclaimer:** This test procedure only addresses the issue of the method's ability to detect the presence of liquid product. It does not test the equipment for safety hazards.

Certification of Results

I certify that the point sensor liquid contact product detector was operated according to the vendor's instructions and that the evaluation was performed according to the Third Party Procedures developed according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."¹ I also certify that the results presented above are those obtained during the evaluation.

Margaret Nasta, Ph.D.
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July 17, 1992
(date)

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Page 1 July 17, 1992

**Test Procedures for Evaluating Leak Detection Methods:
Liquid Contact Point Sensors - Out of Tank Product Detectors
November 1991**

**Test Results for
Veeder-Root UST Monitoring System: Model ILS 350
with Interstitial Liquid Sensor for Steel Tanks 0794390-420
July 1992**

Monitor: Veeder-Root UST Monitoring System: Model ILS 350 (serial # Beta 013)		
Probe Diameter	=	3.77 cm
Test Chamber Diameter	=	4.8 cm

The Detection System described above was tested for its ability to detect test liquids in contact with the point sensor. The following parameters were determined:	
•	Detection Accuracy - The measure of sensor response to the presence of liquids.
•	Response Time - Amount of time the detector must be exposed to liquid before it responds.
•	Recovery Time - Amount of time that passes before the detector returns to its baseline reading after the test liquid is removed.
•	Lower Detection Limit - The smallest liquid concentration that the detector can reliably detect.
•	Minimum Sensitive Height - The minimum sensor length required to be in contact with the liquid product to cause sensor activation.
•	Product Activation Height - The height of liquid to cause sensor activation.
•	Specificity - Indicates the level of response, of the detector, to several different liquids.



ACCURACY AND RESPONSE

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
Sensor = Interstitial liquid sensor for steel tanks 0794390-420
Probe Diameter = 3.77 cm; Std. Dev. = 0.01

NA=not applicable
NR=no response

Minimum Sensitive Height = 1.6 in (40 mm) + 20% = 48 mm

TEST PRODUCT = **UNLEADED GASOLINE**

Test Distance = 16 ft

Trial#	Probe#	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	21	22.1	6.50	< 1	3.5	7.7	50
2	21	22.1	6.50	< 1	3.6	7.8	51
3	21	22.0	6.43	< 1	3.6	7.8	50
4	21	22.0	6.47	< 1	3.6	7.7	50
5	21	22.0	6.60	< 1	3.7	7.6	50
6	21	22.0	6.57	< 1	3.7	7.8	51
Average			6.51	<1	3.62	7.7	50
Std. Dev.			0.06	NA	0.08	0.1	1

Detection Accuracy (%) 100.0

Calculated Lower Detection Limit

Product Activation Height (cm) 4.17

SPECIFICITY

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
 Sensor = Interstitial liquid sensor for steel tanks 0794390-420
 Probe Diameter = 3.77 cm; Std. Dev. = 0.01

NA=not applicable
 NR=no response

Minimum Sensitive Height = 1.6 in (40 mm) + 20% = 48 mm

TEST PRODUCT = Water

Test Distance = 16 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	21	21.2	5.52	< 1	3.1	7.6	42
2	21	21.2	5.45	< 1	3.1	7.5	41
3	21	21.1	5.47	< 1	3.2	7.7	42
Average			5.48	<1	3.13	7.6	42
Std. Dev.			0.04	NA	0.06	0.1	1

Detection Accuracy (%) 100.0

Specificity Calculations
Product Activation Height (%) 86.6

TEST PRODUCT = HEATING OIL

Test Distance = 16 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	21	22.1	5.93	< 1	3.5	7.6	45
2	21	21.9	5.82	< 1	3.5	7.9	46
3	21	21.9	5.90	< 1	3.6	7.8	46
Average			5.88	<1	3.53	7.8	46
Std. Dev.			0.06	NA	0.06	0.2	1

Detection Accuracy (%) 100.0

Specificity Calculations
Product Activation Height (%) 97.7



SPECIFICITY (cont.)

