



VEEDER-ROOT
SYSTEM START-UP AND
OPERATING INSTRUCTIONS

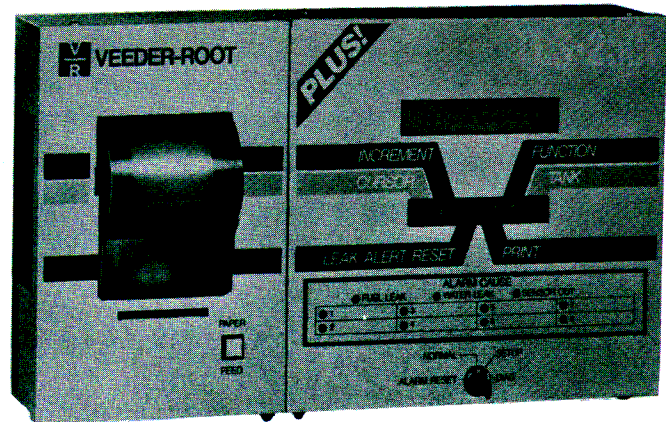
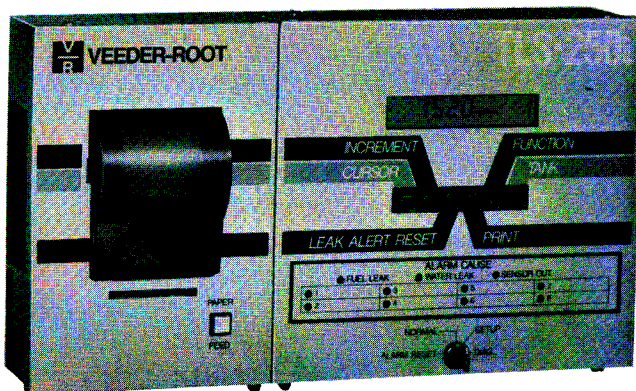
Technical Manual

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TLS-250i AND TLS-250i *Plus!* EIGHT-TANK SYSTEMS INVENTORY MONITOR AND INTERSTITIAL LEAK SENSOR WITH IN-TANK LEAK DETECTION

Manual Number 576013-583



This manual contains start-up and operating instructions
for the following systems:

TLS-250i Eight-Tank System	794190-102 (without printer) 794190-122 (with printer)
TLS-250i Metric Eight-Tank System	794170-202 (without printer) 794170-222 (with printer)
TLS-250i Eight-Tank Emergency Generator Version	794190-302 (without printer) 794190-322 (with printer)
TLS-250i <i>Plus!</i> Eight-Tank System	794194-102 (without printer) 794194-122 (with printer)

TLS-250i and TLS-250i *Plus!*

Statement of Compliance

with Federal Performance Standards

Established by the U.S. E.P.A.

The TLS-250i, TLS-250i Metric, TLS-250i Emergency Generator Version and TLS-250i *Plus!*, when equipped with Series 7842 0.2 GPH Capacitance probes, are classified as Automatic Tank Gauging Systems and have been third-Party tested by Midwest Research Institute (MRI). The results of testing showed that these systems are capable of detecting a 0.20 gallon per hour leak with a 99% probability of detection [P(D)] and a 1% probability of false alarm [P(FA)]. Therefore, these systems meet the Federal performance standards established by the U.S. E.P.A. (0.20 gallons per hour at [P(D)] of 95% and [P(FA)] of 5% and the Federal performance standard measuring water in the bottom of a tank to the nearest 1/8 inch.

The TLS-250i *Plus!*, when equipped with Series 8472 0.1 Capacitance probes and/or Series 8473 0.1 GPH Magnetostrictive probes, qualifies as a Volumetric Tank Tightness Testing Method and has been third-party tested by Midwest Research Institute. The results of testing showed that the system was capable of detecting a 0.10 gallon per hour leak with a 99% probability of detection [P(D)] and a 1% probability of false alarm [P(FA)]. Therefore, these systems meet the Federal performance standards established by the U.S. E.P.A. (0.10 gallons per hour at [P(D)] of 95% and [P(FA)] of 5%.

Summaries of the results of the tests described above are available from the Veeder-Root Company, 125 Powder Forest Drive, Simsbury, CT 06070.

The TLS-250i, when properly installed, complies with the technical standards for interstitial monitoring for tanks and piping in Sections 280.43(g) and 280.44(c) of U.S. E.P.A. Regulation 40 CFR Part 280. The TLS-250i, when used in the interstitial space of a double-walled underground storage tank, can detect a release through the inner wall in any portion of the tank that routinely contains product. The TLS-250i, when used in the interstitial space of double-walled piping, can detect a release from any portion of the underground piping that routinely contains regulated substances.

The above performance claims were determined in the following manner:

- 1) Laboratory testing of interstitial sensors by the Veeder-Root Company Engineering Department and Quality Assurance Department to verify compliance with Federal regulations.
- 2) Field testing at numerous service stations under actual operating conditions by Veeder-Root Company.

Summaries of results of the above testing are available at Veeder-Root Company in Simsbury, Connecticut.

ATTENTION

READ THIS IMPORTANT SAFETY INFORMATION BEFORE STARTING UP OR OPERATING A TLS-250i OR TLS-250i Plus! SYSTEM.

This product has been installed and will operate in the highly combustible environment of a gasoline storage tank. It is essential that you carefully read and follow the warnings and instructions in this manual to protect yourself and others from death, serious injury, explosion or electrical shock.

For safety reasons, we have taken particular care in the design of this product to limit the power in the wiring to the fuel tanks and to keep that wiring physically separate from any other wiring. It is your responsibility to maintain

the effectiveness of these safety features by starting up and operating this product in accordance with the instructions and warnings which follow. Failure to do so could create danger to life and property.

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

Failure to start-up and operate this product in accordance with the instructions and warnings found in this manual will result in voiding all warranties connected with this product (see Section 8).



WARNINGS:

EXPLOSION COULD OCCUR IF OTHER WIRES SHARE TLS-250i PROBE AND SENSOR WIRE CONDUITS OR WIRING TROUGHS. CONDUITS AND WIRING TROUGHS FROM PROBES AND SENSORS TO THE MONITOR MUST NOT CONTAIN ANY OTHER WIRES.

IMPROPER SYSTEM OPERATION COULD RESULT IN INACCURATE INVENTORY CONTROL OR UNDETECTED POTENTIAL ENVIRONMENTAL AND HEALTH HAZARDS IF PROBE- AND SENSOR-TO-MONITOR WIRE RUNS EXCEED 1,000 FEET. RUNS OVER 1,000 FEET ARE NOT UL APPROVED FOR THIS APPLICATION. PROBE- AND SENSOR-TO-MONITOR WIRING MUST NOT EXCEED 1,000 FEET.

EXPLOSION AND/OR EQUIPMENT DAMAGE COULD OCCUR IF CONDUITS DO NOT ENTER THE MONITOR THROUGH THEIR DESIGNATED PREFORMED KNOCKOUTS.

EXPLOSION COULD OCCUR IF THE MONITOR IS INSTALLED IN A VOLATILE, COMBUSTIBLE OR EXPLOSIVE (CLASS I, DIVISION I OR DIVISION II) ATMOSPHERE. DO NOT

INSTALL MONITOR IN A VOLATILE COMBUSTIBLE OR EXPLOSIVE ATMOSPHERE.

IN INSTALLATION AND USE OF THIS PRODUCT, COMPLY WITH THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.

TO AVOID ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY, BE SURE AC POWER TO THE MONITOR IS OFF DURING INSTALLATION.

CAREFULLY READ THE OPERATING INSTRUCTIONS AND WARNINGS FOUND IN THIS MANUAL. FAILURE TO DO SO COULD RESULT IN UNDETECTED ENVIRONMENTAL AND HEALTH HAZARDS.

FAILURE TO COMPLY WITH THESE REQUIREMENTS COULD RESULT IN SERIOUS PERSONAL INJURY, PROPERTY LOSS, EQUIPMENT DAMAGE, AND UNDETECTED POTENTIAL ENVIRONMENTAL AND HEALTH HAZARDS.



WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

CIRCUITRY WITHIN THE PROBE, SENSOR AND CONSOLE BARRIER FORM AN INTRINSICALLY SAFE, ENERGY-LIMITED SYSTEM. THIS SYSTEM MAKES THE TLS PROBE AND SENSOR INTRINSICALLY SAFE FOR USE IN A CLASS I, GROUP D HAZARDOUS LOCATION. THE TLS-250i PROBE AND SENSOR WIRING IS INTRINSICALLY SAFE ONLY WHEN CONNECTED TO VEEDER-ROOT'S MONITOR FORM NUMBER 7941.

DO NOT APPLY POWER TO THE SYSTEM UNTIL ITS INSTALLATION HAS BEEN CHECKED AND FOUND TO BE IN ACCORDANCE WITH THE INSTRUCTIONS OUTLINED IN THE VEEDER-ROOT TLS-250i EIGHT-TANK SYSTEM "SITE PREPARATION AND INSTALLATION INSTRUCTIONS," MANUAL NO. 576013-577; THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

INTRODUCTION

This manual describes system start-up and operating procedures for TLS-250i Standard, TLS-250i Metric, TLS-250i Emergency Generator Version and TLS-250i Plus! Eight-Tank Series UST Monitoring Systems.

U.S. versions of the TLS-250i use gallons, inches and degrees Fahrenheit for the calculation and display of information. The Metric version follows the same set-up procedures, but all information is in millimeters, liters and degrees Celsius. The Emergency Generator Version differs from standard since it operates normally in the Leak Detect Mode and features small variations in set-up, operating and reporting procedures.

Where procedures or displays differ from U.S. standard systems, the differences will be shown or explained.

The TLS-250i, TLS-250i Metric, TLS-250i Emergency Generator Version and TLS-250i Plus! Eight-Tank Systems, when equipped with Series 7842 0.2 GPH Capacitance probes are classified as Automatic Tank Gauging Systems and have been third-party tested by Midwest Research Institute. The results of that testing

showed that these systems are capable of detecting a 0.20 gallon per hour leak with a 99% probability of detection [P(D)] and a 1% probability of false alarm [P(FA)]. Therefore, these systems meet the Federal performance standards established by the U.S. E.P.A. (0.20 gallons per hour at [P(D)] of 95% and [P(FA)] of 5%) and the Federal performance standard of measuring water in the bottom of a tank to the nearest $\frac{1}{8}$ inch.

The TLS-250i Plus! Eight-Tank System, when equipped with Series 8472 0.1 GPH Capacitance and/or Series 8473 0.1 GPH Magnetostrictive probes, qualifies as a Volumetric Tank Tightness Testing Method and has been third-party tested by Midwest Research Institute. The results of this testing showed that the system was capable of detecting a 0.10 gallon per hour leak with a 99% probability of detection [P(D)] and a 1% probability of false alarm [P(FA)]. Therefore, these systems meet the Federal performance standards established by the U.S. E.P.A. (0.10 gallons per hour at [P(D)] of 95% and [P(FA)] of 5%).

In addition, TLS-250i Systems have the ability to provide liquid sensing in up to 16 tank annuli or double-wall piping sumps.

TABLE OF CONTENTS

TLS STATEMENT OF COMPLIANCE	i
SECTION 1 — PREPARATION CHECKLIST	1
SECTION 2 — WARRANTY REGISTRATION AND CHECKOUT	1
A. Intrinsic Safety Check	1
B. TLS-250i Pushbutton Functions and Operating Modes	2
C. System Power-Up and Checkout	4
SECTION 3 — SYSTEM OVERVIEW	6
A. TLS-250i, TLS-250i Metric and TLS-250i Plus! Systems	6
1. Inventory Monitoring Capabilities	6
2. Automatic Inventory Increase	6
3. Alarm Capabilities	6
4. In-Tank Leak Detection	7
5. Interstitial Leak Sensing Capabilities	7
B. TLS-250i Emergency Generator Version	7
SECTION 4 — SYSTEM SETUP	8
A. Time and Date	9
B. Leak Detect Mode Start and Stop Times	10
C. Leak Report Type	11
D. Automatic Print Times	11
E. High Water Limit	11
F. Overfill Limit	12
G. Low Level Limit	13
H. Theft Limit	14
I. Leak Limit	14
J. Fuel Thermal Coefficient of Expansion	16
K. Inventory Increase Report Delay Time	16
L. Tank Volume	17
M. Tank Diameter	18
N. Tank Tilt	19
O. Manifolded Tank Configuration	19
P. Product Code and Product Label Code	20
Q. Security Code	22
R. Alarm Relay Configuration	23
S. Auto-Transmit Message Mode	23
T. Auto-Transmit Repeat Time	24
U. Auto-Transmit Delay Time	25
V. Temperature-Compensated Volume in Inventory Report	25
W. Generator Off and Leak Report Enable Mode	26
X. External Input Alarm Enable	26

Y. Audible Water Alarm Disable and Water Alarm Delay Time for "A" Sensors	27
Z. Audible Water Alarm Disable and Water Alarm Delay Time for "B" Sensors	27
AA. Relay #1 Sensor Alarm Function	28
AB. Relay #2 Sensor Alarm Function	28
AC. External Interface to Enter Station Header	29
SECTION 5 — OPERATING INSTRUCTIONS	30
A. Front-Panel Button Functions	30
B. Alarm Cause Indicator Functions	30
C. Operating Mode Keyswitch Functions	31
D. Operator's Instructions	32
E. In-Tank Leak Detect Operating Procedures	34
F. Alarm Type Recognition	34
G. Alarm Operation and Reset	36
1. Inventory Probe Alarm Limits	36
2. Leak Sensor Alarms	36
H. Changing Printer Paper Roll	37
SECTION 6 — LEAK DETECTION	38
A. Inventory Control	38
B. In-Tank Leak Detection	39
C. Recommended Minimum In-Tank Leak Test Times	39
D. Interstitial and Piping Sump Leak Sensing	41
1. Alarm Causes	41
2. Alarm Indicator Rates	41
3. Alarm Indication Priorities	41
SECTION 7 — SYSTEM REPORTS	42
A. General	42
B. Report Descriptions	42
1. Inventory Status Report	42
2. Sensor Status Report	42
3. Automatic Inventory Increase Report	42
4. Indicator Reports	43
5. Tank Alarm History Report	44
6. Sensor Alarm History Report	44
7. Leak Monitor Report	45
8. System Setup Parameters Report	46
9. Sensor Setup Parameters Report	47
10. Tank Setup Parameters Report	48
SECTION 8 — WARRANTY CONDITIONS AND LIMITATIONS OF LIABILITY	49
APPENDIX A — RESULTS OF U.S. E.P.A. STANDARD VALUATION — VOLUMETRIC TANK TIGHTNESS METHOD AND AUTOMATIC TANK GAUGING SYSTEM	50

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SECTION 1 — PREPARATION CHECKLIST

Before you start checkout and setup procedures for this TLS-250i or TLS-250i Plus! System, be sure you have the materials and information shown on this checklist.

MANDATORY

- ☐ Epoxy sealant kit (one per probe and sensor, furnished with each probe and sensor).
- ☐ Warranty Registration and Checkout Form.
- ☐ TLS-250i or TLS-250i Plus! Eight-Tank System Site Preparation and Installation Instructions, Manual No. 576013-577.
- ☐ Tank specifications including material, diameter, volume.
- ☐ Tank height-to-volume conversion chart.

OPTIONAL

Listed below are optional setup parameters. Enter desired values in the appropriate spaces. Establishing this information will save time and inconvenience during setup.

Leak Detect Mode

Start Time: _____ : _____ (AM/PM)

Leak Detect Mode

Stop Time: _____ : _____ (AM/PM)

Leak Report Type: ☐ 0.2 GPH ☐ 0.1 GPH (Plus! Systems Only)

Auto Print Time #1: _____ : _____ (AM/PM)

Auto Print Time #2: _____ : _____ (AM/PM)

Auto Print Time #3: _____ : _____ (AM/PM)

☐ Security Code _____ (up to six digits).

FUNCTION	TANK NUMBER							
	#1	#2	#3	#4	#5	#6	#7	#8
High Water Alarm Limit (Inches/mm)								
Overfill Alarm Limit (Gallons/Liters)								
Low Level Alarm Limit (Gallons/Liters)								
Theft Alarm Limit (Gallons/Liters)								
Leak Alarm Limit (Gallons/Liters)								
Fuel Coefficient of Thermal Expansion**								
Tank Diameter (Inches/mm)								
Tank Tilt* (Inches/mm)								
Product Label Code (See Section 4.P.)								
Manifolded Tank Configuration (Tank Nos.)								

* Fuel height readings at the fill riser and probe riser should have been taken for each tank at the time of probe installation and recorded in the TLS-250i and TLS-250i Plus! "Site Preparation and Installation Instructions." See Section 4.N. for Tilt instructions.

** Fuel Coefficients are set automatically when Product Label Codes are used. (See Section 4.P.)

SECTION 2 — WARRANTY REGISTRATION AND CHECKOUT

A. Intrinsic Safety Check

Be sure power is OFF before starting this intrinsic safety check.

1. Check to be sure probe and sensor wires are contained in a separate, dedicated rigid conduit.



WARNING: EXPLOSION COULD OCCUR IF OTHER WIRES SHARE TLS-250i AND TLS-250i Plus! PROBE AND SENSOR WIRE CONDUITS OR WIRING TROUGHS. CONDUITS AND WIRING TROUGHS FROM PROBES AND SENSORS TO THE MONITOR MUST NOT CONTAIN ANY OTHER WIRES.

See the TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for wiring diagrams.

2. Check to be sure probe- or sensor-to-monitor wiring does not exceed 1,000 feet.



WARNING: IMPROPER SYSTEM OPERATION COULD RESULT IN INACCURATE INVENTORY CONTROL OR UNDETECTED POTENTIAL ENVIRONMENTAL AND HEALTH HAZARDS IF PROBE- OR SENSOR-TO-MONITOR WIRE RUNS EXCEED 1,000 FEET. RUNS OVER 1,000 FEET ARE NOT UL APPROVED FOR THIS APPLICATION. PROBE- OR SENSOR-TO-MONITOR WIRING MUST NOT EXCEED 1,000 FEET.

See the TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for wiring diagrams.



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

- Verify that all conduits enter the monitor through preformed conduit knockouts.



WARNING: EXPLOSION AND/OR EQUIPMENT DAMAGE COULD OCCUR IF CONDUITS DO NOT ENTER THE MONITOR THROUGH THEIR DESIGNATED PREFORMED KNOCKOUTS.

See the TLS-250i and TLS 250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for wiring diagrams.

- Open the monitor cover by removing the two screws on the right side of the cover and swing the door open. (It may be necessary to loosen the two screws in the left cover to open the right door.) Locate the power supply terminal strip in the lower left-hand corner of the cabinet.
- Verify that #12AWG (or larger) conductor has been connected between the barrier ground (terminal 5 on the power supply wiring strip) and the earth ground bus on the power panel being used to supply AC line voltage to the monitor. (See the TLS-250i and TLS 250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577 for correct wiring diagram.)
- Verify that power supply terminals are correctly wired. (See the TLS-250i and TLS 250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577 for correct wiring diagram.)
- Verify that system power is properly wired to a separate, dedicated breaker.**
- Locate the intrinsically safe barrier cover inside the monitor cabinet, remove the two screws and open the cover.
- Verify that all probe and sensor connections have been made properly using color-coded wires and that the proper color-code designations have been maintained throughout the probe- or sensor-to-monitor wiring hook-ups.
- If any discrepancies are found in wiring or installation, refer to the TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577 for the correct procedures.
- Close the barrier strip cover and fasten its two screws. Close the monitor cover and replace the locking screws (2) on the right side of the cabinet.

