

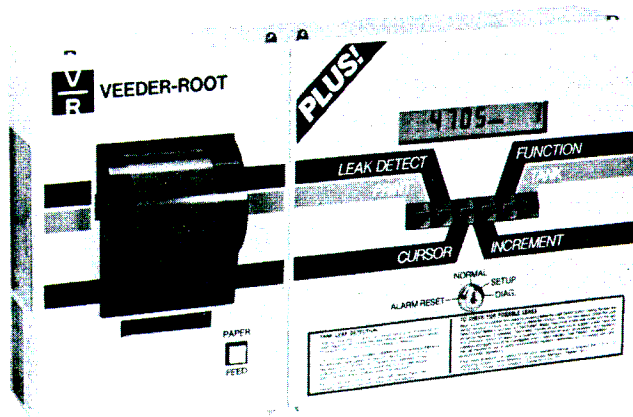
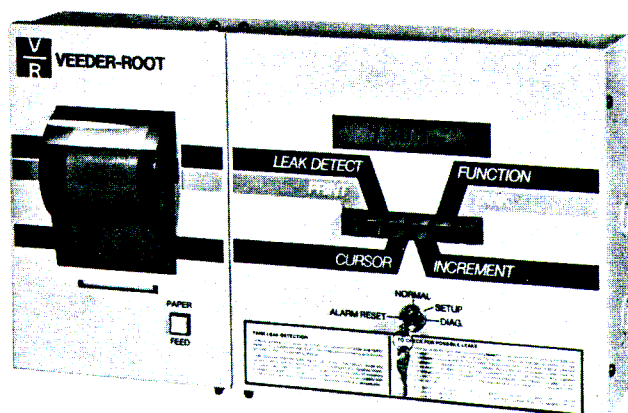


VEEDER-ROOT
SYSTEM START-UP AND
OPERATING INSTRUCTIONS

Technical Manual
14-202
Issued: 6/91
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TLS-250 AND TLS-250 *PLUS!* TANK LEVEL SENSING SYSTEM

MANUAL NUMBER 576013-692



OPERATING MANUAL

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

TLS-250:	P/N 784190-102 (without printer) P/N 784190-122 (with printer)
TLS-250 Emergency Generator Version:	P/N 784190-302 (without printer) P/N 784190-322 (with printer)
TLS-250 Metric Version:	P/N 784170-202 (without printer) P/N 784170-222 (with printer)
TLS-250 <i>Plus!</i>	P/N 784194-102 (without printer) P/N 784194-122 (with printer)



TLS-250 and TLS-250 *Plus!* Statement of Compliance with Federal Performance Standards Established by the U.S. E.P.A.

The TLS-250, TLS-250 Metric, TLS-250 Emergency Generator Version and TLS-250 *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 $\frac{1}{8}$ inch.

The TLS-250 *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.

ATTENTION

READ THIS IMPORTANT SAFETY INFORMATION BEFORE STARTING UP OR OPERATING A TLS-250 OR TLS-250 *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 separated 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 7).



WARNINGS:

EXPLOSION COULD OCCUR IF OTHER WIRES SHARE TLS-250 PROBE WIRE CONDUITS OR WIRING TROUGHS. CONDUITS AND WIRING TROUGHS FROM PROBES 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-TO-MONITOR WIRE RUNS EXCEED 1,000 FEET. RUNS OVER 1,000 FEET ARE NOT UL APPROVED FOR THIS APPLICATION. PROBE-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) 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 AND ON THE WARNING LABEL AFFIXED TO THE FRONT PANEL OF THE SYSTEM MONITOR. 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 AND CONSOLE BARRIER FORM AN INTRINSICALLY SAFE, ENERGY-LIMITED SYSTEM. THIS SYSTEM MAKES THE TLS PROBE INTRINSICALLY SAFE FOR USE IN A CLASS I, GROUP D HAZARDOUS LOCATION. THE TLS-250 PROBE WIRING IS INTRINSICALLY SAFE ONLY WHEN CONNECTED TO VEEDER-ROOT'S MONITOR FORM NUMBER 7841.

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 "SITE PREPARATION AND INSTALLATION INSTRUCTIONS," MANUAL NO. 576013-553; THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.