Monitor = Veeder-Root UST Monitoring System: Model ILS 350
Sensor = Interstitial liquid sensor for steel tanks 0794390-420
Probe Diameter = 3.77 cm; Std. Dev. = 0.01

NA=not applicable
NR=no response

Minimum Sensitive Height = 1.6 in (40 mm) + 20% = 48 mm

TEST PRODUCT = **DIESEL FUEL**

Test Distance = 16 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	21	24.1	5.87	< 1	3.5	7.8	46
2	21	24.3	5.80	< 1	3.6	7.9	46
3	21	23.9	5.77	< 1	3.5	8.0	46
Average			5.81	<1	3.53	7.9	46
Std. Dev.			0.05	NA	0.06	0.1	0

Detection Accuracy (%) 100.0

Specificity Calculations

Product Activation Height (%) 97.7

TEST PRODUCT = **SYNTHETIC GASOLINE**

Test Distance = 16 ft

Trial#	Probe #	Liquid Temp. (°C)	Response Time (min)	Recovery Time (min)	Product Activation Height (cm)	Flow Rate (ml/min.)	Liquid Volume (ml)
1	21	21.1	5.93	< 1	3.8	8.1	48
2	21	21.1	5.90	< 1	3.8	8.1	48
3	21	21.2	5.73	< 1	3.7	8.0	46
Average			5.85	<1	3.77	8.1	47
Std. Dev.			0.11	NA	0.06	0.1	1

Detection Accuracy (%) 100.0

Specificity Calculations

Product Activation Height (%) 104.1



Standard Test Procedures for Evaluating Leak Detection Methods:
Vapor-Phase Out of Tank Product Detectors - June 1990

**Complete Test Results for
Veeder - Root UST Monitoring System
Models TLS -350, ILS-350
with Adsistor Vapor Probe**

July 1992

x0001 Standard Test Method for Accuracy and Response Time (*)

Test Gas	Concentration ppm	Accuracy %	Rise hr:min:sec	Fall hr:min:sec
Unleaded Gasoline	50	0	Not Applicable	Not Applicable
Unleaded Gasoline	500	100	0:20:39	0:02:20
Unleaded Gasoline	1000	100	0:07:46	0:02:38
Synthetic Gasoline	50	--	--	--
Synthetic Gasoline	500	--	--	--
Synthetic Gasoline	1000	0	Not Applicable	Not Applicable
JP-4 Jet Fuel	50	0	Not Applicable	Not Applicable
JP-4 Jet Fuel	500	100	0:17:27	0:03:50
JP-4 Jet Fuel	1000	100	0:17:01	0:03:05

(*) Average of Five Tests

x0003 Standard Test Method for Specificity ()**

Test Gas	Concentration ppm	Accuracy %	Rise hr:min:sec	Fall hr:min:sec
Unleaded Gasoline	500	100	0:16:42	0:02:00
n-Hexane	500	0	Not Applicable	Not Applicable
JP-4 Jet Fuel	500	100	0:33:58	0:03:22
Synthetic Gasoline	500	0	Not Applicable	Not Applicable
Toluene	500	0	Not Applicable	Not Applicable
Xylene	500	0	Not Applicable	Not Applicable

(**) Average of Two Tests

x0006 Standard Test Method for Lower Detection Limit (*)**

Test Gas	Concentration ppm	Accuracy %	Rise hr:min:sec	Fall hr:min:sec
Unleaded Gasoline	500	100	0:19:33	0:02:16
Synthetic Gasoline	1000	0	Not Applicable	Not Applicable
JP-4 Jet Fuel	500	100	0:24:20	0:03:44

(***) Average of Six Tests

ILS -350 Monitoring System Serial # Beta 013: TLS -350 Monitoring System Serial # 11014666415001



Results of U.S. EPA Standard Evaluation Vapor-Phase Out-of-Tank Product Detectors

This form documents the performance of the vapor-phase product detector described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Vapor-Phase Out-of-Tank Product Detectors."¹

Tank owners using this leak detection system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to verify that this form satisfies their requirements.