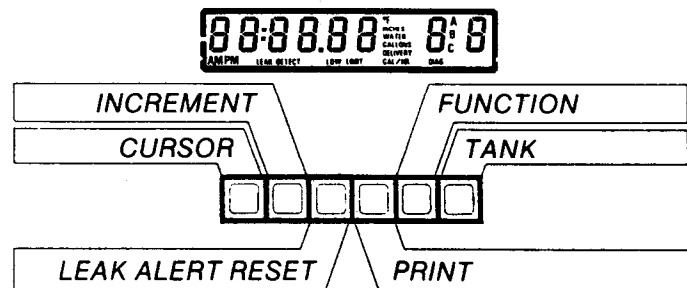
DO NOT APPLY POWER TO THE SYSTEM UNTIL ITS INSTALLATION HAS BEEN CHECKED AND FOUND TO BE IN ACCORDANCE WITH THE INSTRUCTIONS OUTLINED IN THE VEEDER-ROOT TLS-250i AND TLS-250i Plus! EIGHT-TANK SYSTEM "SITE PREPARATION AND INSTALLATION INSTRUCTIONS," MANUAL NO. 576013-577; THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.

B. TLS-250i Pushbutton Functions and Operating Modes

- TLS-250i Systems feature front-panel pushbuttons that let you enter or change all system and tank setup parameters. In addition, these buttons are used during normal operation to review inventory information and call for printed reports. An easy-to-read Liquid Crystal Display (LCD) presents inventory, setup and diagnostic information. Values displayed are identified by electronic labels in the NORMAL mode and by display codes when the systems are in either its SETUP or DIAGNOSTIC modes.

The following explanation of pushbutton functions and operating modes will be helpful during the System Power-up and Checkout procedures described in Section 2.C.

PUSHBUTTON FUNCTIONS



CURSOR — SETUP mode only

Depress button to move cursor (flashing digit) to digit to be changed.

INCREMENT — SETUP mode only

After cursor is set, depress **INCREMENT** button to change digit to desired value.

LEAK ALERT RESET



NOTE: The **LEAK ALERT RESET** button is a multi-purpose button whose functions change depending on key-switch position and display information.

NORMAL MODE — Depress once to shut off and reset audible alarm (will not shut off alarm LEDs) except when displaying the Leak Rate function. When audible alarm is inactive, depress once to test LEDs and audible alarm, except when displaying the Leak Rate function. When Leak Rate shown on display, depress twice to start leak detect test for all tanks. Or, depress once, then select tank # and depress again for single tank test. **SETUP MODE** — When on the -A or -B setup codes, depress to reset sensor configuration. **DIAG MODE** — Depress to set the system in Sensor Checkout Mode.

PRINT

Set display to information to be printed using keyswitch, **FUNCTION**, **TANK** buttons. Depress **PRINT** button once for printout.

FUNCTION

Depress button to advance display function.

TANK

Depress button to advance displayed tank.



OPERATING MODES

The Operating Mode keyswitch provides access to the various modes required to set up, operate and service the TLS-250i.

In the NORMAL mode, all inventory and sensor status may be viewed on the display and, using the PRINT button, printed by the optional printer. In the SETUP mode, all setup parameters may be entered, viewed on the display and changed if required. The DIAGNOSTIC mode reveals important information about the system which is helpful while servicing the equipment.

Turning the keyswitch to the ALARM RESET position will reset the flashing display and alarm relays after an alarm condition has been detected. **The ALARM RESET position will only reset the SENSOR ALARM CAUSE LEDs for those sensors which have been corrected or which have returned to a NORMAL condition.**

The following is an explanation of the inventory, setup and diagnostic information accessible using the Operating Mode keyswitch.

KEYSWITCH POSITION									
NORMAL			SETUP				DIAGNOSTIC		
Format*	Function	Code	Format*	Function	Code	Format*	Function		
HH:MM	Time of Day	0A	HH:MM	Time of Day	0	IIIIIIII	Product ID. Rev. Level		
		0B	MM-DD	Month and Day	1	XXXXXX	Probe Serial Number		
GGGGGG	Fuel Volume	0C	YYYY	Year	2	XXX	Probe Circuit Bd. Code		
		1A	HH:MM	Leak Detect Mode Start Time	3	XXX.XX	Probe Length		
GGGGGG	Temperature-Compensated Fuel Volume**	1B	HH:MM	Leak Detect Mode Stop Time	3A	XXXX	Probe Date Code		
		1C	0.n	Leak Report Type	4	XXXX.XX	10† Standard Capacitance Values + # of samples		
		2A	HH:MM	Auto Print Time #1	5	XXXX	8† Dry Calibration Constants		
GGGGGG	Ullage	2B	HH:MM	Auto Print Time #2	6	XXXX	8† Wet Calibration Constants		
		2C	HH:MM	Auto Print Time #3	7	XXXX.XX	Updated Dry Variables		
III.DD	Fuel Height	3	I.D	High Water Alarm Limit	7A	XXXX.XX	Updated Wet Variables		
		3A	GGGGGG	Overfill Alarm Limit	8	—	No Display. Used for Tank Alarm History Report Printout		
I.D	Water Height	3B	GGGGGG	Low Level Alarm Limit	8A	—	No Display. Used for Sensor Alarm History Report Printout		
FFFF.D	Fuel Temperature	3C	GGGGGG	Theft Alarm Limit	9	XXXX.XX	10 Slow Capacitance Values + # of samples		
		3AB	GG.O	Leak Alarm Limit	Use INCREMENT button to advance through Capacitance and Calibration Values for Functions 4-9. †These numbers may vary up to 33 for 0.1 Capacitance probe.				
GGGGGG	Delivery Volume	3BC	SNNN.O	Thermal Coefficient					
		3ABC	GG.O	Inventory Increase Report Delay Time					
GGGGGG	Leak Rate	4	GGGGGG	1.00 Height Volume Capacity					
		H	GGGGGG	0.95 Height Volume Capacity					
GGG.DD		HA	GGGGGG	0.90 Height Volume Capacity					
		HB	GGGGGG	0.85 Height Volume Capacity					
NNN	"A" Sensor Status (for each active sensor)	HC	GGGGGG	0.80 Height Volume Capacity					
		4A	GGGGGG	0.75 Height Volume Capacity					
NNN	"B" Sensor Status (for each active sensor)	E	GGGGGG	0.70 Height Volume Capacity					
		EA	GGGGGG	0.65 Height Volume Capacity					
		EB	GGGGGG	0.60 Height Volume Capacity					
		EC	GGGGGG	0.55 Height Volume Capacity					
		4B	GGGGGG	0.50 Height Volume Capacity					
		L	GGGGGG	0.45 Height Volume Capacity					
		LA	GGGGGG	0.40 Height Volume Capacity					
		LB	GGGGGG	0.35 Height Volume Capacity					
		LC	GGGGGG	0.30 Height Volume Capacity					
		4C	GGGGGG	0.25 Height Volume Capacity					
		P	GGGGGG	0.20 Height Volume Capacity					
		PA	GGGGGG	0.15 Height Volume Capacity					
		PB	GGGGGG	0.10 Height Volume Capacity					
		PC	GGGGGG	0.05 Height Volume Capacity					
		5	III.DD	Tank Diameter					
		6	SII.DD	Tank Tilt					
		7	nnnnnn	Manifolded Tank Configuration					
		8	C CC	Product Code and Product Label					
		9	nnnnnn	System Security Code					
		9A	RRRRRR	Relay #1 Configuration					
		9B	RRRRRR	Relay #2 Configuration					
		9C	n	Auto-Transmit Message Mode					
		9AB	MMM	Auto-Transmit Repeat Time					
		9AC	n	Temperature-Compensated Volume					
		9BC	SSS	Auto-Transmit Delay Time					
		9ABC	n	Generator OFF Mode and Leak Report Enable (Emergency Generator Versions only)					
		—	n	External Input Alarm Enable					
		—A	n HH.H	Audible Water Alarm Disable/Sensor Type Selection and Water Alarm Delay Time — "A" Sensors (see Section 4.W)					
		—B	n HH.H	Audible Water Alarm Disable/Sensor Type Selection and Water Alarm Delay Time — "B" Sensors (see Section 4.X)					
		—C	nnnnnn	Relay #1 Sensor Alarm Function					
		—AB	nnnnnn	Relay #2 Sensor Alarm Function					

*Some formats may differ for metric versions. In all cases, G (Gallons) will be L (Liters), I (Inches) will be mm (millimeters) and F (°Fahrenheit) will be C (°Celsius).

**Optional inventory report feature selectable in Setup Mode.



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

C. System Power-Up and Checkout

DO NOT APPLY POWER TO THE SYSTEM UNTIL ITS INSTALLATION HAS BEEN CHECKED AND FOUND TO BE IN ACCORDANCE WITH THE INSTRUCTIONS OUTLINED IN THE VEEDER-ROOT TLS-250i EIGHT-TANK SYSTEM "SITE PREPARATION AND INSTALLATION INSTRUCTIONS," MANUAL NO. 576013-577; THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.

IMPORTANT: Read this information before proceeding with system power-up and checkout!

The TLS-250i is programmed by entering desired values for various setup and operating parameters. It uses procedures similar to those used to set the time in a digital watch. Displays are selected and values entered or changed using specified buttons.

The **FUNCTION** button on the TLS-250i is used to advance the display from one function to the next (i.e., to advance from "Time-of-Day" to "Month/Date"). When using the **FUNCTION** button, be sure the display shown on the LCD actually represents the desired information **BEFORE** you enter or change any values. Confirm this by observing the Function Code that appears in the display. The **FUNCTION** button is sensitive and the display can easily jump beyond the desired display if the button is held down.

If you inadvertently pass the desired function, simply turn the keyswitch to any other position and then back to setup. The display will return to Time-of-Day and you may index to the desired function using the **FUNCTION** button.



NOTE: Although TLS-250i Eight-Tank Systems can monitor up to eight tanks with one console, if fewer than eight tank probes are connected, the system skips the unused tank positions (except when in "SETUP" mode). For example, if only four probes are connected, depressing the **TANK** button while in the "NORMAL" mode will advance the display through 1, 2, 3, 4 and then return to 1. The same is true for sensors in the system.

If a system with four tanks only displays information for three, this would indicate that the missing probe is improperly connected.

To power up the TLS-250i systems:

1. Set the Operating Mode keyswitch to "DIAG" (diagnostic) position.
2. Apply system power by setting the station power panel breaker to the "ON" position.
 - a. The LCD should show the error code **E00**.
 - b. If any other error code appears, refer to the TLS-250i troubleshooting manual for an explanation.
 - c. TLS systems with the optional integral printer will print an error code interpretation.
3. Set the Operating Mode keyswitch to "NORMAL" position.
 - a. A random time value will appear in the display.
4. Depress the **FUNCTION** button twice to display fuel height for tank #1 in inches to two decimal places.
 - a. A proper display indicates the wiring to probe #1 is correct.
5. Depress the **TANK** button to display fuel height for tank #2. Again, a display in inches to two decimal places indicates proper probe wiring.
6. Repeat this procedure for each tank in the system until the display returns to tank #1.
7. Depress the **FUNCTION** button to display water height for tank #1 in inches to one decimal place.
 - a. A proper display indicates the water sensor in the probe is functioning.

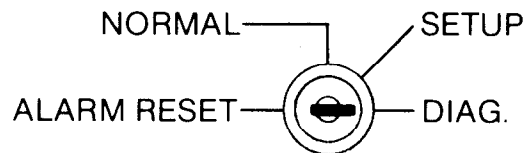


NOTE: If there is less than 3/4 inch of water in the tank, the TLS will show 0.0 inches on the display. Water is displayed in inches to tenths from 3/4 inch and up.

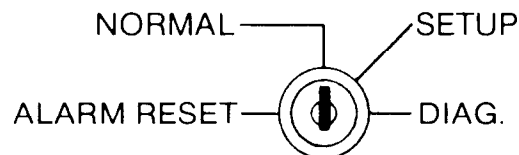


Function Code

Function Code Display



Error Code Display



Fuel Height Display



Water Height Display

System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection



8. Depress the **TANK** button to display water height in tank #2 in inches to one decimal place.
9. Repeat step 8 for each tank until the display returns to tank #1.
10. Depress the **FUNCTION** button to display fuel temperature for tank #1 in degrees Fahrenheit to one decimal place.
 - a. A proper display indicates the temperature sensor is working.
11. Depress the **TANK** button to display the fuel temperature in tank #2 in degrees Fahrenheit to one decimal place.
12. Repeat step 11 for each tank until the display returns to tank #1.
13. Perform the Sensor Learn procedure.



Fuel Temperature Display

- a. Set the Operating Mode Keyswitch to "SETUP".
 - b. Depress the **FUNCTION** button until Function Code -A or -B appears on the display.
 - c. Depress the **LEAK ALERT RESET** button.
 - d. Return the Operating Mode Keyswitch to "NORMAL".



Sensor Learn Display



NOTE: On systems equipped with a printer, a sensor configuration report will be printed automatically after you depress the **LEAK ALERT RESET** button.

14. Place the system in Sensor Checkout Mode.
 - a. Set the Operating Mode Keyswitch to the "DIAG." (diagnostic) position.
 - b. Depress the **LEAK ALERT RESET** button. The "DIAG" annunciator in the LCD will begin to flash.
 - c. Return the key to the "NORMAL" position.



NOTE: In the "NORMAL" operating mode, sensor status is polled every 15 minutes. The Sensor Checkout Mode provides immediate access to the current sensor status.

15. Depress the **FUNCTION** button six times to display the sensor status for sensor #1A.
 - a. A three digit display of all zeros indicates no alarm conditions exist and the sensor is connected. A "1" in any digit means an alarm condition has been detected or a sensor is out.
16. Depress the **TANK** button to display the sensor status for sensor #2A.
17. Repeat step 15 for all sensors in the system until the display returns to Sensor #1A.



Fuel Leak Status ☒
Water Leak Status ☐
Sensor Out ☐

Sensor Status Display

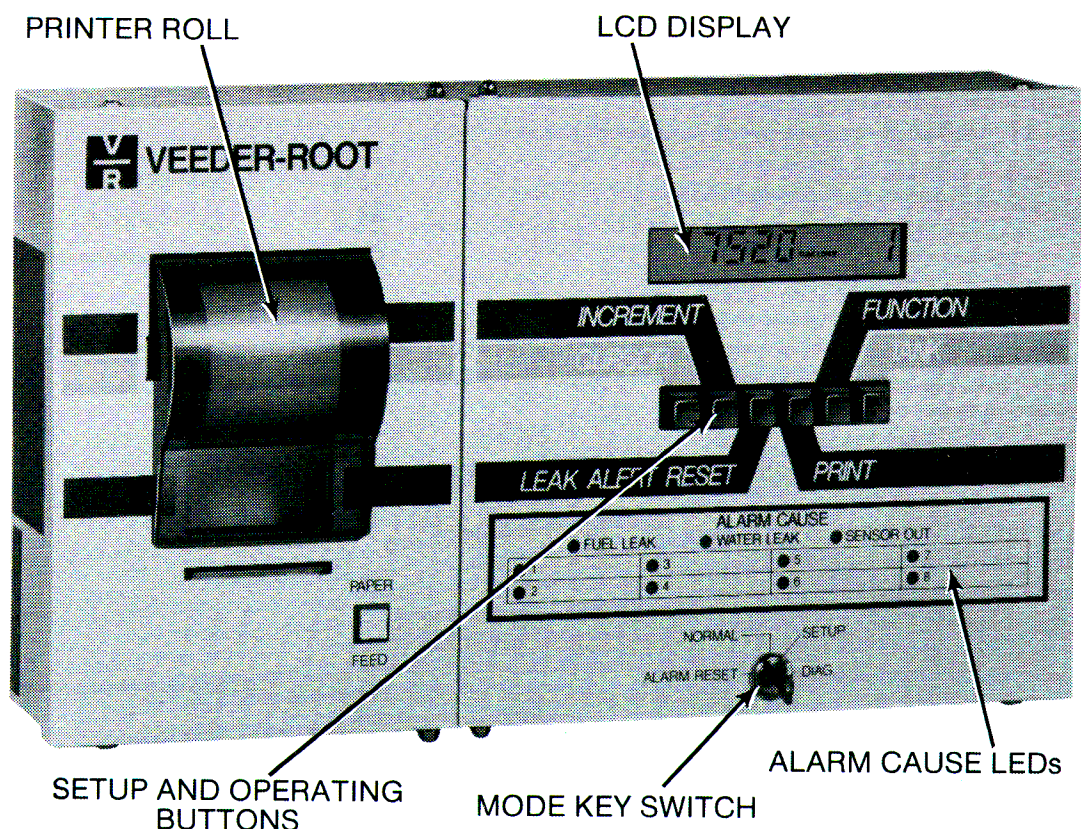


NOTE: Be sure the number of sensors accessed using the **TANK** button is the same as the number of sensors in the system. If the number of sensors shown is less than the number installed, a sensor may be connected improperly or a defective sensor may exist.

18. Depress the **FUNCTION** button to display status for sensor #1B.
19. Repeat steps 15 and 16 to review the sensor status for all "B" sensors until the display returns to sensor #1B.
20. Exit the Sensor Checkout Mode.
 - a. Turn the key to the "DIAG" position.
 - b. Depress the **LEAK ALERT RESET** button. The "DIAG" annunciator will stop flashing.
 - c. Return the Operating Mode Keyswitch to the "NORMAL" position.
21. Remove the probe junction box cover in probe manhole #1.
22. Check the conduit-to-box seals for watertightness.
23. Seal probe wiring connections and sensor wiring connections in the probe junction box using the epoxy sealant furnished with probe.
24. Replace probe junction box cover. BE SURE seal is watertight.
25. Seal the probe wiring connections for all other probes in the system, following the same instructions described for probe #1.



SECTION 3 — SYSTEM OVERVIEW



A. TLS-250i, TLS-250i Metric and TLS-250i Plus! Systems

These TLS-250i Systems are electronic continuous monitoring devices designed to offer improved business management through detailed inventory information and provide compliance with regulations governing liquids stored in underground tanks.

1. Inventory Monitoring Capabilities

TLS-250i Systems can display full inventory information for all tanks in the system and, when equipped with the integral printer, provide a printed inventory report as well. The following inventory data is available by tank:

- Date and Time
- Product Type
- Ullage
- Water Height
- Temperature-Compensated Fuel Volume
- Tank #
- Fuel Volume
- Fuel Height
- Fuel Temperature

2. Automatic Inventory Increase Report

After a bulk delivery has been made to a tank, an Inventory Increase Report will be generated automatically.

3. Alarm Capabilities

During the setup process, alarm limits can be entered to identify certain conditions. These include:

- High Water
- Low Inventory Level
- Potential Overfill
- Losses Due to Theft or Leak

When any of these conditions is detected, the system will alert you with a printed alarm report (if equipped with a printer) and, for most conditions, a display indicator.

In addition, any of these alarm limits can trigger one or both of the two relays built into the TLS System to activate other external alarm devices.



4. In-Tank Leak Detection

The TLS-250i Systems can conduct in-tank leak tests automatically at programmed times or on demand using buttons on the front panel keyboard. TLS-250i and TLS-250i Metric Systems are capable of detecting leaks as small as 0.2 gallons per hour. The TLS-250i *Plus!* Systems can detect leaks as small as 0.1 gallons per hour, when used with a Cap 1 or Magnetostrictive Probe.

When a leak test is complete, the system will generate a printed leak test report (if equipped with a printer) showing a PASS, FAIL, INVALID or SHORT result, and it will store the results in memory for retrieval through the front panel display or the RS-232 interface.

5. Interstitial Leak Sensing Capabilities.

The TLS-250i Interstitial Leak Sensors monitor the annular space and piping sumps in double-wall tanks for the presence of liquids.

An audible alarm and flashing LEDs indicate the presence of liquid and identify which sensor in the system has detected the condition.

TLS-250i leak sensors can also be installed in piping sumps to monitor the area for liquids.

In addition, if a sensor fails or is disconnected, the front-panel LEDs and audible alarm will indicate a "Sensor Out" condition and identify the sensor.