Systems Start-Up and Operating Instructions

TLS-250 and TLS-250 Plus! Tank Level Sensing System

INTRODUCTION

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

U.S. versions of the TLS-250 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-250, TLS-250 Metric, TLS-250 Emergency Generator Version and TLS-250 Plus! 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 1/8 inch.

The TLS-250 Plus! 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%).

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Note: Vertical bars ■ adjacent to text indicate information added or changed during issue date on the front cover.



SECTION 1 — PREPARATION CHECKLIST

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

MANDATORY

- ☐ Epoxy sealant kit (one per probe, furnished with each probe).
- ☐ Warranty Registration and Checkout Form.
- ☐ TLS-250 and TLS-250 Plus! Site Preparation and Installation Instructions, Manual No. 576013-553.
- ☐ 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 Start Time: _____ (AM/PM)

Leak Detect Stop Time: _____ (AM/PM)

Leak Report Type (Plus! Systems Only) 0.2 or 0.1 GPH.

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

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

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

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 3.P.)								
Manifolded Tank Configuration (Tank)								

*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-250 and TLS-250 Plus! "Site Preparation and Installation Instruction." See Section 3.N for Tilt instructions.

**Fuel Coefficients are set automatically when Product Label Codes are used. (See Section 3.P.)

- ☐ Security Code _____ (up to six digits)

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 wires are contained in a separate, dedicated rigid conduit.



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

See Section 2.C. of the TLS-250 and TLS-250 *Plus!* "Site Preparation and Installation Instructions," Manual No. 576013-553.

2. Check to be sure probe-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-TO-MONITOR WIRE RUNS EXCEED 1,000 FEET. RUNS OVER 1,000 FEET ARE NOT UL APPROVED FOR THIS APPLICATION. PROBE-TO-MONITOR WIRE MUST NOT EXCEED 1,000 FEET.

See Section 2.C. of the TLS-250 and TLS-250 *Plus!* "Site Preparation and Installation Instructions," Manual No. 576013-553.

3. 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 Figure 3 of the TLS-250 and TLS-250 *Plus!* "Site Preparation and Installation Instructions," Manual No. 576013-553.

4. 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.

5. Verify that a #12 AWG (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 Figure 4, "TLS-250 and TLS-250 *Plus!* Wiring Installation Diagram," in the TLS-250 and TLS-250 *Plus!* "Site Preparation and Installation Instructions," Manual No. 576013-553.)

SEE SECTION 3.D.1 OF THE "SITE PREPARATION AND INSTALLATION INSTRUCTIONS," MANUAL NO. 576013-553.

6. Verify that the power supply terminals are correctly wired. (See Figure 4, "TLS-250 and TLS-250 *Plus!* Wiring Installation Diagram," in the TLS-250 and TLS-250 *Plus!* "Site Preparation and Installation Instructions," Manual No. 576013-553.)

7. Verify that system power is properly wired to a separate, dedicated breaker.

8. Locate the intrinsically-safe barrier cover inside the monitor cabinet, remove the two screws and open the cover.

9. Verify that all probe connections have been made properly using color-coded wires and that the proper color-code designations have been maintained throughout the probe-to-monitor wiring hook-ups.

10. If any discrepancies are found in the wiring or installation, refer to the TLS-250 and TLS-250 Plus! "Site Preparation and Installation Instructions," Manual No. 576013-553, for the correct procedures.

11. 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.

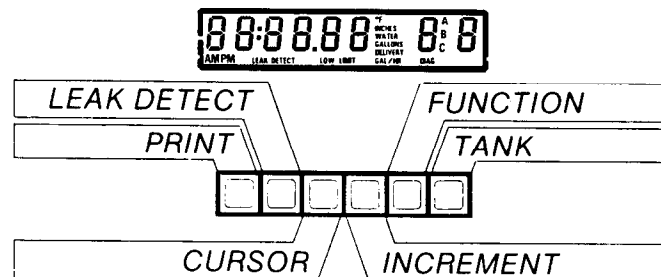
DO NOT APPLY POWER TO THE SYSTEM UNTIL ITS INSTALLATION HAS BEEN CHECKED AND FOUND TO BE IN ACCORDANCE WITH THE INSTRUCTIONS OUTLINED IN THE VEEDER-ROOT "SITE PREPARATION AND INSTALLATION INSTRUCTIONS," MANUAL NO. 576013-553; THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.