Method Description

Name 350 Series UST Monitoring Systems:
Models ILS 350 (serial #Beta 013) & TLS 350 (serial #11014666405001)

Version with Adsistor Vapor Probes

Vendor Veeder-Root Environmental Products 125 Powder Forest Drive
(Street Address)
Simsbury CT 06070-2003 (203) 651-2700
(City) (State) (Zip) (Phone)

Detector output type: Quantitative ☒ Qualitative

Detector operating principle: Metal Oxide Semiconductor ☒ Adsistor Detector Tub
Catalytic Gas Sensor Combustible Gas Detector Photoionization Detector
Product-Permeable Detector IR Detector Other

Detector sampling frequency: Intermittent ☒ Continuous

Evaluation Results

The detector described above was tested for its ability to detect known concentrations of test gas. The following parameters were determined:

Accuracy - How closely test gas concentration, as measured by the detector, agrees with the actual gas concentration.

Bias - Whether the method consistently over-estimates or under-estimates gas concentration. Not applicable to qualitative detectors.

Precision - Agreement between multiple measurements of the same gas concentration. Not applicable to qualitative detectors.

Detection Time - Amount of time the detector must be exposed to test gas before it responds.

Fall Time - Amount of time that passes before the detector returns to its baseline reading after test gas is removed.

Lower Detection Limit - The smallest gas concentration that the detector can reliably detect.

Specificity - Indicates the ability of the detector to detect several different test gases.

¹ Radian Corporation. Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted methods. Draft Report. EPA Contract No. 68-03-3409. Work Assignment 22. June 29, 1990. [Gas concentrations levels were corrected for laboratory temperature and pressure.]

Vapor-Phase Product Detector Model TLS -350 (#11014666405001) & ILS-350 (#Beta 013)
Version with Adsistor Vapor Probes

Evaluation Results (continued)

> Accuracy, Response Time, and Lower Detection Limit Results

Test	Commercial Gasoline	Synthetic Gasoline	JP-4 Jet Fuel
Accuracy* (%)	<u>100</u>	<u>0</u>	<u>100</u>
Bias* ◇ (%)	<u>Not Applicable</u>	<u>Not Applicable</u>	<u>Not Applicable</u>
Precision* ◇ (%)	<u>Not Applicable</u>	<u>Not Applicable</u>	<u>Not Applicable</u>
Detection Time* (hh:mm:ss)	<u>00:07:46</u>	<u>Not Applicable</u>	<u>00:17:01</u>
Fall Time* (hh:mm:ss)	<u>00:02:38</u>	<u>Not Applicable</u>	<u>00:03:05</u>
Lower Detection Limit (ppm)	<u>500</u>	<u>> 1000</u>	<u>500</u>

* For tests conducted with 1000 ppm of test gas

◇ Not applicable to qualitative detectors.

> Specificity Results (%)

Commercial gasoline	<u>Activated</u>
Synthetic gasoline	<u>No Response</u>
JP-4 Jet Fuel	<u>Activated</u>
n -Hexane	<u>No Response</u>
Toluene	<u>No Response</u>
Xylene(s)	<u>No Response</u>

> **Safety disclaimer: This test procedure only addresses the issue of the method's ability to detect leaks. It does not test the equipment for safety hazards.**

Certification of Results

I certify that the vapor-phase product detector was operated according to the vendor's instructions and that the evaluation was performed according to the standard EPA test procedure for vapor-phase out-of-tank product detectors except as noted on any attached sheets. I also certify that the results presented above are those obtained during the evaluation.

Marc Portnoff
(printed name)
Marc Portnoff
(signature)
July 24, 1992
(date)

Carnegie Mellon Research Institute *
(organization performing evaluation)
Pittsburgh, PA 15213
(city, state, zip)
412 - 268 - 3495
(phone number)

* Consultant to the Manufacturer



Standard Test Procedures for Evaluating Leak Detection Methods: Vapor-Phase Out of Tank Product Detectors - June 1990

Complete Test Results for Veeder - Root UST Monitoring System Models TLS -350, ILS-350 with Adsistor Vapor Probe