B. TLS-250i Emergency Generator Version.

Emergency generators are typically located at unattended and/or remote facilities and their underground fuel tanks are normally full. Fuel should leave the tank only when the generator is running.

The TLS-250i emergency generator version runs a continuous leak test as its normal mode of operation. To start a continuous leak test, program a Leak Detect Start Time and leave the Leak Detect Stop Time disabled. The test will run for 24 hours in systems with four or less tanks and 13 hours in systems with five to eight tanks.

At the beginning of a test, an inventory report will be printed. If the generator starts, the TLS stops the leak test and prints and stores in memory a "Generator Start" message with the date and time. When the generator shuts off, a "Generator Stop" message with date and time is printed and stored. Fifteen minutes after the generator shuts off, a new inventory report is printed and the leak test is started again.

At the end of each test period the leak test result is stored, the test is restarted automatically and another inventory report is printed.

Start and Stop messages, and leak test reports can be retrieved from memory through the integral printer or via the RS-232 communications interface.

All programmable alarm limits, alarm relays, communications and reporting features found in the standard TLS-250i are included in the emergency generator version.

IMPORTANT: Inventory and Leak Test information provided by TLS-250i Systems should be used as part of a conscientious Inventory Control and Regulatory Compliance Program. If routine inventory reconciliation reveals a loss of product, use the Leak Detect feature to provide a more accurate indication of product loss. All Inventory Reconciliation records and Leak Test reports should, as required, be saved to comply with local, state and Federal UST regulations.

Do not excavate tanks or take other remedial action based solely on TLS-250i Inventory or Leak Test reports! ALWAYS CONFIRM A SUSPECTED LEAK USING AN ALTERNATE TEST METHOD OR INSPECTION TECHNIQUE.

IMPORTANT: EVEN SMALL LEAKS CAN CAUSE SEVERE ENVIRONMENTAL DAMAGE. IT IS RECOMMENDED THAT THE TLS-250i SYSTEM BE SET REGULARLY IN ITS LEAK DETECT MODE WHEN THE FACILITY IS CLOSED.



System Start-Up and Operating Instructions TLS-250i and TLS-250i *Plus!* Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

SECTION 4 — SYSTEM SET-UP

IMPORTANT: This manual describes system start-up, setup and operating procedures for the TLS-250i and TLS-250i *Plus!* Eight-Tank System. Where procedures or displays are different for the TLS-250i Metric or the Emergency Generator versions, the differences will be shown or explained.

The TLS-250i requires that certain parameters be set prior to operation. Some apply to the system as a whole while others apply to specific tanks and sensors.



NOTE: "System" setup parameters are values that apply to the monitor only. **It is not necessary to set individual values for each tank using the TANK selector button.**

System setup parameters include:

Code	Format†	Function	Requirement
0A	HH:MM	Time of Day	MANDATORY
0B	MM-DD	Month-Date	MANDATORY
0C	YYYY	Year	MANDATORY
1A	HH:MM	Leak Detect Mode Start Time	OPTIONAL
1B	HH:MM	Leak Detect Mode Stop Time	OPTIONAL
1C	0..n	Leak Report Type	OPTIONAL (<i>Plus!</i> Systems Only)
2A	HH:MM	Auto Print Time #1	OPTIONAL
2B	HH:MM	Auto Print Time #2	OPTIONAL
2C	HH:MM	Auto Print Time #3	OPTIONAL
9	nnnnnn	System Security Code	OPTIONAL
9A	RRRRRR	Relay #1 Configuration	OPTIONAL
9B	RRRRRR	Relay #2 Configuration	OPTIONAL
9C	n	Auto-Transmit Message Mode	OPTIONAL
9AB	MMM	Auto-Transmit Repeat Time	OPTIONAL
9BC	SSS	Auto-Transmit Delay Time	OPTIONAL
9AC	n	Temperature-Compensated Volume	OPTIONAL
9ABC	nn	Generator OFF Mode and Leak Report Enable	OPTIONAL
		(Emergency Generator Versions Only)	
-	n	External Input Alarm Enable	OPTIONAL
-C	nnnnnn	Relay #1 Sensor Alarm Function	OPTIONAL
-AB	nnnnnn	Relay #2 Sensor Alarm Function	OPTIONAL



NOTE: "Tank" setup parameters are values which apply to the individual tanks or sensors. **It will be necessary to use the TANK button to select each specific tank or sensor for which a value is being entered.**

Tank setup parameters are:

Code	Format†	Function	Requirement
3	I.D.	High Water Alarm Limit	OPTIONAL
3A	GGGGGG	Overfill Alarm Limit	OPTIONAL
3B	GGGGGG	Low Level Alarm Limit	OPTIONAL
3C	GGGGGG	Theft Alarm Limit	OPTIONAL
3AB	GG.0	Leak Alarm Limit	OPTIONAL
3BC	SNNN.0	Fuel Thermal Coefficient	MANDATORY*
3ABC	MM	Delivery Report Delay Time	OPTIONAL
4	GGGGGG	1.00 Height Volume Capacity	MANDATORY
H	GGGGGG	0.95 Height Volume Capacity	OPTIONAL
HA	GGGGGG	0.90 Height Volume Capacity	OPTIONAL
HB	GGGGGG	0.85 Height Volume Capacity	OPTIONAL
HC	GGGGGG	0.80 Height Volume Capacity	OPTIONAL
4A	GGGGGG	0.75 Height Volume Capacity	MANDATORY**
E	GGGGGG	0.70 Height Volume Capacity	OPTIONAL
EA	GGGGGG	0.65 Height Volume Capacity	OPTIONAL
EB	GGGGGG	0.60 Height Volume Capacity	OPTIONAL
EC	GGGGGG	0.55 Height Volume Capacity	OPTIONAL
4B	GGGGGG	0.50 Height Volume Capacity	MANDATORY**
L	GGGGGG	0.45 Height Volume Capacity	OPTIONAL

System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection



Code	Format†	Function	Requirement
LA	GGGGGG	0.40 Height Volume Capacity	OPTIONAL
LB	GGGGGG	0.35 Height Volume Capacity	OPTIONAL
LC	GGGGGG	0.30 Height Volume Capacity	OPTIONAL
4C	GGGGGG	0.25 Height Volume Capacity	MANDATORY**
P	GGGGGG	0.20 Height Volume Capacity	OPTIONAL
PA	GGGGGG	0.15 Height Volume Capacity	OPTIONAL
PB	GGGGGG	0.10 Height Volume Capacity	OPTIONAL
PC	GGGGGG	0.05 Height Volume Capacity	OPTIONAL
5	III.DD	Tank Diameter	MANDATORY
6	SII.DD	Tank Tilt	OPTIONAL
7	nnnnnn	Manifolded Tank Configuration	MANDATORY
8	C CC	Product Code/Product Label	OPTIONAL***
-A	n HH.H	Audible Water Alarm Disable and Water Alarm Delay Time — “A” Sensors	OPTIONAL
-B	n HH.H	Audible Water Alarm Disable and Water Alarm Delay Time — “B” Sensors	OPTIONAL

† Some formats may differ for the TLS-250i Metric. In all cases, G (Gallons) will be L (Liters), I (Inches) will be mm (millimeters) and F (°Fahrenheit) will be C (°Celsius).

* Fuel Coefficient of Thermal Expansion will be set automatically if Product Label Codes are used for each tank (except for jet fuel and AVGAS which must be entered manually). See Section 4.O, Product Code and Product Label Code.

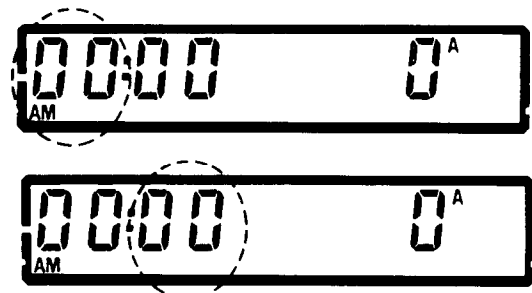
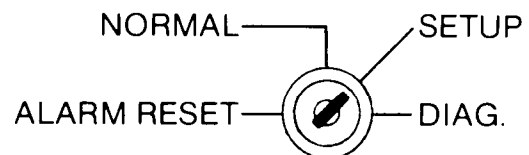
** Must be entered for fiberglass tanks.

*** Must be entered for tanks containing diesel fuel.

The following instructions describe the proper methods of entering “system” and “tank” setup parameters.

A. Time and Date (MANDATORY)

1. Turn the Operating Mode keyswitch to “SETUP” position.
2. Set the time of day using the following instructions.
 - a. The display will show a random time value in hours and minutes (HH:MM). Code 0A will appear in the display. A code number is assigned for each function. Be sure that the proper code number for the function being set is shown in the display. Otherwise, incorrect information could be entered.
 - b. The hours digits (HH:MM) will be flashing indicating that their value may be changed.
 - c. Depress the **INCREMENT** button to select the desired value for the hours digits (HH:MM). Be sure to increment to AM or PM, whichever is correct.
 - d. Depress the **CURSOR** button to activate the minutes digits (HH:MM). They will flash indicating that their value may be changed.
 - e. Depress the **INCREMENT** button to select the desired value for the minutes digits.
 - f. Depress the **FUNCTION** button to complete the time set and advance the display to the next function — Month and Date (MM:DD), Code 0B.



Time Display



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

3. Set the month and day using the following instructions.
 - a. The month digits (**MM:DD**) of the display will be flashing indicating that their value may be changed. Depress the **INCREMENT** button to select the desired value for these digits.
 - b. Depress the **CURSOR** button to activate the date display (**MM:DD**). Repeat the procedures in Step 3.a. to set the values for the date display. Depress the **FUNCTION** button to complete the month and date set and advance the display to the next function — Year (YYYY), Code 0C.
4. Set the year by following the same procedures used to set the month and date. The years digits will flash in this order: first two digits (YYYY), the decades digit (YYYY) and the year digit (YYYY). When all values have been entered, press the **FUNCTION** button to complete the year set and advance the display to the next function — Leak Start Time (HH:MM), Code 1A.



Month/Date Displays



Year Displays

B. Leak Detect Mode Start and Stop Times (OPTIONAL)

The TLS-250i Eight-Tank System features in-tank leak detection that may be programmed to start and stop automatically each day at selected times.

THE RECOMMENDED MINIMUM TEST TIME IS FIVE (5) HOURS.

IMPORTANT: If a Leak Detect Start Time is set and no Leak Detect Stop Time is entered, the test will run for 24 hours in systems of four or less tanks and 13 hours in systems of five or more tanks. At the end of the test period, the TLS will issue a Leak Test Report and begin another test automatically. This cycle will continue until a Stop Time is entered or the Start Time is removed.

It is recommended that the start time be set for at least 1 hour after closing time, and the stop time be set for at least 30 minutes prior to opening time. Providing this time buffer will also help avoid dispensing fuel while in the Leak Detect mode and setting off the theft alarm.

If the Leak Detect Mode Start and Stop Time feature is not to be used, simply leave the "EE" display showing by depressing the **FUNCTION** button to advance to the next function. If a value is shown in the display and you wish to "disable" this feature, depress the **INCREMENT** button until the "EE" appears in the hours position.

1. Set the Leak Detect Start Time using the following instructions.
 - a. Code 1A will be shown in the display and the hours digits (**HH:MM**) will be flashing indicating that their values may be changed. Depress the **INCREMENT** button to select the desired value for these digits. Be sure the desired time is properly set for AM or PM.
 - b. Depress the **CURSOR** button and repeat this procedure to set the minutes digits (**HH:MM**) of the start display. When all values have been entered, depress the **FUNCTION** button to complete the Start Time and advance the display to the next function — Leak Detect Mode Stop Time (HH:MM), Code 1B.
2. Set the Stop Time by repeating the instruction procedures for Start Time, paragraphs 1.a. to 1.b. Depress the **FUNCTION** button to complete the Leak Detect Mode Stop Time and advance the display to the next function — Leak Report Type (0.n), Code 1C (*Plus!* Systems only) or Auto-Print Time #1 (HH:MM), Code 2A (Standard Systems).



Leak Detect Mode "Disable" Display



Leak Detect Mode Start Time Display



Leak Detect Mode Stop Time Display



NOTE: For Emergency Generator versions running in 24-hour Leak Test, enter a Leak Detect Start Time, but **DO NOT** enter a Leak Detect Stop Time.

C. Leak Report Type (OPTIONAL — TLS-250i Plus! Systems only)

TLS-250i Plus! Systems give you the option of conducting either a 0.2 gallon per hour (GPH) or 0.1 GPH Leak Test. At the end of the test period, a report for the selected test type will be printed or stored in memory. The alternate test type results can be retrieved using procedures in the diagnostic mode if the test duration for the alternate test was sufficient to yield valid test results.

1. Select the Leak report Type using the following instructions:
 - a. The first digit to the right of the decimal point will be flashing indicating that its value may be changed. Press the **INCREMENT** button to toggle the value between 2 and 1.
 - b. When the desired Leak Report Type is displayed, press the **FUNCTION** button to advance the display to the next function — Auto Print Time #1 (HH:MM), Code 2A.



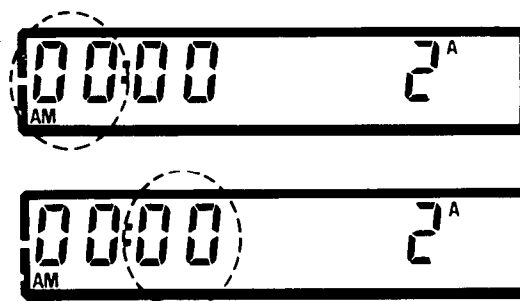
Leak Report Type Display

D. Automatic Print Times (OPTIONAL)

TLS-250i systems having the optional integral printer can be programmed, using the following procedures, to automatically print or store in memory inventory status reports at three separate times during a 24-hour period. Once the times have been set, the reports will be printed or stored at those times every day.

Automatic Print Times are optional. If any or all of them are not to be used, leave the "EE" showing in the display and advance to the next function by depressing the **FUNCTION** button. If a value is shown in the display and you wish to "disable" the feature, use the **CURSOR** button to activate the appropriate hours digits and depress the **INCREMENT** button until the "EE" appears in the hours position.

1. Set Auto Print Time #1 using the following instructions.
 - a. The hours digits (HH:MM) of the Auto Print Time #1 will be flashing indicating that its value may be changed. Depress the **INCREMENT** button to select the desired value for these digits.
 - b. Depress the **CURSOR** button and repeat this procedure to set the minutes digits (HH:MM) of the Auto Print Time #1 display. When all values have been entered, depress the **FUNCTION** button to complete the Auto Print Time #1 and advance the display to the next function — Auto Print Time #2 (HH:MM), Code 2B.
2. Set Auto Print Time #2 by repeating the instructions for Auto Print Time #1. When the desired values have been entered, depress the **FUNCTION** button to complete the Auto Print Time #2 and advance the display to the next function — Auto Print Time #3 (HH:MM), Code 2C.
3. Set Auto Print Time #3 by repeating the instructions for Auto Print Time #1. When the desired values have been entered, depress the **FUNCTION** button to complete the Auto Print Time #3 and advance the display to the next function — High Water Indicator (I.D), Code 3.



Auto Print Time Displays

E. High Water Limit (OPTIONAL)

The TLS-250i measures water in the bottom of a tank and will show the amount up to five inches to tenths of an inch on the monitor's display and in an inventory report.

The High Water Limit lets you set a water level value which when reached, will activate a High Water Indicator in the display. In addition, the High Water Limit may be programmed to trigger one or both alarm relays in the TLS system (see section 4.R., Alarm Relay Configuration).



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection



NOTE: Two alarm relays are built into each TLS-250i monitor. Consult the TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for power specifications and proper installation when wiring to an optional, customer-supplied alarm system.



NOTE: The High Water Limit cannot be set at a value over 5.0 inches (or 199 mm). This is the maximum water height that the TLS-250i probe can detect. In practice, it is advisable to set this value at a height lower than the pickup for the submersible pump or suction line. This will help to avoid the possibility of delivering water to a vehicle.



NOTE: To "disable" the High Water Limit in any tank, set its value at 5.0.

1. Set High Water Limit in inches to one decimal place (I.D), Code 3.
 - a. The first digit of the High Water Limit display (I.D) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit.
 - c. Depress the **CURSOR** button to activate the Decimal digit (I.D) of the display and depress the **INCREMENT** button to select the desired value.
 - d. Depress the **TANK** button to advance the display to tank #2.
 - e. Repeat the procedures outlined for tank #1 to enter the High Water Limit for tank #2. Depress the **TANK** button to advance the display to tank #3.
 - f. Continue to follow these procedures to set the High Water Limit values for each tank in the system.
 - g. Once the limits have been set and the tank indicator in the display is returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Overfill Limit in gallons for tank #1 (GGGGGG), Code 3A.



High Water Limit Displays



High Water Limit Display (Metric Version)

F. Overfill Limit (OPTIONAL)

The Overfill Limit feature will warn of a potential overfill condition during a bulk delivery from a tank truck. It is a gallon value which when reached, will trigger a printout showing alarm type, tank number, product, date and time. In addition, the Overfill Limit can be programmed to trigger one or both alarm relays in the TLS system (see Section 4.R, Alarm Relay Configuration).



NOTE: Two alarm relays are built into each TLS-250i monitor. Consult the TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for power specifications and proper installation when wiring to an optional, customer-supplied alarm system.

Assuming an accurate tank chart, the Overfill Limit should be no greater than a value 200 gallons less than the tank's capacity.

If no Overfill limit is desired for a tank, set its limit value at 999999.

1. Set Overfill Limit in gallons (GGGGGG), Code 3A.
 - a. The first digit of the Overfill Limit display in gallons (GGGGGG) for tank #1 will be flashing.



Overfill Limit Display

- b. Depress the **INCREMENT** button to select the desired value for this digit.



NOTE: Zeros must be set in the leading digits to enter a limit value under six digits.

- c. Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
- d. Repeat these procedures for each digit of the Overfill Limit for tank #1 and depress the **TANK** button to advance the display to tank #2.
- e. Set the Overfill Limits for each tank in the system using the same procedures outlined in tank #1.
- f. Once the limits have been entered and the tank indicator in the display has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Low Level Limit in gallons for tank #1 (GGGGGG), Code 3B.

G. Low Level Limit (OPTIONAL)

The Low Level Limit feature of TLS-250i is designed to warn of low inventory in any of the system's tanks. When the preset low limit is reached, a signal is sent to the monitor. The electronic label "LOW LIMIT" will flash indicating the low level limit has been exceeded.

TLS-250i systems with the optional integral printer will also automatically print a low limit report showing the product, date and time of day.

In addition, the Low Level Limit may be programmed to trigger one or both alarm relays in the TLS system (see Section 4.R., Alarm Relay Configuration).



NOTE: Two alarm relays are built into each TLS-250i monitor. Consult the TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for power specifications and proper installation when wiring to an optional, customer-supplied alarm system.

If no Low Level Limit is desired for a tank, set its limit at 000000 gallons.

1. Set Low Level Limits in gallons (GGGGGG), Code 3B.
 - a. The first digit of the Low Level Limit display (GGGGGG) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit.
 - c. Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
 - d. Repeat these procedures for each digit of the Low Level Limit for tank #1 and depress the **TANK** button to advance the display to tank #2.
 - e. Set the Low Level Limits for each tank in the system following the same procedures outlined for tank #1.
 - f. Once the Low Level Limits have been entered and the tank indicator in the display has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Theft Limit in gallons for tank #1 (GGGGGG), Code 3C.



Low Level Limit Display



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

H. Theft Limit (OPTIONAL)

The Theft Limit feature will warn of a sudden loss of fuel during the Leak Detect Mode. It is a gallon value which, when reached, will trigger a printout showing alarm type, tank number, date and time. In addition, the Theft Limit can be programmed to trigger one or both alarm relays in the TLS system (see Section 4.R., Alarm Relay Configuration).