B. Operating Buttons and Display Functions

1. The front-panel pushbuttons let you enter or change all system and tank setup parameters. In addition, they 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 system is in either its SETUP or DIAGNOSTIC mode.

The following explanation of button operation and display functions will be helpful during the System Power-up and Checkout procedures described in Section 1.

SWITCH OPERATION



LEAK DETECT

Depress button twice to start a leak test. Repeat to end leak test.

PRINT

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

CURSOR — SETUP mode only

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

FUNCTION

Depress button to advance display function.

TANK

Depress button to advance displayed tank.

INCREMENT — SETUP mode only

After cursor is set, depress **INCREMENT** button to advance digit to desired number.



Systems Start-Up and Operating Instructions TLS-250 and TLS-250 Plus! Tank Level Sensing System

DISPLAY FUNCTIONS

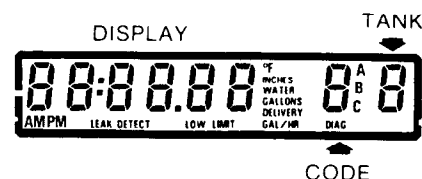
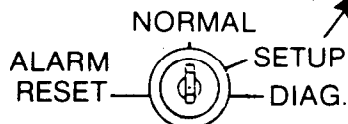
KEY SWITCH: Set position to desired display mode.

NORMAL DISPLAY FUNCTIONS

Format*	Function
HH:MM	Time of Day
GGGGGG	Fuel Volume
GGGGGG	Temperature-Compensated Volume**
GGGGGG	Ullage
III.DD	Fuel Height
I.D	Water Height
FFFF.D	Fuel Temperature
GGGGGG	Delivery Volume
GGG.DD	Leak Rate

SETUP DISPLAY FUNCTIONS

Code	Format*	Function
0A	HH:MM	Time of Day
0B	MM-DD	Month and Day
0C	YYYY	Year
1A	HH:MM	Leak Detect Start Time
1B	HH:MM	Leak Detect Stop Time
1C	0.n	Leak Report Type
2A	HH:MM	Auto Print Time #1
2B	HH:MM	Auto Print Time #2
2C	HH:MM	Auto Print Time #3
3	I.D.	High Water Alarm Limit
3A	GGGGGG	Overflow Alarm Limit
3B	GGGGGG	Low Level Alarm Limit
3C	GGGGGG	Theft Alarm Limit
3AB	GG.0	Leak Alarm Limit
3BC	SNNN.0	Thermal Coefficient
3ABC	MM	Inventory Increase Report Delay Time
4	GGGGGG	1.00 Height Volume Capacity
H	GGGGGG	0.95 Height Volume Capacity
HA	GGGGGG	0.90 Height Volume Capacity
HB	GGGGGG	0.85 Height Volume Capacity
HC	GGGGGG	0.80 Height Volume Capacity
4A	GGGGGG	0.75 Height Volume Capacity
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
9BC	SSS	Auto-Transmit Delay Time
9AC	n	Temperature-Compensated Volume
9ABC	n	Generator OFF mode (Emergency Generator versions only)



DIAGNOSTIC DISPLAY FUNCTIONS

Code	Format	Function
0	IIRRRR	Product ID, Rev. Level
1	XXXXXX	Probe Serial Number
2	XXX	Probe Circuit Bd. Code
3	XXX.XX	Probe Length
3A	XXXX	Probe Date Code
4	XXXX.XX	10* Standard Capacitance Values + # of samples
5	XXXX	8* Dry Calibration Constants
6	XXXX	8* Wet Calibration Constants
7	XXXX.XX	Updated Dry Variables
7A	XXXX.XX	Updated Wet Variables
8	-----	No Display. Used for Alarm History Report Printout
9	XXXX.XX	10 Slow Capacitance Values # + of samples

Use **INCREMENT** button to advance through Capacitance and Calibration Values for Functions 4-9.

*These numbers may vary up to 33 for 0.1 GPH Capacitance probe.



NOTE: For the purposes of this explanation, the display (above) shows all the LCD characters displayed at once. At no time during actual operation will this condition exist.

†The full display will appear for the first second after power is applied to the system. It will switch immediately to the proper display for the function selected.

*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.

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 "SITE PREPARATION AND INSTALLATION INSTRUCTIONS," MANUAL NO. 576013-553; 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!

A TLS-250 or TLS-250 *Plus!* 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 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.