July 1992

x0001 Standard Test Method for Accuracy and Response Time

UNLEADED GASOLINE								
CHAMBER =21°C			CHAMBER =20°C			CHAMBER = 20°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)	Conc. (ppm)	Rise Time (min)	Fall Time (min)	Conc. (ppm)	Rise Time (min)	Fall Time (min)
50	NR	NR	500	22.17	2.30	1000	10.78	2.28
50	NR	NR	500	15.22	2.12	1000	7.28	2.92
50	NR	NR	500	20.70	2.97	1000	6.55	2.12
50	NR	NR	500	21.12	2.25	1000	7.57	2.92
50	NR	NR	500	24.08	2.02	1000	6.63	2.90
Average	NR	NR	Average	20.66	2.33	Average	7.76	2.63

SYNTHETIC GAS						CHAMBER =20°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)	Conc. (ppm)	Rise Time (min)	Fall Time (min)	Conc. (ppm)	Rise Time (min)	Fall Time (min)
50			500			1000	NR	NR
50			500			1000	NR	NR
50			500			1000	NR	NR
50			500			1000	NR	NR
50			500			1000	NR	NR
Average			Average			Average	NR	NR

JP-4 JET FUEL								
CHAMBER =22°C			CHAMBER =22°C			CHAMBER =21°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)	Conc. (ppm)	Rise Time (min)	Fall Time (min)	Conc. (ppm)	Rise Time (min)	Fall Time (min:sec)
50	NR	NR	500	36.02	4.42	1000	29.87	5.20
50	NR	NR	500	15.88	2.93	1000	24.43	4.22
50	NR	NR	500	17.80	4.32	1000	12.28	2.75
50	NR	NR	500	8.32	4.03	1000	10.22	1.90
50	NR	NR	500	9.22	3.45	1000	8.32	1.37
Average	NR	NR	Average	17.45	3.83	Average	17.02	3.09

Rise and Fall Time was based on when the buzzer alarmed and reset

NR: No Response after exposure for 1 hour

CHAMBER: Sensor Chamber Temperature

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x0003 Standard Test Method for Specificity

UNLEADED GASOLINE		
CHAMBER =21°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
500	13.98	1.95
500	19.40	2.05
Average	16.69	2.00

SYNTHETIC GAS		
CHAMBER =19°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
500	NR	NR
500	NR	NR
Average	NR	NR

JP-4 JET FUEL		
CHAMBER =19°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
500	9.22	3.45
500	58.72	3.28
Average	33.97	3.37

XYLENE		
CHAMBER =19°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
500	NR	NR
500	NR	NR
Average	NR	NR

n-HEXANE		
CHAMBER =19°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
500	NR	NR
500	NR	NR
Average	NR	NR

TOLUENE		
CHAMBER =21°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
500	NR	NR
500	NR	NR
Average	NR	NR

x0006 Standard Test Method for Lower Detection Limit

UNLEADED GASOLINE		
CHAMBER =21°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
500	22.17	2.30
500	15.22	2.12
500	20.70	2.97
500	21.12	2.25
500	24.08	2.02
500	13.98	1.95
Average	19.54	2.27

SYNTHETIC GAS		
CHAMBER =20°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
1000	NR	NR
1000	NR	NR
1000	NR	NR
1000	NR	NR
1000	NR	NR
1000	NR	NR
Average	NR	NR

JP-4 JET FUEL		
CHAMBER =22°C		
Conc. (ppm)	Rise Time (min)	Fall Time (min)
500	36.02	4.42
500	15.88	2.93
500	17.80	4.32
500	8.32	4.03
500	9.22	3.45
500	58.72	3.28
Average	24.33	3.74

ILS -350 Monitoring System Serial # Beta 013
TLS -350 Monitoring System Serial # 11014666415001

Rise and Fall Time was based on when the buzzer alarmed and reset
NR: No Response after exposure for 1 hour
CHAMBER: Sensor Chamber Temperature



125 Powder Forest Drive, Post Office Box 2003, Simsbury, CT 06070-2003 U.S.A. TEL: (203) 651-2700, FAX: (203) 651-2719 TECH SUPPORT: (203) 651-2753

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