NOTE: Two alarm relays are built into each TLS-250i monitor. Consult the TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for power specifications and proper installation when wiring to an optional, customer-supplied alarm system.

In addition, TLS systems with the integral printer will print a theft report which shows the product and date and time of theft.

If no Theft Limit is desired for a tank, set its limit value at 999999.

1. Set Theft Limit, Code 3C.

- The first digit of the Theft Limit display in gallons (GGGGGG) for tank #1 will be flashing.
- Depress the **INCREMENT** button to select the desired value for this digit.



Theft Limit Display



NOTE: Zeros must be set in the leading digits to enter a limit value under six digits.

- Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
- Repeat these procedures for each digit of the Theft Limit for tank #1 and depress the **TANK** button to advance the display to tank #2.
- Set the Theft Limits for each tank in the system following the same procedures outlined for tank #1.
- Once the Theft Limits have been entered and the tank indicator in the display has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Leak Limit (GG.0), Code 3AB.

I. Leak Limit (OPTIONAL)

The Leak Limit provides a warning that a preset amount of fuel has been lost from a tank during a leak test period. It is an optional programmable volume limit which, when reached, will cause a Leak Limit Report to be printed. In addition, it can trigger one or both alarm relays in the TLS system — see Section 4.R., Alarm Relay Configuration.



NOTE: Two alarm relays are built into each TLS-250i monitor. Consult the TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for power specifications and proper installation when wiring to an optional, customer-supplied alarm system.

The Leak Limit is in gallons and is automatically set as a negative value by the TLS-250i. Its value may be set from —1.0 to —99.0. The minus sign and decimal zero are fixed and cannot be changed. If the total fuel lost during a test reaches this value, a report will be printed and one or both relays can be triggered.

EXAMPLE: If a Leak Limit has been set at —25 gallons, the alarm relay would be triggered when the TOTAL fuel loss in that tank during a single test period reached 25 gallons. In an eight-hour test, a loss rate of 3.125 gallons per hour or greater would be necessary to trigger the relay. If the limit was set at —5 gallons, a loss rate of .625 gallons per hour or greater in an eight-hour test would trigger the relay.

When establishing a Leak Limit, consider the length of the leak test period and the desired loss rate in gallons per hour to be identified.

If no Leak Limit is entered for a tank, the system will default to a limit of —99.0 gallons (-399.0 liters-metric version).

The following chart shows the relationship of Leak Limit to leak test length and loss rate.

IMPORTANT: The Leak Limit is designed to identify and warn of large leaks that occur during a test period. Small changes in fuel conditions can cause temporary variations in fuel level readings which balance out over the duration of a test in a tight tank. To prevent false reports and alarms from being triggered by this condition, it is not recommended that the Leak Limit be set at a value which would identify small leaks of 0.2 gallons per hour during the test period.

It is recommended that the Leak Limit be set at a value that will identify a Leak Rate of one Gallon per hour or greater.

Test Length (hours) Leak Limit (gallons)	5	6	7	8	9	10
		Minimum Loss Rate (GPH)				
50	10.00	8.33	7.14	6.25	5.56	5.00
40	8.00	6.67	5.71	5.00	4.44	4.00
30	6.00	5.00	4.28	3.75	3.33	3.00
20	4.00	3.33	2.86	2.50	2.22	2.00
10	2.00	1.67	1.43	1.25	1.11	1.00
5	1.00					
4						

The total fuel loss is a temperature compensated value.

1. To enter Leak Limits, Code 3AB:
 - a. The first digit of the Leak Limit display in gallons (—GG.0) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value (0 - 9) for this digit.
 - c. Depress the **CURSOR** button to activate the second digit of the display and use the **INCREMENT** button to select the desired value.
 - d. Depress the **TANK** button to advance the display to tank #2 and repeat steps a, b and c to set the Leak Limit for tank #2.
 - e. Repeat these procedures for all tanks in the system.
 - f. Once the Leak Limits for each tank in the system have been entered and the tank indicator in the display has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Fuel Thermal Coefficient of Expansion, Code 3BC.



Leak Limit Displays



Leak Limit Display (Metric Version)



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

J. Fuel Thermal Coefficient of Expansion (FTCE) (MANDATORY)

The coefficient of expansion (the ratio of expansion or contraction of fuel due to temperature changes) varies among fuels approved for the TLS-250i. To ensure accurate temperature compensation during leak test procedures, this value must be entered for each tank in the system.



NOTE: If a "Product Label Code" has been assigned to a Product* (see Section 4.P.), the proper FTCE will be assigned automatically.

*Except Product Label Code 39 — Jet Fuel, and 40 — AVGAS. These FTCEs **MUST BE ENTERED MANUALLY!**

If no FTCE or Product Label Code is entered for a tank, the system will default to the FTCE for gasoline. A DIESEL product label code **MUST** be assigned to a tank containing diesel fuel (see Section 4. P., Product Code and Product Label Code).

1. To set Fuel Thermal Coefficient of Expansion ($\pm NNN.0$), Code 3BC.
 - a. The first digit of the FTCE display (0000.0) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select either 0 (+) or -.
 - c. Depress the **CURSOR** button to activate the second digit and depress the **INCREMENT** button to select the desired value (0-9).
 - d. Repeat these procedures for the remaining digits of the display for tank #1 and depress the **TANK** button to advance the display to tank #2.
 - e. Set the FTCE for the remaining tanks in the system using the same procedures outlined for tank #1.
 - f. Once the FTCE has been set for each tank and the tank indicator in the display has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Inventory Increase Report Delay Time (MM), Code 3ABC.



FTCE Display

K. Inventory Increase Report Delay Time (OPTIONAL)**

** NORMALLY USED WITH MANIFOLDED TANKS.

The Inventory Increase Report Delay Time is an OPTIONAL tank parameter. It will delay the Automatic Inventory Increase Report up to 99 minutes after the completion of a fuel delivery.

IMPORTANT: The Inventory Increase Report records only the starting and ending fuel volumes to calculate net increase. It does not compensate for fuel dispensed during the bulk delivery **OR THE DELAY PERIOD.**

This delay time will prevent separate inventory increase reports from being generated during intervals between multi-compartment bulk deliveries to one tank. It also allows fuel to "settle out" and helps prevent false inventory increase reports from being generated as a result of fuel movement. This is especially important for manifolded tank installations.

If, at the end of this delay period, the increase has been less than 25 gallons, no inventory increase report will be issued.

1. Set Inventory Increase Report Delay Time, Code 3ABC.
 - a. The first digit of the Inventory Increase Report Delay Time display (GG) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit.



Inventory Increase Report
Delay Time Display

- c. Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
- d. Depress the **TANK** button to advance the display to tank #2 and follow the same procedures outlined for tank #1.
- e. Set the Inventory Increase Report Delay Time for all tanks in the system.
- f. Once the delay times have been entered for all tanks and the tank indicator has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Tank Volume, Code 4 through Code PC.

L. Tank Volume (MANDATORY)

Tank Volume is a MANDATORY tank parameter. It MUST be entered for every tank in the system. Refer to the manufacturer's tank volume chart for volume specifications.

For flat-ended cylindrical steel tanks: The 1.00 height volume capacity (Code 4) MUST be entered for all tanks.

For fiberglass tanks: The volume capacities at 1.00 height (Code 4), 0.75 height (Code 4A), 0.50 height (Code 4B) and 0.25 height (Code 4C) capacities MUST be entered for all tanks.

IMPORTANT: It is recommended that all 20 height volume capacities (see the following chart for function codes) be entered for tanks where reconciliation differences have shown distortion in the tank shape. This will help improve inventory accuracy at all levels of the tank.

The TLS system will assume a 10,000 gallon, 96", flat-ended, cylindrical tank if no height volume capacities are entered and default to a 010000 value for the 1.00 height volume capacities. All other capacities will default to 000000.

- 1. Enter tank volumes in gallons (GGGGGG) for all capacities.
 - a. The first digit of the 1.00 height volume display (GGGGGG) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit.



Tank Volume Display



NOTE: Zeroes must be entered in the leading digits to enter a volume amount under six digits.

- c. Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
- d. Repeat these steps for each digit of the 1.00 height volume capacity for tank #1 and depress the **TANK** button to advance the display to tank #2.
- e. Enter the 1.00 height volume capacities for all tanks in the system following the same procedures outlined for tank #1.
- f. Once the 1.00 height volume capacities for all tanks have been entered, depress the **FUNCTION** button to advance the display to the next desired function. If all 20 capacities are being entered for all tanks, the next function will be 0.95 height volume capacity, Code H. If the next capacity is to be at 0.75 height, continue to depress the **FUNCTION** button until function Code 4A is displayed.



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

- g. Enter the desired height volume capacities for all tanks in the system using the procedures described for Code 4.

Function Code	Function
4	1.00 Height Volume Capacity
H	0.95 Height Volume Capacity
HA	0.90 Height Volume Capacity
HB	0.85 Height Volume Capacity
HC	0.80 Height Volume Capacity
4A	0.75 Height Volume Capacity
E	0.70 Height Volume Capacity
EA	0.65 Height Volume Capacity
EB	0.60 Height Volume Capacity
EC	0.55 Height Volume Capacity
4B	0.50 Height Volume Capacity
L	0.45 Height Volume Capacity
LA	0.40 Height Volume Capacity
LB	0.35 Height Volume Capacity
LC	0.30 Height Volume Capacity
4C	0.25 Height Volume Capacity
P	0.20 Height Volume Capacity
PA	0.15 Height Volume Capacity
PB	0.10 Height Volume Capacity
PC	0.05 Height Volume Capacity

- h. Once all desired capacities have been entered and the tank indicator in the display has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Tank Diameter in inches (III.DD) for tank #1, Code 5.

M. Tank Diameter (MANDATORY)

Tank Diameter is a **MANDATORY** tank setup parameter. It is the **inside** diameter of the tank. This dimension can usually be found on the tank chart.

1. Enter Tank Diameter, Code 5, in inches to two decimal places (or millimeters to one decimal place).
 - a. The first digit of the Tank Diameter display in inches (III.DD) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit.



NOTE: A zero must be set in the leading digit if the tank diameter is less than 100 inches.



Tank Diameter Display

- c. Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
 - d. Repeat these steps for each digit of the Tank Diameter for tank #1 and depress the **TANK** button to advance the display to tank #2.
 - e. Enter the Tank Diameter for each tank in the system, using the same procedures outlined for tank #1.
 - f. Once the diameters for all tanks have been entered and the tank indicator in the display has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Tank Tilt in inches for tank #1, Code 6.



Tank Diameter Display (Metric Version)

N. Tank Tilt (OPTIONAL)

The Tank Tilt adjustment allows you to enter a value which will adjust for a discrepancy between TLS-250i probe and the center of the tank height caused by the tilt of the tank. Fuel height readings at the fill riser and the TLS probe riser should have been taken at the time of probe installation and recorded in the appropriate section of the "Site Preparation and Installation Instructions." From these readings, a tilt value (the figure can be a positive or negative value) may be determined.

The Tank Tilt adjustment is an optional value. It is easily calculated by subtracting the fuel height in inches at the fill riser from the fuel height in inches at the probe riser then dividing the difference by the distance in inches between the two points. This equals slope in inches. Multiply the slope by the distance from the probe to the tank center to obtain your tilt factor.



NOTE: For best results, the TLS probe should be installed in the center of the tank and the tilt factor should be set at 000.00.

If no Tank Tilt value is desired for a tank, set its tank tilt value at 000.00 inches.

1. Enter Tank Tilt in inches to two decimal place (III.DD) (or millimeters to one decimal place) for tank #1, Code 6.
 - a. The first digit of the display (III.DD) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit. If the Tank Tilt adjustment is a negative value, enter a minus sign (-) in the digit.



Tank Tilt Display



Tank Tilt Display (Metric Version)



NOTE: Zeros must be set in the leading digits to enter a tank tilt value under three whole digits.

- c. Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
- d. Repeat these procedures for each digit of the Tank Tilt value for tank #1 and depress the **TANK** button to advance the display to tank #2.
- e. Enter the Tank Tilt values for each tank in the system following the same procedures outlined for tank #1.
- f. Once the Tank Tilt values have been entered and the tank indicator in the display has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Manifolded Tank Configuration, Code 7.

O. Manifolded Tank Configuration (MANDATORY)

This entry is **MANDATORY** for systems with manifolded tanks.

The Manifolded Tank Configuration feature lets you tell TLS which tanks in the system have been manifolded together. With this information, TLS is able to provide information for total product inventory automatically.

It is necessary to enter manifold information for one tank in a group only. Corresponding information for the other tanks in the manifolded group is automatically entered by TLS.

EXAMPLE: In a system with tanks 1, 2 and 3 manifolded and 4 and 5 manifolded, you need only to enter information for tanks 1 and 4. For tank 1, enter 2 and 3, for tank 4, enter 5. The system automatically recognizes that tank 2 is manifolded with 1 and 3, 3 is manifolded with 1 and 2, and 5 is manifolded with 4.



NOTE: If there are no manifolded tanks in the system, depress the **FUNCTION** button to advance the display to the next function.



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

1. Enter Manifolder Tank Configurations, Code 7.
 - a. The first digit of the display (NNNNNN, N = 0-8) for tank #1 will be flashing.



NOTE: If tank #1 is not part of a manifolded group, but other tanks in the system are, depress the **TANK** button to advance the display to the first tank in the first manifolded group.



Manifolded Tank Display

- b. Using the **INCREMENT** button, enter the number of the first tank manifolded to tank #1.
 - c. If another tank is manifolded to the first two, depress the **CURSOR** button to activate the second digit in the display and use the **INCREMENT** button to enter its tank number.
 - d. Be sure the rest of the digits in the display are "0" before using the **TANK** button to advance the display to the next tank.
 - e. If the next tank is part of a manifolded group that has already been entered under another tank, its corresponding tank numbers will automatically appear in the display. Simply skip over this tank by depressing the **TANK** button to advance the display to the first tank in the next manifolded group.
 - f. Once the manifolding configurations for each tank group have been entered, depress the **FUNCTION** button to advance the display to the next function — Product Code and Product Label Code, Code 8.

P. Product Code and Product Label Code (OPTIONAL)

The Product Code and Product Label Code features allow you to assign a name or number designation to fuel stored in the tanks of your system. These codes are used only in TLS systems having an integral printer or those that interface with external reporting devices such as computers and point-of-sale terminals.

The Product Label Code is an **OPTIONAL** tank parameter except for tanks containing diesel fuel.

IMPORTANT: For **Diesel Fuels**, a "**Diesel**" Product Label Code **Must Be Entered** to ensure proper Leak Test performance.

When no product labels are desired, a "0" in the Product Label Code will cause the TLS to automatically default to a PRODUCT 1, PRODUCT 2... label system.

There are two types of product codes shown in the Product Label Code display. At the far left is a single-digit External Communications Interface Product Code. It is designed to match product codes used by a point-of-sale terminal or other external device to the product/tank configuration of a system. Using the front-panel keys, it may be set only to a numeric value from 0 to 9 (i.e., Product 1 to tanks 1, 2 and 5, Product 2 to tanks 3 and 4). If this product code has been set to a non-numeric value via an external device, a dash (—) will be displayed in this location.

IMPORTANT: If a flashing dash is displayed during setup and the **INCREMENT** button is pushed on the front panel, the alpha code will be replaced by a numeric code. The alpha code **CANNOT BE REENTERED** except through an external input device.

In the center of the display is a two-digit Internal Product Label Code. These codes are stored within the TLS-250i and may be used to assign product designations by tank. Internal Product Label Codes may be entered using the front-panel keys or through the external interface. A list of the codes follows.

When assigning Product Label Codes to manifolded tanks, it is advisable to use the "generic" product label for the first tank in the manifolded group. When an inventory report is printed, manifolded tank inventories are grouped under the heading of the first tank.



EXAMPLE: For a manifolded group, tanks 1, 2 and 3 containing unleaded,
it is advisable to assign the labels as follows:

Tank 1 — Code 27 UNLEADED
Tank 2 — Code 28 UNLEADED 1
Tank 3 — Code 29 UNLEADED 2

The following is a list of Internal Product Label Codes contained in the
TLS and the Coefficients of Expansion of each of these fuels.

Product Label Code	Product Label	Fuel Coefficient of Thermal Expansion Standard and Generator	
		Versions	Metric Version
00	None (Defaults to PRODUCT 1, 2, etc.)	—070	-126
01	DIESEL	—047	-085
02	DIESEL 1	—047	-085
03	DIESEL 2	—047	-085
04	DIESEL 3	—047	-085
05	DIESEL 4	—047	-085
06	GASOLINE	—070	-126
07	LEAD FREE	—070	-126
08	LEADED	—070	-126
09	LEADED GASOLINE	—070	-126
10	LEADED REGULAR	—070	-126
11	NO LEAD	—070	-126
12	PREMIUM	—070	-126
13	PREMIUM LEADED	—070	-126
14	PREMIUM UNLEADED	—070	-126
15	REGULAR	—070	-126
16	REGULAR 1	—070	-126
17	REGULAR 2	—070	-126
18	REGULAR 3	—070	-126
19	REGULAR 4	—070	-126
20	REGULAR LEADED	—070	-126
21	REGULAR UNLEADED	—070	-126
22	SUPER	—070	-126
23	SUPER 1	—070	-126
24	SUPER 2	—070	-126
25	SUPER LEADED	—070	-126
26	SUPER UNLEADED	—070	-126
27	UNLEADED	—070	-126
28	UNLEADED 1	—070	-126
29	UNLEADED 2	—070	-126
30	UNLEADED 3	—070	-126
31	UNLEADED 4	—070	-126
32	UNLEADED GASOLINE	—070	-126
33	UNLEADED PREMIUM	—070	-126
34	UNLEADED GASOLINE	—070	-126
35	UNLEADED SUPER	—070	-126
36	XTRA	—070	-126
37	TOLUENE	—047	-085
38	HYDRAULIC OIL	—047	-085
39	JET FUEL (Jet "A", JP-4, JP—5)	—047*	-085
40	AVGAS	—075*	-135*
41	#2 HEATING OIL	—047	-085
42	KEROSENE	—047	-085
43	TURBINE OIL	—047	-085
44	XYLENE	—047	-085
45	MID GRADE LEADED	—070	-126
46	MID GRADE UNLEADED	—070	-126

*Must be entered manually.



External Communications Interface Product Codes

1. Enter Product Codes, Code 8.
 - a. The first digit of the Product Label Code display, the External Communications Interface Product Code (N, where N = 0-9) for tank #1 will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for tank #1.
 - c. Depress the **TANK** button to advance the display to tank #2 and use the **INCREMENT** button to select the desired value.
 - d. Repeat the procedures for each tank in the system.



External Communications Interface Product Code Display

Internal Product Label Codes

- a. The first digit of the Product Label Code display (N...NN) for tank #1 will be flashing.
- b. Depress the **CURSOR** button to activate the first digit of the Internal Product Label Code display (N...NN, where N = 0-9).
- c. Depress the **INCREMENT** button to select the desired value for this digit.



Internal Product Label Code Display



NOTE: A zero must be set in the leading digit to enter product codes 0-9.

- d. Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
- e. Depress the **TANK** button to advance the display to tank #2 and repeat the procedures outlined for tank #1.
- f. Once the Product Label Codes for all tanks have been entered and the tank indicator has been returned to tank #1, depress the **FUNCTION** button to advance the display to the next function — Security Code, Code 9.

Q. Security Code (OPTIONAL)

The Security Code is a six-digit number designed to prevent unauthorized access to the system through its external interface. Any six digits may be selected making the code unique to this system. When less than six digits are to be used, leading zeros must be entered to fill the six digits allowed for the security code.



NOTE: The Security Code may contain alphanumeric characters when entered using an external keyboard through the TLS system's external interface. These characters will appear as dashes (-----) on the display.

IMPORTANT: Do not change externally entered security codes without the proper authority! Depressing the **INCREMENT** button while on this setup code will overwrite the alpha characters.