Function Code Display

Function Code

If you inadvertently pass the desired function, simply turn the key switch 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.

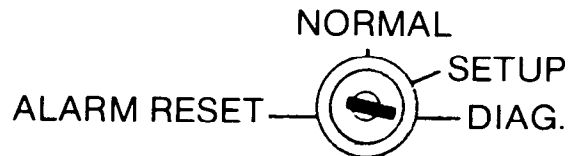


NOTE: Although a TLS-250 or TLS-250 *Plus!* can monitor up to eight tanks with one console, if fewer than eight tank probes are connected, the system skips the unused tank positions (except when in "SETUP" mode). For example, if only four probes are connected, depressing the **TANK** button will advance the display through 1, 2, 3, 4 and then return to 1.

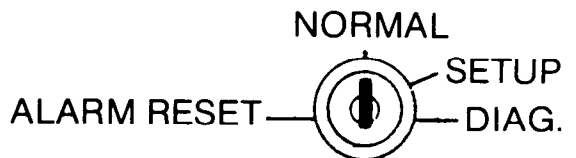
If a system with four tanks only displays information for three, this would indicate that the missing probe is improperly connected.

To power up the TLS-250 system:

1. Set Mode Key Switch 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-250 troubleshooting manual for an explanation.
 - c. TLS systems with the optional integral printer will print an error code interpretation.
3. Set Mode Key Switch to "NORMAL" position.
 - a. A random time value will appear in the display.



Error Code Display





Systems Start-Up and Operating Instructions TLS-250 and TLS-250 *Plus!* Tank Level Sensing System

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 proper 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 inches 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 inches and up.

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. Remove the probe junction box cover in probe manhole #1.

14. Check the conduit-to-box seals for watertightness.

15. Seal the probe wiring connections in the probe junction box using the epoxy sealant furnished with each probe.

16. Replace the probe junction box cover. BE SURE the cover seal is watertight.

17. Seal the probe wiring connections for all other probes in the system following the same instructions described for probe #1.



Fuel Height Display



Water Height Display



Fuel Temperature Display



SECTION 3 — SYSTEM SETUP

IMPORTANT: This manual describes system start-up, setup and operating procedures for the standard and *Plus!* versions. Where procedures or displays are different for the emergency generator or metric version, the differences will be shown or explained.

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



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 Start Time	OPTIONAL
1B	HH:MM	Leak Detect 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	Alarm Relay #1 Configuration	OPTIONAL
9B	RRRRRR	Alarm 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	n	Generator OFF Mode	OPTIONAL (EMERGENCY GENERATOR VERSIONS ONLY)



NOTE: “TANK” setup parameters are values which apply to the individual tanks. **It will be necessary to use the TANK button to select each specific tank 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
LA	GGGGGG	0.40 Height Volume Capacity	OPTIONAL

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Code	Format†	Function	Requirement
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	OPTIONAL
8	C CC	Product Code/Product Label	OPTIONAL***

†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).

*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 3. P, 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 Mode Key Switch to "SETUP" position.

2. Set 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, wrong 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 set 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.

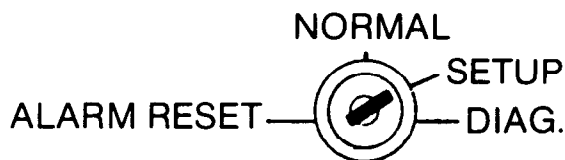
e. Depress the **INCREMENT** button to select the desired value for the minutes digits.

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.

3. Set 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 3a 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.



Time Display



Month/Date Displays

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.

B. Leak Detect Start and Stop Times (OPTIONAL)

The TLS-250 system may be programmed, using the following procedures, to automatically start and stop its leak detect mode. Once these times have been set, the TLS system will start and stop a leak detect procedure daily for all tanks or a single tank in the system.

RECOMMENDED MINIMUM TEST TIMES:

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

NOTE FOR EMERGENCY GENERATOR VERSION: The TLS-250 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.