The Security Code is a "system" setup parameter and is **OPTIONAL**. Only one code may be entered.

1. Enter a six-digit Security Code (NNNNNN, N = 0-9), Code 9.
 - a. The first digit of the Security Code display (NNNNNN) will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit.
 - c. Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
 - d. Repeat this procedure to enter values for the remaining four digits of the Security Code.



Security Code Display

R. Alarm Relay Configuration (OPTIONAL)

The Alarm Relay Configuration feature allows you to program any or all alarm indicators to trigger one or both of the TLS-250i internal alarm relays.

For example, Alarm Relay #1 could be connected to an on-site audible alarm while Relay #2 is connected to a central security monitoring service. Using the Alarm Relay Configuration feature you would be able to tie the overfill and theft alarm indicators to the on-site alarm and any other or all alarm indicators to the monitoring service alarm.

In addition, this feature lets you integrate external devices such as hydrocarbon monitoring wells into the TLS alarm relay system.

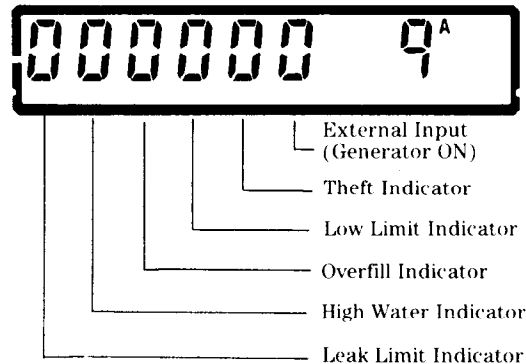
There is an Alarm Relay Configuration display (NNNNNN, where N = 0 for "OFF" or 1 for "ON") for each alarm relay — Code 9A for Relay #1 and Code 9B for Relay #2. Each digit represents the ON/OFF status of an alarm indicator or external input for that particular relay.

1st digit	Leak Limit Indicator
2nd digit	High Water Indicator
3rd digit	Overfill Indicator
4th digit	Low Limit Indicator
5th digit	Theft Indicator
6th digit	External Input (Generator ON)

If No Alarm Relay Configuration values are set, the system will default to:

Relay #1 = 000010 (Theft Indicator enabled)
Relay #2 = 001000 (Overfill Indicator enabled)

1. Set the Alarm Relay Configuration for Relay #1, Code 9A.
 - a. The first digit in the Alarm Relay Configuration display (NNNNNN) will be flashing.
 - b. Depress the **INCREMENT** button to select the desired OFF (0) or ON (1) status for the Leak Limit Indicator.
 - c. Depress the **CURSOR** button to activate the second digit of the display (High Water Indicator) and depress the **INCREMENT** button to select the desired OFF (0) or ON (1) status.
 - d. Repeat these procedures for each indicator and external input OFF/ON status in the display and depress the **FUNCTION** button to advance the display to set the Alarm Relay Configuration for Relay #2, Code 9B.
 - e. Repeat the procedures outlined for Relay #1 to set the Alarm Relay Configuration for Relay #2.
 - f. Depress the **FUNCTION** button to advance the display to the next function — Auto-Transmit Message Mode, Code 9C.



Alarm Relay Configuration Display

S. Auto-Transmit Message Mode (OPTIONAL)

The Auto-Transmit Message Mode feature lets the TLS-250i transmit, or transmit and repeat automatically, any or all alarm indications, delivery and external input messages through the RS-232 communications port to an external device. The repeat interval may be programmed to any time in minutes from 001 to 240 (see Section 4.S., Auto Transmit Repeat Time).

If no Auto-Transmit Message Mode is selected, the TLS will default to a "0" value (both transmit and repeat disabled).

IMPORTANT: If the Auto-Transmit Message Mode feature is desired, a Message Mode must be set for each Message Type (shown by **TANK** display).



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection



NOTE: In this function code, the **TANK** display becomes the Message Type display. The **TANK** button is used to select the Message Type to be transmitted.

The available message modes (first digit of the display N 9 C N) for each message type are:

- N = 0 Transmit and Repeat disabled
- N = 1 Transmit enabled, Repeat disabled
- N = 2 Transmit and Repeat enabled

The available message types (last digit of the display N 9 C N) which can be transmitted or repeated are:

- N = 1 Leak Indicator Message
- N = 2 High Water Indicator Message
- N = 3 Overfill Indicator Message
- N = 4 Low Limit Indicator Message
- N = 5 Theft Indicator Message
- N = 6 Delivery Start Message
- N = 7 Delivery End Message
- N = 8 External Input On Message (Generator OFF)
- N = 9 External Input Off Message (Generator ON)
- N = - Sensor Fuel Message
- N = E Sensor Water Message (Water Message not active at this time.)
- N = H Sensor Out
- N = L } Reserved
- N = P } Reserved
- N = 0 }

1. Set the Auto-Transmit Message Mode, Code 9C.
 - a. The Message Mode digit of the display (N 9 C N) will be flashing for Message Type #1 (shown in the tank number display).
 - b. Depress the **TANK** button to advance the display to Message Type #2 and depress the **INCREMENT** button to select the desired Message Mode.
 - c. Depress the **INCREMENT** button to select the desired Message Mode (0, 1 or 2) for Message Type #2.
 - d. Repeat this procedure for each Message Type.
 - e. After a Message Mode has been set for each Message Type, depress the **FUNCTION** button to advance the display to the next function — Auto-Transmit Repeat Time, Code 9AB.



Message Mode
(0, 1 or 2)

Message Type
1-9, -, E, H, L, P, 0



Auto-Transmit
Message Mode Display

T. Auto-Transmit Repeat Time (OPTIONAL)

The Auto-Transmit Repeat Time feature enables you to set the length of time in minutes the TLS-250i will wait before it repeats the Auto-Transmit Message if the Repeat mode is enabled (see Section 4.R.). The message will continue to repeat at this interval until the alarm indicator has been reset either manually using the front-panel keyswitch or automatically through the external communications interface.

The interval time in minutes may be set from 001 to 240. The selected time will apply to all Auto-Transmit Messages.

IMPORTANT: If an Auto-Transmit Message is being repeated at a regular interval and a second message occurs, it will be transmitted immediately (unless a delay time has been set). After its initial transmission, the second message will then be repeated at the same time as the first.

1. Set the Auto-Transmit Repeat Time, Code 9AB.
 - a. The first digit in the Auto-Transmit Repeat Time display (MMM) will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit.
 - c. Depress the **CURSOR** button to activate the second digit and depress the **INCREMENT** button to select the desired value.
 - d. Repeat the procedures outlined above to set the desired value for the third digit.
 - e. Once the Auto-Transmit Repeat Time has been set, depress the **FUNCTION** button to advance the display to the next function —Auto-Transmit Delay Time, Code 9BC.



NOTE: A zero or zeros must be set in the leading digit(s) if the repeat time is less than 100 minutes.



Auto-Transmit
Repeat Time Display

U. Auto-Transmit Delay Time (OPTIONAL)

The Auto-Transmit Delay Time lets you set an interval between the time any external communication takes place with the TLS and time TLS sends an Auto-Transmit Message.

This feature permits inventory reporting programs to be completed in the host computer before Auto-Transmit messages are sent. The delay time should take into consideration the time required for a computer to finish its program cycle.

The delay in seconds can be set from 001 to 240 and will apply to all Auto-Transmit Messages.

1. Set the Auto-Transmit Delay Time, Code 9BC.
 - a. The first digit of the Auto-Transmit Delay Time display (MMM) will be flashing.
 - b. Depress the **INCREMENT** button to select the desired value for this digit.
 - c. Depress the **CURSOR** button to activate the second digit and depress the **INCREMENT** button to select the desired value.
 - d. Repeat the procedures outlined above to set the desired value for the third digit.
 - e. Once the Auto-Transmit Delay Time has been set, depress the **FUNCTION** button to advance the display to the next function — External Input Alarm Enable, Code —.



NOTE: A zero or zeros must be set in the leading digit(s) if the repeat time is less than 100 minutes.



Auto-Transmit
Delay Time Display

V. Temperature-Compensated Volume in Inventory Report (OPTIONAL)

This option adds temperature compensated volume to the TLS-250i Inventory Report in addition to gross volume. If this feature is enabled, the temperature-compensated volume will appear on each printed report and can be shown on the front panel display.

1. To select Temperature-Compensated Volume in Inventory Report:
 - a. The Temperature-Compensated Volume Display (n) will be flashing.
 - b. Press the **INCREMENT** button to set the value at either 0 or 1.

0 = option disabled
1 = option enabled
 - c. Once the Temperature-Compensated Volume Option has been set, press the **FUNCTION** button to advance the display to the next function — Generator OFF Mode, Code 9ABC.



Temperature-Compensated Volume
in Inventory Display



W. Generator OFF and Leak Report Enable Mode (Emergency Generator Version Only)

The TLS-250i emergency generator version runs a continuous leak test as its normal mode of operation. The test will run for 24 hours in systems with four or less tanks and 13 hours in systems with five to eight tanks.

If the generator starts, the TLS stops the leak test, prints and stores in memory a "Generator Start" message with the date and time. When the generator shuts off, a "Generator Stop" message with date and time is stored and printed. Fifteen minutes after the generator shuts off, an inventory report is printed and the leak test is started again.

The generator input connects to the External Input terminal in the TLS. A dry contact switch is used to signal the TLS that the generator has turned on. This switch may be either Normally Open (NO) or Normally Closed (NC). The Generator OFF Mode feature lets you match the switch type to TLS so that the "Generator On" signal from the NO or NC switch is properly recognized and TLS will interrupt its leak test.

The leak report in the emergency generator version is normally suppressed. It can be printed first by depressing the **FUNCTION** button in the NORMAL Mode until the leak rate appears on the display, then depressing the **PRINT** button. The Leak Report Enable Option allows the report to be printed automatically at the end of the leak test period.

0 -- Automatic Leak Report Disabled

1 -- Automatic Leak Report Enabled

Default is 0

The Generator OFF Mode may be set to either 0 or 1. The proper settings to match switch types are:

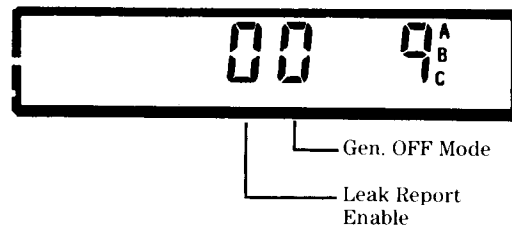
0 -- For a switch which is normally open when the generator is OFF.

1 -- For a switch which is normally closed when the generator is OFF.

If the system is not tied to a generator, the Generator OFF Mode **must** be set to "0".

The TLS will default to "1" if no Generator OFF Mode is set.

1. To set the Generator OFF Mode (Code 9ABC):
 - a. The Generator OFF Mode display (n) will be flashing. Its value will be 1.
 - b. Depress the **INCREMENT** button to set the value at either 0 or 1.



Generator OFF Mode Display

X. External Input Alarm Enable

An input from external monitoring devices, such as line leak detectors and monitoring wells, can be wired directly to the TLS-250i console. When this is done, the TLS-250i recognizes an "External Input ON" and "External Input OFF" signal from the external device and can integrate this signal into its own alarm and reporting functions.

The External Input Alarm Enable function lets you electronically assign the input from an external monitoring device to the alarm cause feature in the TLS-250i. When this function is enabled, a signal from the external device will activate the alarm cause LED for sensor #8B and trigger the audible alarm.



NOTE: In systems where the sensor #8B LED is already used by a sensor, it is recommended that this feature be set to the DISABLE (0) status to avoid confusing alarm signals.

1. Set the External Alarm Input Enable, Code —.
 - a. The single digit in the display (N) will be flashing.
 - b. Depress the **INCREMENT** button to select the desired status (1 = enabled, 0 = disabled).
 - c. Once this status has been set, depress the **FUNCTION** button to advance the display to the next function — Audible Water Alarm Disable and Water Alarm Delay Time for “A” Sensors, Code —A.



External Input Alarm
Enable Display

Y. Audible Water Alarm Disable (OPTIONAL), Sensor Type Selection (MANDATORY) and Water Alarm Delay Time for “A” Sensors (OPTIONAL)

Three setup functions are available in this display.

The **Audible Water Alarm Disable** feature is not active in this system.

The **Sensor Type Selection** function is used with switch-type liquid sensors and lets you select NO or NC as the normal (non-alarm) condition.



NOTE: The system defaults to a Veeder-Root Normally Open sensor.

The **Water Alarm Delay Time** feature is not active in this system.

1. Enter the Sensor Type Selection, Code —A.
 - a. The first digit of the display (Sensor Type Selection) (N HH.H) for sensor #1A will be flashing.
 - b. Depress the **INCREMENT** button to select the desired condition:
 - 0 = (Inactive)
 - 1 = (Inactive)
 - 2 = Switch-Type Sensor Normally Open
 - 3 = Switch-Type Sensor Normally Closed



NOTE: The system reacts to the presence of any liquid with a fuel alarm.

- c. Once the Sensor Type Selection for all sensors has been set for the “A” sensors, depress the **FUNCTION** button to advance the display to the next function — Audible Water Alarm Disable, Sensor Type Selection and Water Alarm Delay Time for “B” Sensors, Code —B.



Water Audible
Delay Time (Inactive)

Audible Water Alarm Disable (Veeder-Root
Sensors)

- 0 = (Inactive)
- 1 = (Inactive)

Sensor Type Selection

- 2 = Switch-Type Normally Open
- 3 = Switch-Type Normally Closed

Z. Audible Water Alarm Disable (OPTIONAL), Sensor Type Selection (MANDATORY) and Water Alarm Delay Time (OPTIONAL) for “B” Sensors

Sensor Type Selection can be set for the “B” sensors in the system.

1. Enter the Sensor Type Selection for “B” sensors, Code —B.
 - a. Repeat the procedures outlined for the “A” sensors.
 - b. Once these values have been set for the “B” sensors, depress the **FUNCTION** button to advance the display to the next function — Relay #1 Sensor Alarm Function, Code —C.



Water Audible
Delay Time (Inactive)

Audible Water Alarm Disable (Veeder-Root
Sensors)

- 0 = (Inactive)
- 1 = (Inactive)

Sensor Type Selection

- 2 = Switch-Type Normally Open
- 3 = Switch-Type Normally Closed



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

AA. Relay #1 Sensor Alarm Function (OPTIONAL)

This feature allows you to assign the fuel leak, water leak or sensor out alarms to internal alarm relay #1. When an assigned alarm condition is detected by a sensor, the alarm relay will be triggered.

1. Assign Sensor Alarm Functions for Relay #1, Code —C.



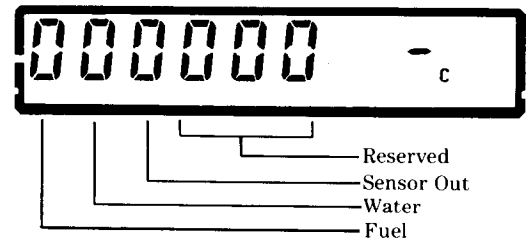
NOTE: If no values are set, the system will default to 000000 (disabled).

- a. The first digit of the display (NNNNNN) will be flashing.



NOTE: Only the first three digits of the display are used. The remaining three are inactive and reserved for future use.

- b. Depress the **INCREMENT** button to select the desired status (1 = assigned, 0 = disabled) for the fuel leak alarm.
- c. Depress the **CURSOR** button to activate the second digit and, using the **INCREMENT** button, select the status for the water leak alarm.
- d. Depress the **CURSOR** button again and select the status for the sensor out alarm.
- e. Once the status for each alarm has been set, depress the **FUNCTION** button to advance the display to the next function — Relay #2 Sensor Alarm Function, Code —AB.



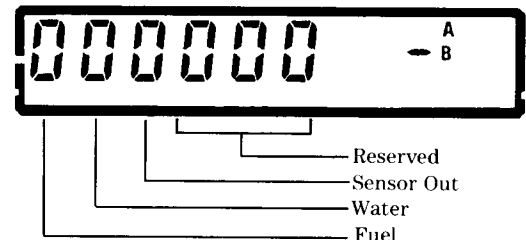
Relay #1 Sensor Alarm Function Display

AB. Relay #2 Sensor Alarm Function (OPTIONAL)

This feature allows you to assign the fuel leak, water leak or sensor out alarms to internal alarm relay #2. When an assigned alarm condition is detected by a sensor, the alarm relay will be triggered.

1. Assign Sensor Alarm Functions for Relay #2, Code —AB.
- a. Repeat the procedures outlined for Relay #1.

SETUP PROCEDURES ARE COMPLETE. ALL DESIRED SYSTEM AND TANK PARAMETERS SHOULD HAVE BEEN ESTABLISHED. TURN THE OPERATING MODE KEYSWITCH TO "NORMAL".



Relay #2 Sensor Alarm Function Display

Setup Procedures Are Complete

At this point, all "system" and "tank" parameters should have been entered.

AC. External Interface to Enter Station Header (OPTIONAL)

A four-line custom station header may be entered into the TLS system via the RS-232 port using an external keyboard. This header will appear on Inventory Status, Leak Detect, and Automatic Delivery Reports each time they are printed.

Each line of the header may contain up to 20 characters, and the header typically includes information such as station name, address and telephone.



NOTE: The TLS-250i has factory-set conditions that must be matched by the keyboard device. They are:

Baud Rate 300
Parity Odd
Security Code .. Disabled

1. Connect a Keyboard Device.
 - a. Connect an RS-232 null cable (not a straight-through cable) from the keyboard device to the front RS-232 plug on the underside of the TLS-250i monitor.
 - b. Set the baud rate of the keyboard to match TLS (factory set at 300 baud).
 - c. Set the terminal for 10 bit character transmission: 1 start bit; 7 data bits; 1 odd parity bit; 1 stop bit.
2. Enter Station Header.
 - a. Using the keyboard, depress "CONTROL A".
 - b. Enter code 7 3 1 (this accesses first line of header).
 - c. Enter the first line of header. (All 20 characters must be filled. Blanks **MUST** be filled using space bar.) The TLS-250i will echo back the setup command after the 20th header line character.
 - d. Depress "CONTROL A".
 - e. Enter code 7 3 2 to access the second line of header.
 - f. Enter the second line of header (all spaces must be filled).
 - g. Depress "CONTROL A".
 - h. Enter code 7 3 3 to access the third line of header.
 - i. Enter the third line of header (all spaces must be filled).
 - j. Depress "CONTROL A".
 - k. Enter code 7 3 4 to access the fourth line of header.
 - l. Enter the fourth line of header (all spaces must be filled).

NOTICE: THE OWNER OF THIS PRODUCT SHOULD REMOVE THE FRONT PANEL KEY TO PREVENT MISUSE OF THE PRODUCT. UNAUTHORIZED CHANGES IN THE SETUP PARAMETERS COULD RESULT IN INACCURATE INVENTORY CONTROL OR UNDETECTED POTENTIAL ENVIRONMENTAL AND HEALTH HAZARDS.



SECTION 5 — OPERATING INSTRUCTIONS

A. Front-Panel Button Functions

TLS-250i Systems feature front-mounted pushbuttons that let you review all inventory information, tank by tank, and call for inventory reports.

These buttons are also used to enter or change system and tank setup parameters and reset audible sensor alarms as required (refer to Section 4).

The following is a brief description of each button's function.



NOTE: The **LEAK ALERT RESET** button is a multi-purpose button whose functions change depending on keyswitch position and display information.

CURSOR — (Setup mode only) Depress **CURSOR** button to select digit to be changed. Digit will flash.

INCREMENT — (Setup mode only) Used to select desired value for a displayed digit.

LEAK ALERT RESET — **NORMAL MODE** — Depress once to shut off and reset audible alarm (will not shut off alarm LEDs) except when displaying the Leak Rate function. When audible alarm is inactive, depress once to test LEDs and audible alarm, except when displaying the Leak Rate function. When Leak Rate shown on display, depress twice to start leak detect test for all tanks. Or, depress once, then select tank # and depress again for single tank test. **SETUP MODE** — When on the —A or —B setup codes, depress to reset sensor configuration. **DIAG MODE** — Press to set the system in Sensor Checkout Mode.

PRINT — Used to print inventory, setup and diagnostic information. First select the desired information using the keyswitch, **FUNCTION** and **TANK** buttons.

FUNCTION — Depress **FUNCTION** button to advance display to next function.

TANK — Used to select tank or sensor for which information is to be entered, displayed or printed (except during Auto-Transmit Message mode setup where the **TANK** button is used to select message type).

B. Alarm Cause Indicator Functions

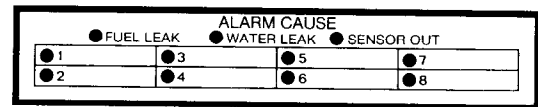
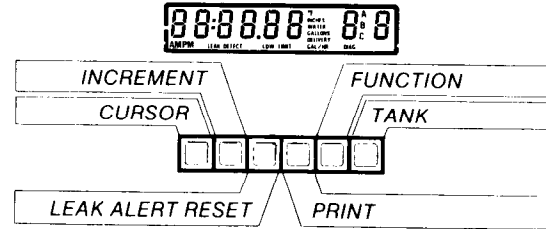
The TLS-250i has on its front panel eleven Alarm Cause LED indicators that will flash when an alarm condition is detected. Three of the LEDs — Fuel Leak, Water Leak and Sensor Out — indicate the type of alarm condition sensed. The LEDs labeled 1-8 will show which sensor in the system has detected the condition.

In addition, an audible alarm will beep when any sensor alarm condition is detected.



NOTE: The audible alarm for water as an option is not active in this system.

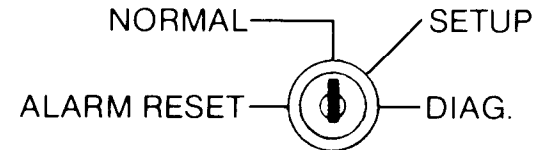
The audible alarm can be reset immediately using the Leak Alert Reset button. However, the LED Alarm Cause indicators and LCD Annunciators cannot be reset until the alarm condition has been corrected and the Operating Mode keyswitch turned to the Alarm Reset position and back to Normal.





C. Operating Mode Keyswitch Functions

The TLS-250i Operating Mode keyswitch is a management feature that allows selection of the system operating modes — Normal, Setup, Diagnostic and Alarm Reset. It also limits access to the Setup, Diagnostic and Alarm Reset modes so that only authorized personnel can enter or change system, sensor and tank parameters.



NOTICE: THE OWNER OF THIS PRODUCT SHOULD REMOVE THE FRONT PANEL KEY TO PREVENT MISUSE OF THE PRODUCT. UNAUTHORIZED CHANGES IN THE SETUP PARAMETERS COULD RESULT IN INACCURATE INVENTORY CONTROL OR UNDETECTED POTENTIAL ENVIRONMENTAL AND HEALTH HAZARDS.

There are four positions on the switch. The following is a brief description of their functions.

NORMAL — For daily system operation. Displays inventory and sensor status information, provides automatic and programmed operating reports, monitors limit values for alarm conditions.

Normal display functions include:

FUNCTION	UNITS	
	TLS-250i	TLS-250i Metric
Time of Day	Hours/Minutes	Hours/Minutes
Fuel Volume	Gallons	Liters
Temperature-Compensated Volume	Gallons	Liters
Fuel Height	Inches/Hundredths	Millimeters/Tenths
Water Height	Inches/Tenths	Millimeters/Tenths
Fuel Temperature	Degrees F/Tenths	Degrees C/Tenths
Delivery Volume (Last delivery to tank)	Gallons	Liters
Leak Rate	Gallons per hour/ Hundredths	Liters per hour/ Hundredths
"A" Sensor Status	Status Indicator for Each Alarm Cause 0 = OFF, 1 = ON	
"B" Sensor Status	Status Indicator for Each Alarm Cause 0 = OFF, 1 = ON	

SETUP — Provides access to system, sensor and tank parameters. Used to enter and change setup values. The keyswitch limits the setup mode to authorized personnel.

See Section 4. for System Setup procedures.

DIAGNOSTIC — The Diagnostic function provides a means of accessing certain information regarding system identification, capacitance values, and calibration information. It also permits printing of the Alarm History Report.

ALARM RESET — Used to reset LCD indicator and flashing alarm cause LEDs after leak, theft and overfill alarms have been triggered. Will also reset alarm relays after alarm indications.



NOTE: When an alarm condition is eliminated (i.e., excessive water has been removed from inside the tank), the alarm will reset itself automatically.

IMPORTANT: The Alarm Reset will shut off the flashing LEDs only after the cause of the alarm indication had been corrected and the sensor detects no other alarm condition.



D. Operator's Instructions

1. To display inventory and sensor status information:
 - a. With the Operating Mode keyswitch in the NORMAL mode, depress the **FUNCTION** button to select the desired display function (i.e., Fuel Volume, Water Height, Sensor Status, etc.).
 - b. Depress the **TANK** button to select the desired tank or sensor for which the information is to be displayed.
2. To print inventory information:
 - a. With Operating Mode keyswitch in the NORMAL mode, depress the **PRINT** button. An inventory report will be printed for all tanks in the system.
3. To print delivery information:
 - a. With Operating Mode keyswitch in the NORMAL position, depress the **FUNCTION** button until "Gallons Delivered" appears on the display.
 - b. Depress the **PRINT** button. The latest inventory increase report for the display specified tank will be printed.
4. To print a complete Leak Test Results Report:

The automatic Leak Test Results Report generated at the end of a leak test period shows only PASS, FAIL, INVALID or SHORT result indications for each tank tested. A complete report showing the hour-by-hour cumulative change and the final leak rate by tank can be printed by following these instructions.



NOTE: TLS-250i *Plus!* Systems equipped with 0.1 GPH Capacitance or Magnetostrictive probes have the ability to provide **either** 0.1 GPH or 0.2 GPH Leak Test Results Reports. This choice was made during the test setup process. If a 0.1 GPH Leak Report Type was selected, the small "c" annunciator will appear in the Leak Rate display. If a 0.2 GPH report was selected, the "c" annunciator will not appear.

The Leak Report Type (0.1 GPH or 0.2 GPH) can be changed and the respective results printed as long as the test duration was sufficient to provide valid results for the alternate test report.

- a. With the Operating Mode keyswitch in the NORMAL position, press the **FUNCTION** button until the "Leak Rate" display appears.
 - b. Check the Leak Report Type annunciator ("c" for 0.1 GPH report, no annunciator for 0.2 GPH report) to be sure the desired report type is correct.
 - c. To change the report type, press the **INCREMENT** button to turn the "c" annunciator on or off.
 - d. Press the **PRINT** button. A complete report of the last leak test results will be printed.
5. To print sensor status information:
 - a. With the Operating Mode keyswitch in the NORMAL mode, depress the **FUNCTION** button until the "A" annunciator appears in the display.
 - b. Depress the **PRINT** button. A sensor status report will be printed for all sensors in the system.
6. To print "System" Setup Information:

There are two reports showing system setup parameters not related to individual tanks.

 - a. The first report shows all system setup parameters **except** the auto-transmit parameters. To print this report:
 1. Turn the Operating Mode keyswitch to SETUP position.
 2. Using the **FUNCTION** button, select the function code for any system setup parameter (except auto-transmit parameters).
 3. Depress the **PRINT** button. All setup parameters shown on the report will be printed.

- b. The second report shows the auto-transmit parameters. To print this report:
 1. Turn the Operating Mode keyswitch to **SETUP** position.
 2. Using the **FUNCTION** button, select the function code for any auto-transmit parameter.
 3. Depress the **PRINT** button. All auto-transmit setup parameters will be printed.
7. To print "Sensor" Setup Information:
 - a. Turn the Operating Mode keyswitch to **SETUP** position.
 - b. Using the **FUNCTION** button, advance the display to function -A or -B.
 - c. Depress the **TANK** button to select the desired sensor.
 - d. Depress the **PRINT** button. All setup information for the sensor location indicated by the tank number in the display will be printed.
 - e. Depress the **TANK** button to select other sensors in the system and use the **PRINT** button to obtain reports.
8. To print "Tank" Setup Information:

TANK SETUP INFORMATION IS PRINTED ONLY FOR THE TANK NUMBER SHOWN IN THE DISPLAY.

 - a. Turn the Operating Mode keyswitch to **SETUP** position.
 - b. Depress the **FUNCTION** button to advance display to any tank setup function.
 - c. Depress the **TANK** button to select the desired tank.
 - d. Depress the **PRINT** button. A report showing all tank setup information for the desired tank will be printed.
 - e. Depress the **TANK** button to select other tanks in the system and use the **PRINT** button to request printed reports.
9. To print Tank Alarm History Report:



NOTE: The tank alarm history report is an operational report rather than diagnostic. It is included in the Diagnostic Mode for security reasons.

- a. Turn the Operating Mode keyswitch to "DIAG" (diagnostic) position.
 - b. Depress the **FUNCTION** button to advance the display to Tank Alarm History Report (Code 8). The display will show dashes (- - - - -).
 - c. Depress the **TANK** button to select the desired tank.
 - d. Depress the **PRINT** button. A report showing the dates and times of the last three occurrences of each type of alarm for this tank will be printed.
 - e. Depress the **TANK** button to select other tanks in the system and use the **PRINT** button to request printed reports.
10. To Print Sensor Alarm History Report:



NOTE: The Sensor Alarm History Report is an operational report rather than diagnostic. It is included in the Diagnostic Mode for security reasons.

- a. Turn the Operating Mode keyswitch to "DIAG" (diagnostic) position.
- b. Depress the **FUNCTION** button to advance the display to Sensor Alarm History Report (Code 8A). The display will show dashes (- - - - -).
- c. Depress the **PRINT** button. A report showing the dates and times of the last three occurrences of each type of sensor alarm for all sensors will be printed.



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

E. In-Tank Leak Detect Operating Procedures

Before starting a test, see Section 6.

1. To Start Leak Detect — All Tanks:
 - a. Turn keyswitch to NORMAL position.
 - b. Depress the **FUNCTION** button until the Leak Rate display is showing.
 - c. Depress the **LEAK ALERT RESET** button **twice**. The first time will bring all dashes (-----) to the display, the second will start the Leak Detect Test.

IMPORTANT: Do not start a Leak Detect Test while the station is in operation. Dispensing fuel during a Leak Detect Test will be interpreted as a sudden loss of inventory by the TLS-250i, and its Theft Indication and Automatic Leak Alert will be activated.



NOTE: A manually entered leak detect test will override automatic leak detect start and stop times. A full-system test will run for 13 hours in systems of five or more tanks and 24 hours in systems of four or less tanks, and shut off automatically if no command from the operator is received to terminate the test. After the test, automatic start and stop times will again control the leak detect function.

2. To Start Leak Detect — Single Tank:
 - a. Turn keyswitch to NORMAL position.
 - b. Depress the **FUNCTION** button until the Leak Rate display is showing.
 - c. Depress the **LEAK ALERT RESET** button **once**. Dashes (-----) will appear in the display. No tank number will appear.
 - d. Depress the **TANK** button (the tank number will appear) and advance the tank digit to the desired tank.
 - e. Depress the **LEAK ALERT RESET** button a second time to start the leak detect test.



NOTE: A manually entered leak detect test will override automatic leak detect start and stop times. A single-tank will run for 97 hours and shut off automatically if no command from the operator is received to terminate the test. After the test, automatic start and stop times will again control the leak detect function.

3. To Stop Leak Detect, depress the **FUNCTION** button until the Leak Rate display is showing and depress the **LEAK ALERT RESET** button twice.

F. Alarm Type Recognition

There are two types of alarm indications in a TLS-250i. The first is based on programmed alarm limits sensed by an in-tank inventory and leak test probe. These alarms are indicated by a flashing display and/or annunciators in the display and an alarm report printout (in systems equipped with a printer).

The other is based on alarm conditions detected by an interstitial or piping sump sensor and indicated by an audible alarm, flashing alarm cause LEDs, a flashing "A" or "B" annunciator, a flashing "Leak Detect" display annunciator in the case of liquid alarms, and an alarm report printout (in systems equipped with a printer).

In addition, an external monitoring device wired to the TLS-250i can trigger an External Input Alarm indication.

Any alarm condition can be programmed to activate one or both of the TLS-250i's internal alarm relays to trigger external alarms.

System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection



1. Alarm Indications and Causes

ALARM	INDICATIONS	CAUSE
INVENTORY AND IN-TANK LEAK DETECT PROBE LIMIT ALARMS		
Leak	Flashing display "Leak Detect" annunciator Leak Alarm printout	Cumulative product loss during leak test has exceeded the programmed Leak Limit at the end of any hour in the test period.
Theft	Flashing display Theft Alarm printout	Cumulative product loss during a leak test has exceeded the programmed Theft Limit at any time in the test period
Overfill	Flashing display Overfill Alarm printout	Fuel volume in a tank has exceeded the programmed Overfill Limit during a bulk delivery. This alarm will be triggered only if the inventory increase is sufficient to activate the Automatic Inventory Increase Report feature.
Low Limit	Flashing display "Low Limit" annunciator Low Limit Alarm printout	The volume in a tank has dropped below the programmed Low Level Limit.
Low Limit (Magnetostrictive Probes only)	Flashing display "Low Limit" annunciator "Diag" annunciator Low Limit Alarm printout	The Fuel and Water floats on a Magnetostrictive Probe are less than eight inches apart. Until a sufficient amount of fuel is added to the tank to eliminate this condition, inventory, inventory increase and leak test reports for the affected tank are considered invalid.
High Water	Flashing display "Water" annunciator High Water Alarm printout	Water collected in the bottom of a tank has exceeded the programmed High Water Limit.
LIQUID SENSOR ALARMS		
Liquid Leak	Flashing Fuel Leak LED Flashing Sensor Location LED Flashing "A" or "B" annunciator "Leak Detect" annunciator Audible alarm Fuel Alarm printout	A liquid sensor located in a tank annulus or piping sump has detected the presence of a liquid.
Sensor Out	Flashing Sensor Out LED Flashing Sensor Location LED Flashing "A" or "B" annunciator Audible alarm Sensor Out printout	The system has detected a disconnected or failed sensor in the system.
EXTERNAL INPUT ALARM		
External Input	External Input ON or OFF printout	An external monitoring device wired to the TLS-250 has turned on or off.



G. Alarm Operation and Reset

1. Inventory Probe Alarm Limits.

A flashing display indicates an alarm limit condition. When an alarm limit is reached, the related annunciator on the display starts flashing to indicate the type of alarm. If the system has a printer, a printout will also occur.

a. To find which tank has an alarm limit condition:

1. Depress the **TANK** button to advance the display through the tank numbers until a flashing number is shown. This indicates that this tank has an alarm condition.

b. To identify the event that has triggered the alarm:

1. Depress the **FUNCTION** button to advance the display through the functions.
2. When the entire display shown is flashing, the quantity shown is the amount that has triggered the alarm.

The Overfill and Theft Indicators will not cause a display annunciator to flash.

When the Overfill Limit is exceeded, a printout shows the type of alarm, time and date it occurs. However, when the affected tank is displayed, the tank number will flash. In addition, when the gallons of fuel is displayed, the tank number AND gallons quantity will flash.

When the Theft Indicator is triggered, the display is not affected. A printout will occur showing the type of alarm, the date and time.

To reset the flashing display and alarm relays, turn the mode keyswitch to the ALARM RESET position then back to the NORMAL position.

If the high water or low inventory alarm condition still exists, the display will continue to flash.

2. Leak Sensor Alarms.

Flashing Alarm Cause LEDs and a beeping audible alarm indicate an alarm condition detected by a leak sensor and, if programmed, an input from an external monitoring device such as a line leak detector. For liquid alarm conditions, a "Leak Detect" display annunciator will flash. An "A" or "B" display annunciator will also flash to distinguish between A and B sensors.

a. To reset the beeping audible alarm:

1. Depress the **LEAK ALERT RESET** button. (This will not reset any visual alarm indications.)

b. To reset the alarm relays (if triggered):

1. Turn the Operating Mode keyswitch to the ALARM RESET position and back to NORMAL.

c. To reset the flashing Alarm Cause LEDs and LCD annunciators:

1. Correct the cause of the alarm condition.

IMPORTANT: Do not excavate tanks or take any other remedial action based solely on TLS-250i Leak Alarm indications. The TLS-250i is not a precision leak test device. Call for a "precision" test to confirm a suspected leak!

a. Liquid Leak: Confirm the type of liquid that has caused the alarm. Correct the cause and re-install the sensor. (See the TLS-250i and TLS-250i Plus! "Site Preparation and Installation Instructions," Manual No. 576013-577, for installation procedures.)

b. Sensor Out: Correct the sensor problem or replace the defective sensor (see TLS-250i and TLS-250i Plus! Eight-Tank System "Site Preparation and Installation Instructions," Manual No. 576013-577, for installation procedures).

2. Place the system in Sensor Checkout Mode.
 - a. Set the Operating Mode keyswitch to the "DIAG." (diagnostic) position.
 - b. Depress the **LEAK ALERT RESET** button. The DIAG annunciator in the LCD will begin to flash.
3. Turn the Operating Mode keyswitch to the ALARM RESET position and back to "NORMAL."
4. Exit the Sensor Checkout Mode.
 - a. Set the Operating Mode keyswitch to the "DIAG." position.
 - b. Depress the **LEAK ALERT RESET** button.
 - c. Return the Operating Mode keyswitch to the "NORMAL" position.

When a sensor location is removed from the system or moved to another channel, the Sensor Out LED and Sensor Location LED will flash since the TLS-250i expects to see a sensor on that channel. Only after resetting the Sensor Out condition will the LEDs turn off.

- d. To reset Leak Sensor LEDs after a sensor has been removed from the system or moved to another channel:
 1. Place the system in Sensor Checkout Mode.
 - a. Set the Operating Mode keyswitch to the "DIAG." (diagnostic) position.
 - b. Depress the **LEAK ALERT RESET** button. The DIAG annunciator in the LCD will begin to flash.
 2. Turn the Operating Mode keyswitch to the SETUP position.
 3. Depress the **FUNCTION** button to access function code -A or -B.
 4. Depress the **LEAK ALERT RESET** button.
 5. Return the Operating Mode keyswitch to the "DIAG." position.
 6. Depress the **LEAK ALERT RESET** button to exit the Checkout Mode (the DIAG annunciator in the LCD will stop flashing).
 7. Return the Operating Mode keyswitch to the "NORMAL" position.

H. Changing Printer Paper Roll



NOTE: It is **NOT** necessary to open the printer compartment door to change the paper roll.

TLS-250i uses a 2-1/2 inch thermal paper. To order from Veeder-Root, specify: P/N 576008-424, TLS-250i Printer Paper.

1. Lift paper roll cover and remove empty core.
2. Switch roll shaft to new roll and insert the new roll into the printer.
3. Snap the ends of the roll shaft into the slots.
4. Feed the end of the paper downward into the rollers. Depress the **PAPER FEED** button to advance the paper through the rollers and into the print position.



SECTION 6 — LEAK DETECTION

IMPORTANT

LEAK DETECT TESTS

IMPORTANT! EVEN SMALL LEAKS CAN CAUSE SEVERE ENVIRONMENTAL DAMAGE!

Your leak detection program must be planned to comply with local, state and Federal regulations governing underground storage tanks. All inventory and leak test records provided by the TLS system should be saved as part of a conscientious regulatory compliance program.