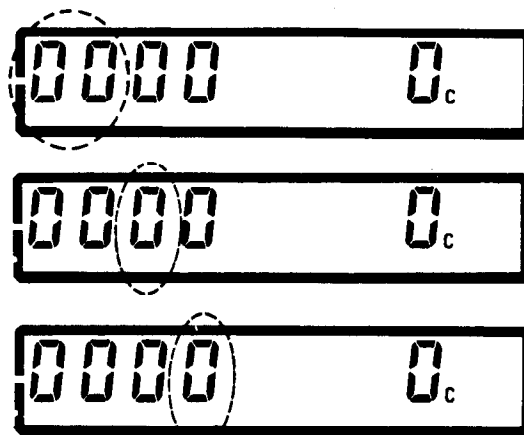
It is recommended that the start time be set for at least 1 hour after closing time to allow the tank to “settle out,” and the stop time be set for at least 30 minutes prior to opening time. Providing this time buffer will also help avoid dispensing fuel while in the Leak Detect mode and setting off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

If the Leak Detect 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.

5. 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. (When setting times for a single tank, depress the **TANK** button to select the desired tank.) 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 Leak Detect Start display. When all values have been entered, depress the **FUNCTION** button to complete the Leak Detect Start Time and advance the display to the next function — Leak Detect Stop Time (HH:MM), Code 1B.



Year Displays



Leak Detect “Disable” Display



Leak Detect Start Time Display



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6. Set the Leak Detect Stop Time by repeating the instruction procedures for Leak Detect Start Time, paragraph 5a to 5b. Depress the **FUNCTION** button to complete the Leak Detect Stop Time and advance the display to the next function — Leak Report Type (O.N), Code 1C in TLS-250 *Plus!* Systems or Auto Print Time (HH:MM), Code 2A in TLS-250 Systems.



Leak Detect Stop Time Display

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

TLS-250 *Plus!* Systems give you the option of conducting either a 0.2 gallons 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:

- 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.
- 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-250 systems having the optional integral printer can be programmed, using the following procedures, to automatically print inventory status reports at three separate times during a 24-hour period. Once the times have been set, the reports will be printed 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.

- 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.
- 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.



Auto Print Time Displays

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.

E. High Water Limit (OPTIONAL)

The TLS-250 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 alarms in the TLS System — see Section 3.R, Alarm Relay Configuration.



NOTE: Two alarm relays are built into each TLS-250 monitor. Consult the TLS-250 and TLS-250 *Plus!* "Site Preparation and Installation Instructions," Manual No. 576013-553, 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 199mm). This is the maximum water height that the TLS-250 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 3.R, Alarm Relay Configuration.



NOTE: Two alarm relays are built into each TLS-250 monitor. Consult the TLS-250 and TLS-250 *Plus!* "Site Preparation and Installation Instructions," Manual No. 576013-553, 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



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- 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-250 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-250 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 3.R, Alarm Relay Configuration.



NOTE: Two alarm relays are built into each TLS-250 monitor. Consult the TLS-250 and TLS-250 *Plus!* "Site Preparation and Installation Instructions," Manual No. 576013-553, 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 value 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.



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 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

H. Theft Limit (OPTIONAL)

The Theft Limit feature will warn of a sudden loss of fuel during a leak detect period. 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 3.R, Alarm Relay Configuration.



NOTE: Two alarm relays are built into each TLS-250 monitor. Consult the TLS-250 and TLS-250 Plus! "Site Preparation and Installation Instructions," Manual No. 576013-553, 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(s), set its limit value at 999999.

1. To 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 — Tank Volume in gallons (GGGGGG), Code 4.

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 3.R, Alarm Relay Configuration.



NOTE: Two alarm relays are built into each TLS-250 monitor. Consult the TLS-250 and TLS-250 Plus! "Site Preparation and Installation Instructions," Manual No. 576013-553, 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-250. 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 period reaches this value, a report will be printed and one or both relays can be triggered.



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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, take into consideration 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)	5	6	7	8	9	10
Leak Limit (gallons)	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:

- The first digit of the Leak Limit display in gallons (-GG.0) for tank #1 will be flashing.
- Depress the **INCREMENT** button to select the desired value (0 - 9) for this digit.
- Depress the **CURSOR** button to activate the second digit of the display and use the **INCREMENT** button to select the desired value.
- 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.
- Repeat these procedures for all tanks in the system.
- 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 Display



Leak Limit Display (Metric Version)

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-250. 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 3.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 3.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 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)

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. To 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



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- c. Depress the **CURSOR** button to activate the second digit of the display and depress the **CURSOR** 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. To 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.



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



Tank Volume Display



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. To 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.