The TLS-250i, TLS-250i Metric, TLS-250i Emergency Generator Version and TLS-250i Plus! Eight-Tank Systems, when equipped with Series 7842 0.2 GPH Capacitance probes, are classified as Automatic Tank Gauging Systems and have been third-party tested by Midwest Research Institute. The results of that testing showed that these systems are capable of detecting a 0.20 gallon per hour leak with a 99% probability of detection [P(D)] and a 1% probability of false alarm [P(FA)]. Therefore, these systems meet the Federal performance standards established by the U.S. E.P.A. (0.20 gallons per hour at [P(D)] of 95% and [P(FA)] of 5%) and the Federal performance standard of measuring water in the bottom of a tank to the nearest $\frac{1}{8}$ inch.

The TLS-250i Plus! Eight-Tank System, when equipped with Series 8472 0.1 GPH Capacitance and/or Series 8473 0.1 GPH Magnetostrictive probes, qualifies as a Volumetric Tank Tightness Testing Method and has been third-party tested by Midwest Research Institute. The results of this testing showed that the system was capable of detecting a 0.10 gallon per hour leak with a 99% probability of detection [P(D)] and a 1% probability of false alarm [P(FA)]. Therefore, these systems meet the Federal performance standards established by the U.S. E.P.A. (0.10 gallons per hour at [P(D)] of 95% and [P(FA)] of 5%).

IMPORTANT: Information provided by TLS-250i Systems should be used as part of a conscientious inventory control and regulatory compliance program. If routine inventory reconciliation reveals a loss of product, use the Leak Detect feature to provide a more accurate indication of product loss. Regular leak tests must be conducted in accordance with all local, state and Federal regulations. All inventory reconciliation records and leak test reports should, as required, be saved as documentation of compliance with local, state and Federal UST regulations.

Do not excavate tanks or take other remedial action based solely on TLS-250i Inventory or Leak Test Reports! ALWAYS CONFIRM A SUSPECTED LEAK USING AN ALTERNATIVE TEST METHOD OR INSPECTION TECHNIQUE.

THE TLS-250i WILL FUNCTION ACCURATELY WITH ONLY CERTAIN APPROVED FLUIDS. See Section 4.P. of this manual for the list of approved fluids.

A. Inventory Control

Good inventory control practices are the first line of defense against the problems that can be caused by leaking underground tanks. TLS-250i Systems can, through their inventory reports, provide the required information for stored products to help an operator accurately prepare inventory control records. The American Petroleum Institute publication, "Recommended Practice for Bulk Liquid Stock Control at Retail Outlets," provides guidance to operators of underground tanks on the requirements for maintaining control of inventories.

B. In-Tank Leak Detection

The leak detect function can be started and run during a period when no dispensing from or deliveries to the tank are taking place. The **LEAK ALERT RESET** button on the system console is used to start the test by depressing the button twice. Leak detect tests may also be started and stopped using automatic start and stop times (see Section 4.B.).

Immediately after the leak test is started, the system will print a full inventory report. In addition, the TLS will perform a series of pre-test checks of tank and equipment conditions to be sure they are suitable for a leak test at that time.



NOTE FOR EMERGENCY GENERATOR VERSIONS: At the beginning of a test, an inventory report will be printed. If the generator starts, the TLS stops the leak test, prints and stores in memory a "Generator Start" message with the date and time. When the generator shuts off, a "Generator Stop" message with date and time is printed and stored. Fifteen minutes after generator shuts off, a new inventory report is printed and the leak test is started again. Leak Test Reports are not printed automatically. They must be requested using the front panel buttons or via the RS-232 communications port.

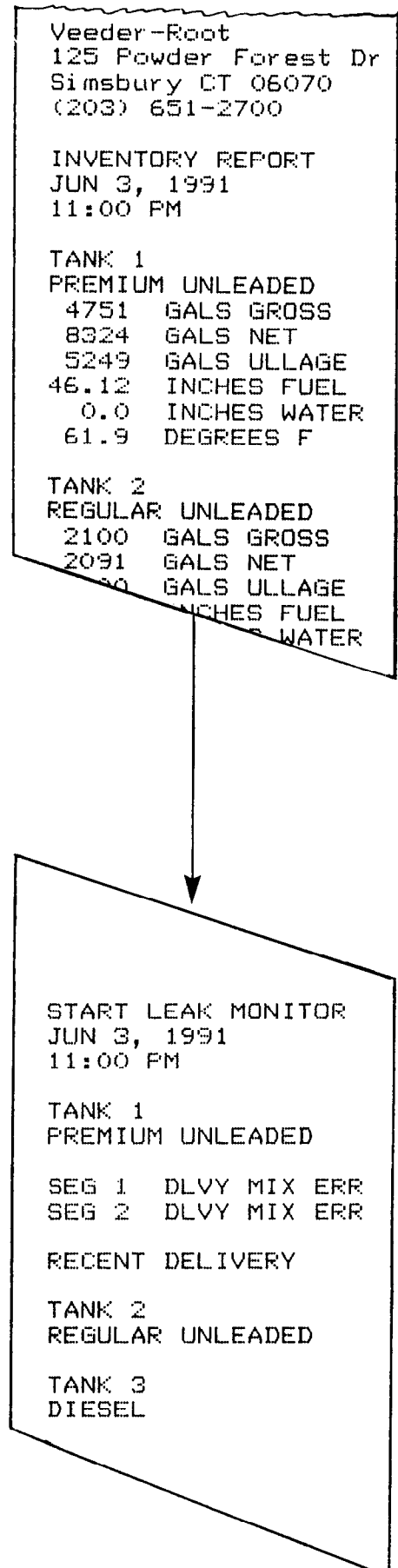
C. Recommended Minimum In-Tank Leak Test Times

To ensure accurate leak test results, the following test length guidelines should be adhered to.

EIGHT-TANK SYSTEM	TEST TYPE	PROBE TYPE	MINIMUM TEST TIME
TLS-250i TLS-250i Metric TLS-250i Em. Gen. Version TLS-250i <i>Plus!</i>	0.2 GPH	0.2 Capacitance	5 Hours
TLS-250i <i>Plus!</i>	0.2 GPH	0.1 Capacitance 0.1 Magnetostrictive	2 Hours
TLS-250i <i>Plus!</i>	0.1 GPH	0.1 Capacitance 0.1 Magnetostrictive	3 Hours

Following the inventory report, the system will print out, tank by tank, the tank number, product label and any pre-test conditions in the tank that may affect test results. These conditions are:

- Probe segments out of range
- Delivery mix errors
- Temperature out of range
- Recent delivery
- Tank level low





System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

During the leak detect test, the TLS again looks for tank and equipment conditions that could invalidate or cause a false FAILURE reading. These conditions are:

- Test mix error
- Segment out of range
- Delivery mix error
- Temperature change error
- Last hour error
- First hour error
- Temperature out of range
- Recent delivery
- Tank level low

At the end of the test, which may be concluded by either depressing the leak detect button twice or by an automatic stop time, the system will produce a report which will indicate one of four conditions for each tank:

PASSED — Volume change (if any) was less than 0.2 gallons per hour.

FAILED — Volume change was greater than ± 0.2 gallons per hour and all test conditions were acceptable.

INVALID — One or more test conditions was outside acceptable parameters and the volume change was greater than ± 0.2 gallons per hour. The tank number, product label and unacceptable conditions(s) will be printed after the leak rate report.

SHORT — Test duration was too short to yield valid test results.

The report will then show, by tank, any conditions that occurred during the test which may have affected the test results.

To print a complete Leak Test Results Report, see Section 7.B.

STOP LEAK MONITOR

JUN 4, 1991
6:00 AM

LEAK MONITOR REPORT

TEST START TIME
JUN 3, 1991
11:00 PM

DURATION = 7 HOURS

TANK	0.20 GAL/HR TEST
1	INVALID
2	PASSED
3	FAILED
4	PASSED



NOTE: If the TLS is used with manifolded tanks, the final leak rates for the manifolded tanks will be reported separately and summed algebraically.



MANIFOLDED TANK RESUL

TANK	GAL/HR
5	0.06
6	-0.05

MANIFOLDED TOTAL 0.01

TANK 1
PREMIUM UNLEADED

SEG 1 TEST MIX ERR
SEG 2 TEST MIX ERR

SEG 1 DLVY MIX ERR
SEG 2 DLVY MIX ERR

TEMP CHANGE ERROR
RECENT DELIVERY

TEST ENDING TIME:
JUN 4, 1991
6:00 AM



D. Interstitial and Piping Sump Leak Sensing

The TLS-250i Leak Sensors monitor the annular space and piping sumps in double-wall tanks for the presence of a liquid. Up to eight sensors may be connected to a single console.

The front panel LEDs and audible alarm will indicate a "Sensor Out" condition if a sensor fails or is disconnected.

When a liquid or Sensor Out condition is detected, an audible alarm and flashing alarm-cause LED indicators are triggered. The flashing LEDs indicate the type of alarm — liquid or Sensor Out — and identify which sensor in the system has detected the condition.

A Sensor Alarm printout will occur (in systems equipped with the optional printer) showing the sensor location, alarm type, and the date and time of the occurrence.

The audible alarm can be reset immediately using the **LEAK ALERT RESET** button. However, the flashing LED Alarm Cause indicators and display annunciators cannot be reset until the alarm condition has been corrected and the Operating mode keyswitch turned to the ALARM RESET position and back to NORMAL.

If a secondary condition exists after the cause of the primary indication has been corrected, the alarm indicators for that condition will be triggered.

1. Alarm Causes.

Two types of alarm causes can be detected by the system.

Liquid Leak — Liquid has been detected by the sensor in the annular space or piping sump. The "Fuel Leak" LED will flash.

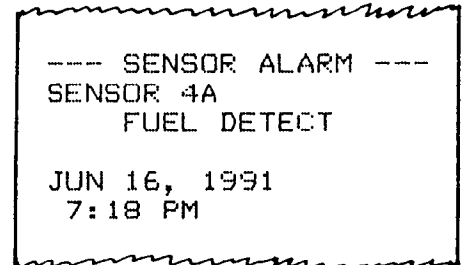
Sensor Out — The system has detected an open sensor circuit indicating a failed or disconnected sensor.

2. Alarm Indicator Rates.

The rate at which the LEDs flash and the audible alarm beeps varies according to the type of alarm. A liquid leak indication will cause the rapid flash and beep. A sensor out indication will be slower.

3. Alarm Indication Priorities.

Alarm indications are prioritized by the TLS-250i according to their degree of severity. If more than one alarm condition is detected by a single sensor, the more serious condition will supersede all others. The order of alarm priority is: 1) Liquid Leak, 2) Sensor Out.





SECTION 7 — SYSTEM REPORTS

A. General

TLS-250i provides printed reports on inventory status and bulk deliveries that can help speed shift changes and aid in detecting inventory losses. The TLS also features reports and indicators that add extra security to your fueling operation.

The following is a brief description of these reports.

B. Report Descriptions

1. Inventory Status Report.

The Inventory Status Report can be printed by depressing the **PRINT** button while the system is in the **NORMAL** mode and the LCD is showing time, fuel height, gallons of water or temperature. The printout provides complete information on all tanks and includes station header, date and time, tank number and product, gallons of fuel, ullage, inches of fuel, inches of water, and temperature of fuel.

This report may also be printed automatically, three times a day, using the programmable Auto-Print Time feature.

Veeder-Root
125 Powder Forest Dr
Simsbury CT 06070
(203) 651-2700

INVENTORY REPORT
JUN 3, 1991
11:00 PM

TANK 1
PREMIUM UNLEADED
4751 GALS GROSS
8324 GALS NET
5249 GALS ULLAGE
46.12 INCHES FUEL
0.0 INCHES WATER
61.9 DEGREES F

TANK 2
REGULAR UNLEADED
2100 GALS GROSS
2091 GALS NET
7900 GALS ULLAGE
25.25 INCHES FUEL
0.0 INCHES WATER
66.1 DEGREES F

2. Sensor Status Report.

The Sensor Status Report can be printed while the system is in the **NORMAL** mode by depressing the **FUNCTION** button until the "A" annunciator appears in the display then depressing the **PRINT** button. The report will show the status of each sensor in the system and the external input.

SENSOR STATUS

SENSOR 2A NORMAL
SENSOR 4A FUEL
SENSOR 6A NORMAL
SENSOR 8A NORMAL

EXTERNAL INP. STATUS
OPEN

3. Automatic Inventory Increase Report.

The Automatic Inventory Increase Report is printed within one minute (unless an Inventory Increase Delay Time has been entered — see Section 4.J.) of the completion of a bulk delivery to a tank. Information shown on the report is: station header; tank number and product label; starting and ending dates; times, volumes and temperatures; and net inventory increase.

IMPORTANT: The Automatic Inventory Increase feature measures beginning and ending volumes to calculate net volume increase. **IT DOES NOT COMPENSATE FOR FUEL DISPENSED DURING EITHER THE BULK DELIVERY OR THE INVENTORY INCREASE DELAY TIME.**

The last Inventory Increase Report can be reprinted by depressing the **PRINT** button while the system is in the **NORMAL** mode and the Delivery Volume **FUNCTION** is selected.

TANK 1
PREMIUM UNLEADED
INVENTORY INCREASE

JUN 18, 1991
3:38 PM
709 GALLONS FUEL
56.7 DEGREES F

JUN 18, 1991
3:59 PM
5685 GALLONS FUEL
60.4 DEGREES F

4976 NET INCREASE

**System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus!
Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection**



4. Indicator Reports.

The TLS-250i system has programmable indicator limits that can warn of sudden losses due to theft, a potential overfill during bulk delivery, low fuel inventory, and a high water condition in a tank. In addition, its leak sensors will detect a fuel leak, water leak or sensor out condition.

When an indicator limit is exceeded or a leak sensor alarm is triggered, an automatic printout occurs showing the type of indicator or alarm, date and time.

- a. Theft Indicator detects a rapid drop in inventory during the shutdown mode.
- b. Leak Indicator provides an automatic alert during a leak test if the cumulative volume loss exceeds the preprogrammed Leak Alarm Limit.
- c. Overfill Indicator warns of a potential overspill during bulk delivery by a tank truck.
- d. Low Limit Indicator warns when inventory drops below preset low limit amounts.
- e. High Water Indicator warns when water level exceeds a preset limit.
- f. External Input On warns that an external device, such as a line leak detector, has alarmed.
- g. External Input Off warns that an external device, such as a line leak detector, has returned to its normal state.

----THEFT ALARM-----
TANK 1
PREMIUM UNLEADED

JUN 20, 1991
3:36 AM

--- LEAK ALARM ---
TANK 3
DIESEL

JUN 4, 1991
2:00 AM

--OVERFILL ALARM--
TANK 2
REGULAR UNLEADED

JUN 21, 1991
5:38 PM

--LOW LIMIT ALARM--
TANK 2
REGULAR UNLEADED

JUN 21, 1991
9:14 AM

--HIGH WATER ALARM--
TANK 6
PREMIUM UNLEADED

JUN 25, 1991
11:34 AM

-- EXT. INPUT ON ---

JUN 17, 1991
9:09 PM

-- EXT. INPUT OFF ---

JUN 17, 1991
9:09 PM



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

- h. Sensor Alarm shows the sensor number and type of alarm condition.

```
--- SENSOR ALARM ---  
SENSOR 4A  
FUEL DETECT
```

```
JUN 16, 1991  
7:18 PM
```

5. Tank Alarm History Report.

The Tank Alarm History Report is an operational report that includes the last three occurrences of each type of indicator for each tank. The report shows the date and time of each occurrence for each tank.

The Tank Alarm History Report is included in the Diagnostic mode for security reasons.



NOTE FOR EMERGENCY GENERATOR VERSION: The Alarm History Report will show "Generator ON" and "Generator OFF" in place of "External Input ON" and "External Input OFF".



```
ALARM HISTORY REPORT  
-- EXT. INPUT ON --
```

```
JUN 17, 1991  
9:09 PM
```

```
JUN 9, 1991  
4:25 PM
```

```
JUN 6, 1991  
10:25 AM
```

```
-- EXT. INPUT OFF --
```

```
JUN 17, 1991  
9:09 PM
```

```
JUN 9, 1991  
4:25 PM
```

```
JUN 6, 1991  
10:25 AM
```

```
----- LEAK -----
```

```
JUN 4, 1991  
2:00 AM
```

```
JUN 1, 1991  
3:00 AM
```

```
---- HIGH WATER ----
```

```
JUN 25, 1991  
11:34 AM
```

```
-----OVERFILL -----
```

```
JUN 21, 1991  
5:38 PM
```

```
---- LOW LIMIT ----
```

```
JUN 21, 1991  
9:14 AM
```

```
----- THEFT -----
```

```
JUN 20, 1991  
3:36 AM
```

6. Sensor Alarm History Report.

The Sensor Alarm History Report includes the dates and times of the last three occurrences of each type of sensor alarm for all sensors in the system.

The Sensor Alarm History Report is included in the Diagnostic Mode for security reasons.



```
ALARM HISTORY REPORT  
.....
```

```
SENSOR CHANNEL 4  
.....
```

```
----- SENSOR -----
```

```
SENSOR 4A  
FUEL DETECT  
JUN 16, 1991  
7:18 PM
```

```
SENSOR 4A  
OPEN SENSOR  
MAY 30, 1991  
11:47 AM
```

System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection



7. Leak Monitor Report.

The Leak Monitor Report is printed by depressing the **PRINT** button while the system is in the **NORMAL** mode. **FUNCTION** must first be set to Leak Rate.

SEE SECTION 6 — "LEAK DETECTION" FOR COMPLETE INFORMATION ON LEAK DETECT REPORTS.



NOTE FOR EMERGENCY GENERATOR VERSION: As its normal mode of operation the Leak Monitor Report Automatic Printout is disabled. It can be enabled by programming the Leak Report Enable Setup function. If this Setup Option is programmed, the results of the last leak test will be shown.



NOTE: If the TLS is used with manifolded tanks, the final leak rates for the manifolded tanks will be reported separately and summed algebraically.



MANIFOLDED TANK RESULTS:

TANK	GAL/HR
5	0.06
6	-0.05

MANIFOLDED TOTAL 0.01

TANK 1
PREMIUM UNLEADED

SEG 1 TEST MIX ERR
SEG 2 TEST MIX ERR

SEG 1 DLVY MIX ERR
SEG 2 DLVY MIX ERR

TEMP CHANGE ERROR
RECENT DELIVERY

TEST ENDING TIME:
JUN 4, 1991
6:00 AM

STOP LEAK MONITOR

JUN 4, 1991
6:00 AM

LEAK MONITOR REPORT

TEST START TIME
JUN 3, 1991
11:00 PM

TEST HOURS 1 - 6

TNK1 TNK2 TNK3 TNK4

DEGREES F
61.9 66.1 55.9 55.4

GALLONS

0.0	0.0	-0.3	0.0
0.3	0.0	-2.1	0.1
0.7	0.0	-4.0	0.1
1.2	0.1	-5.6	0.0
1.5	0.0	-7.1	0.0
1.8	0.0	-9.3	0.1

DEGREES F
57.0 65.9 55.6 55.3

TEST HOURS 1 - 6

TNK 5 TNK 6

DEGREES F
57.2 56.4

GALLONS

0.0	0.0
0.2	-0.1
0.2	-0.1
0.1	0.0
0.3	-0.1
0.4	-0.3

DEGREES F
57.2 56.4

FINAL LEAK RATES:

TANK	GAL/HR	0.20 GAL/HR TEST
1	0.30	INVALID
2	0.00	PASSED
3	-1.55	FAILED
4	0.01	PASSED



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

8. System Setup Parameters Report.

There are two reports showing setup parameters not related to individual tanks.

- a. The first report shows all system setup parameters **except** auto-transmit parameters. To print this report:
 1. Turn Operating Mode keyswitch to **SETUP** position.
 2. Using the **FUNCTION** button, select the function code for any system setup parameter shown on the report.
 3. Depress the **PRINT** button. All setup parameters shown on the report will be printed.