- 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



Tank Diameter Display (Metric Version)



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N. Tank Tilt (OPTIONAL)

The Tank Tilt adjustment allows you to enter a value which will adjust for a discrepancy between TLS 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," Manual No. 576013-553. 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. To Enter Tank Tilt in inches to two decimal places (III.DD) (or millimeters to one decimal place) for Tank #1 (Code 6):

- The first digit of the display (III.DD) for tank #1 will be flashing.
- 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.



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



Tank Tilt Display



Tank Tilt Display (Metric Version)

- 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 Tank Tilt value for tank #1 and depress the **TANK** button to advance the display to tank #2.
- Enter the Tank Tilt values for each tank in the system following the same procedures outlined for tank #1.
- 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 if applicable)

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.

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

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.

1. To Enter Manifolded 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.

- 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 next function — Product Label Code, Code 8.



Manifolded Tank Display

P. Product Code and Product Label Code (OPTIONAL except for Diesel)

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.

V Systems Start-Up and Operating Instructions

R TLS-250 and TLS-250 *Plus!* Tank Level Sensing System

In the center of the display is a two-digit Internal Product Label Code. These codes are stored within the TLS-250 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

Product Label Code	Product Label	Fuel Coefficient of Thermal Expansion Standard and Generator Versions	Metric Version
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. To enter Product Codes (Code 8):

- 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.
- Depress the **INCREMENT** button to select the desired value for tank #1.
- Depress the **TANK** button to advance the display to tank #2 and use the **INCREMENT** button to select the desired value.
- Repeat the procedures for each tank in the system.



External Communications Interface Product Code Display

Internal Product Label Codes

- The first digit of the Product Label Code display (N...NN) for tank #1 will be flashing.
- Depress the **CURSOR** button to activate the first digit of the Internal Product Label Code display (N...NN, where N = 0—9).
- 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.

- Depress the **CURSOR** button to activate the second digit of the display and depress the **INCREMENT** button to select the desired value.
- Depress the **TANK** button to advance the display to tank #2 and repeat the procedures outlined for tank #1.
- Once the Product Label Code 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

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. **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.**

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TLS-250 and TLS-250 Plus! Tank Level Sensing System

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

1. To 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)

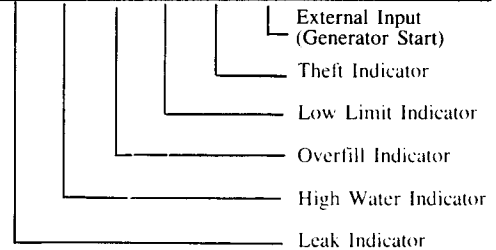
The Alarm Relay Configuration feature allows you to program any or all alarm indicators to trigger one or both of the TLS-250 internal alarm relays.

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 Indicator |
| 2nd digit | High Water Indicator |
| 3rd digit | Overfill Indicator |
| 4th digit | Low Limit Indicator |
| 5th digit | Theft Indicator |
| 6th digit | External Input ("Generator Start" on emergency generator versions) |



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

Standard Version:

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

Emergency Generator Versions:

- Relay #1 = 100000 (Leak Indicator enabled)
- Relay #2 = 000100 (Low Limit Indicator enabled)

1. To 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 either a 0 (OFF) or a 1 (ON) status for the Leak 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.



Alarm Relay Configuration Display

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.

S. Auto-Transmit Message Mode (OPTIONAL)

The Auto-Transmit Message Mode feature lets you transmit or transmit and repeat automatically any or all alarm indications, delivery and external input messages through the TLS 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 3.T — 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).



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 Start” message)
- N = 9 External Input Off Message
 (“Generator Stop” message)

1. To set the Auto-Transmit Message Mode (Code 9C):

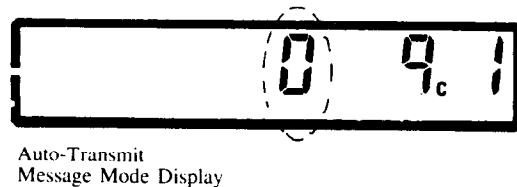
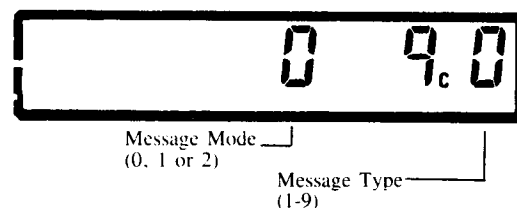
a. The Message Mode digit of the display (N 9 C N) will be flashing for Message Type #1 (Leak Indicator, shown in the tank number display.)

b. Depress the **INCREMENT** button to select the desired Message Mode (0, 1 or 2) for Message Type #1.

c. Depress the **TANK** button to advance the display to Message Type #2 and depress the **INCREMENT** button to select the desired Message Mode.