CALENDAR CLOCK:

JUL 4, 1991

8:31 PM

LEAK DETECT START:

11:00 PM

LEAK DETECT STOP:

6:00 AM

AUTO PRINT 1:

8:00 AM

AUTO PRINT 2:

4:00 PM

AUTO PRINT 3:

12:00 AM

SECURITY CODE:

000000

RELAY CONFIGURATION:

	RLY 1	RLY 2
LEAK ALM	YES	YES
HI WATER	NO	NO
OVERFILL	NO	YES
LO LIMIT	NO	NO
THEFT ALM	YES	NO
EXT. INPUT	NO	NO
SEN FUEL	YES	YES
SEN OUT	NO	YES

EXTERNAL INPUT ALARM
DISABLED

SENSOR CONFIGURATION

SENSOR 2A
SENSOR 4A
SENSOR 6A
SENSOR 8A

b. The second report shows auto-transmit parameters. To print this report:

1. Turn the Operating Mode keyswitch to SETUP position.
2. Using the **FUNCTION** button, select the function code for any auto-transmit parameter.
3. Depress the **PRINT** button. All auto-transmit setup parameters will be printed.

AUTO-TRANSMIT PARAMS:

MESSAGE	TXM	RPT
\$LEAK###	DIS	DIS
\$WATR###	DIS	DIS
\$OVFL###	DIS	DIS
\$LOLV###	DIS	DIS
\$THFT###	DIS	DIS
\$DLST###	DIS	DIS
\$DLND###	DIS	DIS
\$EXTNON\$	DIS	DIS
\$EXTOFF\$	DIS	DIS
\$FUEL###	DIS	DIS
\$OUT ###	DIS	DIS
\$RESEVD\$	DIS	DIS
\$RESEVD\$	DIS	DIS
\$RESEVD\$	DIS	DIS

AUTO-REPEAT TIME:
60 MINUTES

TRANSMIT DELAY TIME:
5 SECONDS

9. Sensor Setup Parameters Report.

The Sensor Setup Parameters Report reveals the status of the water audible alarm and water alarm delay time for each sensor in the system.

- a. Turn the Operating Mode keyswitch to SETUP position.
- b. Using the **FUNCTION** button, select function code -A.
- c. Depress the **PRINT** button. The sensor setup parameters for all sensors in the system will be printed.

SENSOR SETUP PARAMS:

WATER AUDIBLE ALARM:
SENSOR 1A DISABLED

WATER ALM DELAY TIME
SENSOR 1A 0.5 HRS



System Start-Up and Operating Instructions TLS-250i and TLS-250i Plus! Inventory Monitor and Interstitial Leak Sensor With In-Tank Leak Detection

10. Tank Setup Parameters Report.

Tank Setup Parameters Report includes all setup information related to specific tanks. The report is printed by tank and includes: Product Label and Product Code; High Water Limit; Overfill Limit; Low Volume Limit; Theft Limit; Thermal Coefficient; Delivery Report Delay Time; Tank Capacities; Tank Diameter; Tank Tilt Adder; and Manifolded Tank Configuration.

To print the Tank Setup Parameters report:

- Turn Operating Mode keyswitch to **SETUP** position.
- Depress the **FUNCTION** button to select any tank setup parameter function code.
- Depress the **TANK** button to select the desired tank.
- Depress the **PRINT** button. All setup information for that tank will be printed.

```
TANK 1
PREMIUM UNLEADED
PRODUCT CODE 1

HIGH WATER LIMIT:
  4.0 INCHES WATER

OVERFILL LIMIT:
  9500 GALLONS FUEL

LOW LIMIT:
  1000 GALLONS FUEL

THEFT LIMIT:
  -99 GALLONS FUEL

LEAK LIMIT:
  -25 GALLONS FUEL

THERMAL COEFF:
-0.00069 GL/GL/DEG F

DELIVERY REPORT DLY:
  1 MINUTES

TANK CAPACITY
10000 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL

3/4 HEIGHT CAPACITY
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL

1/2 HEIGHT CAPACITY
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL

1/4 HEIGHT CAPACITY
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL
  0 GALLONS FUEL

TANK DIAMETER:
  96.00 INCHES

TANK TILT ADDER:
  0.00 INCHES

MANIFOLDED TANKS:
  NONE
```

SECTION 8 — WARRANTY CONDITIONS AND LIMITATIONS OF LIABILITY

A. LIMITATIONS OF LIABILITY. We warrant that this product will 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 warranty period, we or our representative 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.

We shall not be responsible for any 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 in writing at our Simsbury office 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 1 are our sole obligation and exclude all other remedies or warranties, express or implied, in-

cluding 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 agreements 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 U.S. E.P.A. Standard Evaluation — Volumetric Tank Tightness Method and Automatic Tank Gauging System.

Results of U.S. EPA Standard Evaluation Volumetric Tank Tightness Testing Method

This form tells whether the tank tightness testing method described below complies with the performance requirements of the federal underground storage tank regulation. 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: Volumetric Tank Tightness Testing Methods." The full evaluation report also includes a form describing the method and a form summarizing the test data.

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 make sure this form satisfies their requirements.

Method Description

Name TLS-250/TLS-250i/TLS-350 UST Monitoring Systems

Version 8472 Digital Sensing Probe (Capacitance)

Vendor Veeder-Root

125 Powder Forest Drive P.O. Box 2003

(street address)

Simsbury

CT

06070-2003

(203) 651-2700

(city)

(state)

(zip)

(phone)

Evaluation Results

This method, which declares a tank to be leaking when the measured leak rate exceeds the threshold of 0.071 gallon per hour, has a probability of false alarms [P(FA)] of < 0.10 %.

The corresponding probability of detection [P(D)] of a 0.10 gallon per hour leak is 99 %.

Therefore, this method ☒ does ☐ does not meet the federal performance standards established by the U.S. Environmental Protection Agency (0.10 gallon per hour at P(D) of 95% and P(FA) of 5%).

Test Conditions During Evaluation

The evaluation testing was conducted in a 10,000 gallon ☒ steel ☐ fiberglass tank that was 96 inches in diameter and 324 inches long.

The tests were conducted with the tank 95 percent full.

The temperature difference between product added to fill the tank and product already in the tank ranged from -11.39 °F to 7.07 °F, with a standard deviation of 5.71 °F.

The product used in the evaluation was diesel.

Limitations on the Results

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for using the method are followed.
- The tank is no larger than 15,000 gallons.
- The tank contains a product identified on the method description form.
- The tank is at least 95 * percent full. Associated testing (at MRI) of the system as an ATG demonstrated that the method is valid when the tank is 50-95% full.
- The waiting time after adding any substantial amount of product to the tank is at least 8.25 hours.
- The temperature of the added product does not differ more than 8.57 degrees Fahrenheit from that already in the tank.
- The waiting time between the end of "topping off," if any, and the start of the test data collection is at least NA hours.
- The total data collection time for the test is at least 2 hours.
- Large vapor pockets are identified and removed (for methods that overfill the tank).
- This method ☒ can ☐ cannot be used if the ground-water level is above the bottom of the tank.
- Other limitations specified by the vendor or determined during testing:

This system operates in conjunction with an ATG system. If the groundwater level is above the bottom of the tank, a non-tight tank is detected by means of continuous monitoring of the water level in the bottom of the tank by an ATG System.

> **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 volumetric tank tightness testing method was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the standard EPA test procedure for volumetric tank tightness testing methods and that the results presented above are those obtained during the evaluation.

Dr. J.D. Flora, Jr./Mr. G. Joe Hennon
(printed name)

J. D. Flora, Jr. G. Joe Hennon
(signature)

April 25, 1991
(date)

MIDWEST RESEARCH INSTITUTE
(organization performing evaluation)

Kansas City, MO 64110
(city, state, zip)

(816) 753-7600
(phone number)

Results of U.S. EPA Standard Evaluation

Volumetric Tank Tightness Testing Method

This form tells whether the tank tightness testing method described below complies with the performance requirements of the federal underground storage tank regulation. 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: Volumetric Tank Tightness Testing Methods." The full evaluation report also includes a form describing the method and a form summarizing the test data.

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 make sure this form satisfies their requirements.

Method Description

Name TLS-250/TLS-250i/TLS350 UST Monitoring Systems

Version 8473 Digital Sensing Probe (Magnetostrictive)

Vendor Veeder Root

125 Powder Forest Drive P.O. Box 2003

(street address)

Simsbury

CT

06070-2003

(203) 651-2700

(city)

(state)

(zip)

(phone)

Evaluation Results

This method, which declares a tank to be leaking when the measured leak rate exceeds the threshold of 0.069 gallon per hour, has a probability of false alarms [P(FA)] of 1.0 %.

The corresponding probability of detection [P(D)] of a 0.10 gallon per hour leak is 99 %.

Therefore, this method ☒ does ☐ does not meet the federal performance standards established by the U.S. Environmental Protection Agency (0.10 gallon per hour at P(D) of 95% and P(FA) of 5%).

Test Conditions During Evaluation

The evaluation testing was conducted in a 10,000 gallon ☒ steel ☐ fiberglass tank that was 96 inches in diameter and 324 inches long.

The tests were conducted with the tank 95 percent full.

The temperature difference between product added to fill the tank and product already in the tank ranged from -11.39 °F to 7.07 °F, with a standard deviation of 5.71 °F.

The product used in the evaluation was diesel.

Limitations on the Results

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for using the method are followed.
- The tank is no larger than 15,000 gallons.
- The tank contains a product identified on the method description form.
- The tank is at least 95* percent full. Associated testing (at MRI) of the system as an ATG demonstrated that the method is valid when the tank is 50-95% full.
- The waiting time after adding any substantial amount of product to the tank is at least 8.25 hours.
- The temperature of the added product does not differ more than 8.57 degrees Fahrenheit from that already in the tank.
- The waiting time between the end of "topping off," if any, and the start of the test data collection is at least NA hours.
- The total data collection time for the test is at least 3 hours.
- Large vapor pockets are identified and removed (for methods that overfill the tank).
- This method ☒ can ☐ cannot be used if the ground-water level is above the bottom of the tank. See other limitations below.*
- Other limitations specified by the vendor or determined during testing:

*This system operates in conjunction with an ATG system. If the groundwater level is above the bottom of the tank, a non-tight tank is detected by means of continuous monitoring of the water level in the bottom of the tank by an ATG System.

> **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 volumetric tank tightness testing method was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the standard EPA test procedure for volumetric tank tightness testing methods and that the results presented above are those obtained during the evaluation.

Dr. J.D. Flora, Jr./Mr. G. Joe Hennon
(printed name)

J.D. Flora, Jr. G. Joe Hennon
(signature)

April 26, 1991
(date)

MIDWEST RESEARCH INSTITUTE
(organization performing evaluation)

Kansas City, Missouri 64110
(city, state, zip)

(816) 753-7600
(phone number)

Results of U.S. EPA Standard Evaluation Automatic Tank Gauging System (ATGS)

This form tells whether the automatic tank gauging system (ATGS) described below complies with the performance requirements of the federal underground storage tank regulation. 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: Automatic Tank Gauging Systems." The full evaluation report also includes a form describing the method and a form summarizing the test data.

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 make sure this form satisfies their requirements.

ATGS Description

Name TLS - 250/TLS - 250i/TLS - 350 UST Monitoring Systems
Version number 7842 Digital Sensing Probe (Capacitance)
Vendor Veeder-Root
125 Powder Forest Drive, P.O. Box 2003
(street address)
Simsbury CT 06070-2003 (203) 651-2700
(city) (state) (zip) (phone)

Evaluation Results

This ATGS, which declares a tank to be leaking when the measured leak rate exceeds the threshold of 0.10 gallon per hour, has a probability of false alarms [P(FA)] of 1 %.

The corresponding probability of detection [P(D)] of a 0.20 gallon per hour leak is 99 %.

The minimum water level (threshold) in the tank that the ATGS can detect is 1.40 inches.

The minimum change in water level that can be detected by the ATGS is 0.040 inches (provided that the water level is above the threshold).

Therefore, this ATGS ☒ does ☐ does not meet the federal performance standards established by the U.S. Environmental Protection Agency (0.20 gallon per hour at P(D) of 95% and P(FA) of 5%), and this ATGS ☒ does ☐ does not meet the federal performance standard of measuring water in the bottom of the tank to the nearest 1/8 inch.

Test Conditions During Evaluation

The evaluation testing was conducted in a 10,000 gallon ☒ steel ☐ fiberglass tank that was 96 inches in diameter and 324 inches long.

The temperature difference between product added to fill the tank and product already in the tank ranged from -8.4 °F to 6.1 °F, with a standard deviation of 5.6 °F.

The tests were conducted with the tank product levels 50 and 95 % full.

The product used in the evaluation was diesel.

Version 7842 Digital Sensing Probe (Capacitance)

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for installing and operating the ATGS are followed.
- The tank contains a product identified on the method description form.
- The tank is no larger than 15,000 gallons.
- The tank is at least 50 percent full.
- The waiting time after adding any substantial amount of product to the tank is 8.3 hours.
- The temperature of the added product does not differ more than 8.4 degrees Fahrenheit from that already in the tank.
- The total data collection time for the test is at least 5 hours.
- Other limitations specified by the vendor or determined during testing:

Certification of Results

☒ standard EPA test procedure for ATGS
☐ alternative EPA test procedure for ATGS

De Zennon J. D. Flaro, Jr.
(signature)

(816) 753-7600
(phone number)

Results of U.S. EPA Standard Evaluation Automatic Tank Gauging System (ATGS)

This form tells whether the automatic tank gauging system (ATGS) described below complies with the performance requirements of the federal underground storage tank regulation. 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: Automatic Tank Gauging Systems." The full evaluation report also includes a form describing the method and a form summarizing the test data.

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 make sure this form satisfies their requirements.

ATGS Description

Name TLS-250/TLS-250i/TLS-350 UST Monitoring Systems
Version number 8472 Digital Sensing Probe (Capacitance)
Vendor Veeder-Root
125 Powder Forest Drive, P.O. Box 2003
(street address)
Simsbury CT 06070-2003 (203) 651-2700
(city) (state) (zip) (phone)

Evaluation Results

This ATGS, which declares a tank to be leaking when the measured leak rate exceeds the threshold of 0.126 gallon per hour, has a probability of false alarms [P(FA)] of 0.2 %.

The corresponding probability of detection [P(D)] of a 0.20 gallon per hour leak is 99 %.

The minimum water level (threshold) in the tank that the ATGS can detect is 1.52 inches.

The minimum change in water level that can be detected by the ATGS is 0.027 inches (provided that the water level is above the threshold).

Therefore, this ATGS ☒ does ☐ does not meet the federal performance standards established by the U.S. Environmental Protection Agency (0.20 gallon per hour at P(D) of 95% and P(FA) of 5%), and this ATGS ☒ does ☐ does not meet the federal performance standard of measuring water in the bottom of the tank to the nearest 1/8 inch.

Test Conditions During Evaluation

The evaluation testing was conducted in a 10,000 gallon ☒ steel ☐ fiberglass tank that was 96 inches in diameter and 324 inches long.

The temperature difference between product added to fill the tank and product already in the tank ranged from -8.4 °F to 6.1 °F, with a standard deviation of 5.6 °F.

The tests were conducted with the tank product levels 50 and 95 % full.

The product used in the evaluation was diesel.

Name of ATGS TLS-250/TLS250i/TLS350 UST Monitoring Systems
Version 8472 Digital Sensing Probe (Capacitance)

Limitations on the Results

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for installing and operating the ATGS are followed.
- The tank contains a product identified on the method description form.
- The tank is no larger than 15,000 gallons.
- The tank is at least 50 percent full.
- The waiting time after adding any substantial amount of product to the tank is 8.3 hours.
- The temperature of the added product does not differ more than 8.4 degrees Fahrenheit from that already in the tank.
- The total data collection time for the test is at least 2 hours.
- Other limitations specified by the vendor or determined during testing:

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

Certification of Results

I certify that the ATGS was installed and operated according to the vendor's instructions and that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed according to one of the following:

- ☒ standard EPA test procedure for ATGS
☐ alternative EPA test procedure for ATGS

G. Joe Hennon/J.D. Flora, Jr.
(printed name)

Midwest Research Institute
(organization performing evaluation)

Kansas City, Missouri 64110
(city, state, zip)

1/18/91
(date)

(816) 753-7600
(phone number)

Results of U.S. EPA Standard Evaluation Automatic Tank Gauging System (ATGS)

This form tells whether the automatic tank gauging system (ATGS) described below complies with the performance requirements of the federal underground storage tank regulation. 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: Automatic Tank Gauging Systems." The full evaluation report also includes a form describing the method and a form summarizing the test data.

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 make sure this form satisfies their requirements.

ATGS Description

Name TLS-250/TLS-250i/TLS-350 UST Monitoring Systems
Version number 8473 Digital Sensing Probe (Magnetostrictive)
Vendor Veeder-Root
125 Powder Forest Drive, P.O. Box 2003
(street address)
Simsbury, CT 06070-2003 (203) 651-2700
(city) (state) (zip) (phone)

Evaluation Results

This ATGS, which declares a tank to be leaking when the measured leak rate exceeds the threshold of 0.093 gallon per hour, has a probability of false alarms [P(FA)] of < 0.1 %.

The corresponding probability of detection [P(D)] of a 0.20 gallon per hour leak is 99 %.

The minimum water level (threshold) in the tank that the ATGS can detect is 1.32 inches.

The minimum change in water level that can be detected by the ATGS is 0.024 inches (provided that the water level is above the threshold).

Therefore, this ATGS ☒ does ☐ does not meet the federal performance standards established by the U.S. Environmental Protection Agency (0.20 gallon per hour at P(D) of 95% and P(FA) of 5%), and this ATGS ☒ does ☐ does not meet the federal performance standard of measuring water in the bottom of the tank to the nearest 1/8 inch.

Test Conditions During Evaluation

The evaluation testing was conducted in a 10,000 gallon ☒ steel ☐ fiberglass tank that was 96 inches in diameter and 324 inches long.

The temperature difference between product added to fill the tank and product already in the tank ranged from -8.4 °F to 6.1 °F, with a standard deviation of 5.6 °F.

The tests were conducted with the tank product levels 50 and 95 % full.

The product used in the evaluation was diesel.

Name of ATGS TLS-250/TLS250i/TLS-350 UST Monitoring Systems
Version 8473 Digital Sensing Probe (Magnetostrictive)

Limitations on the Results

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for installing and operating the ATGS are followed.
- The tank contains a product identified on the method description form.
- The tank is no larger than 15,000 gallons.
- The tank is at least 50 percent full.
- The waiting time after adding any substantial amount of product to the tank is 8.3 hours.
- The temperature of the added product does not differ more than 8.4 degrees Fahrenheit from that already in the tank.
- The total data collection time for the test is at least 2 hours.
- Other limitations specified by the vendor or determined during testing:

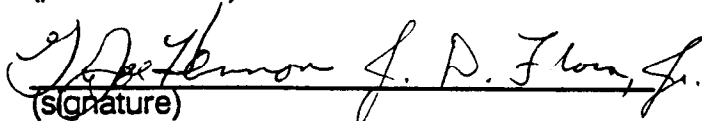
> **Safety disclaimer:** This test procedure only addresses the issue of the ATG system's ability to detect leaks. It does not test the equipment for safety hazards.

Certification of Results

I certify that the ATGS was installed and operated according to the vendor's instructions and that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed according to one of the following:

- ☒ standard EPA test procedure for ATGS
☐ alternative EPA test procedure for ATGS

G. Joe Hennon/J.D. Flora, Jr.
(printed name)


(signature)

1/18/91
(date)

Midwest Research Institute
(organization performing evaluation)

Kansas City, Missouri 64110
(city, state, zip)

(816) 753-7600
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125 Powder Forest Drive, Post Office Box 2003, Simsbury, CT 06070-2003 TEL: (800) 873-3313, FAX: (800) 234-5350

AUSTRALIA: Cheltenham, Victoria • BRAZIL: Sao Paulo • CANADA: Etobicoke • FRANCE: Rungis • SCOTLAND: Dundee • WEST GERMANY: Neuhausen/Filder