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.



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T. Auto-Transmit Repeat Time (OPTIONAL)

The Auto-Transmit Repeat Time feature enables you to set the length of time in minutes the TLS-250 will wait before it repeats the Auto-Transmit Message if the Repeat mode is enabled (see Section 3.R.). The message will continue to repeat at this interval until the alarm indicator has been reset either manually using the front-panel key switch 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. To set the Auto-Transmit Repeat Time (Code 9AB):

- The first digit in the Auto-Transmit Repeat Time display (MMM) will be flashing.
- Depress the **INCREMENT** button to select the desired value for this digit.



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

- Depress the **CURSOR** button to activate the second digit and depress the **INCREMENT** button to select the desired value.
- Repeat the procedures outlined above to set the desired value for the third digit.
- 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.



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. To set the Auto-Transmit Delay Time (Code 9BC):

- The first digit of the Auto-Transmit Delay Time display (MMM) will be flashing.
- Depress the **INCREMENT** button to select the desired value for this digit.



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

- Depress the **CURSOR** button to activate the second digit and depress the **INCREMENT** button to select the desired value.



Auto-Transmit
Delay Time Display

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 -- Temperature-Compensated Volume, Code 9AC.

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

This option adds temperature compensated volume to the TLS-250 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 Report Display

W. Generator OFF mode (Emergency Generator Version Only)

The TLS-250 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 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. Fifteen minutes after the generator shuts off, 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 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 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

Setup Procedures Are Complete

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



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X. External Interface to Enter Station Header (OPTIONAL)

A four-line custom station header may be entered into the TLS system 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-250 has factory-set conditions that must be matched by the keyboard device. They are:

Baud Rate 300
Parity Odd
Security Code Disabled

1. To 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-250 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. To 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-250 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 4 — OPERATING INSTRUCTIONS

A. General

1. TLS-250, TLS-250 Metric and TLS-250 *Plus!* Systems

These TLS-250 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.

a. Inventory Information

TLS-250 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

b. Automatic Inventory Increase Report

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

c. Alarm Indications

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.

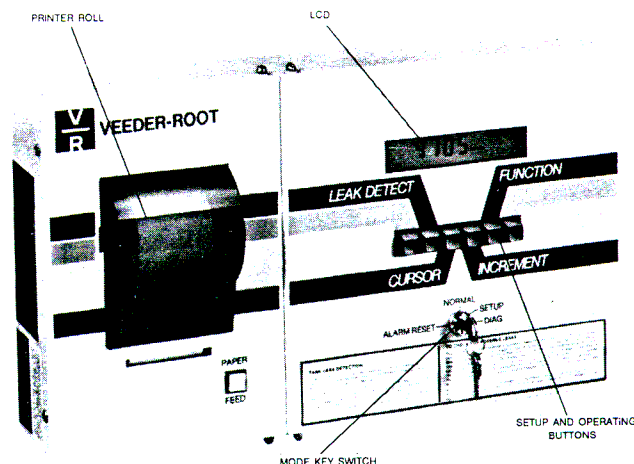
In addition, any of these alarm limits can trigger one or both of the two relays built into the TLS System to activate other external alarm devices.

d. Leak Detection

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

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.

TLS-250 Systems do not check lines or pumps for leaks. Line or pump leaks must be detected through record reconciliation or other means.





Systems Start-Up and Operating Instructions TLS-250 and TLS-250 *Plus!* Tank Level Sensing System

The TLS-250 does not check lines or pumps for leaks. Line or pump leaks must be discovered through record reconciliation or other means.

2. TLS-250 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-250 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 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-250 are included in the emergency generator version.

IMPORTANT: Inventory and Leak Test information provided by TLS-250 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-250 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-250 System be set regularly in its Leak Detect Mode when the facility is closed.

B. Front-Panel Button Functions

TLS-250 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 as required (refer to Section 3).

Systems Start-Up and Operating Instructions TLS-250 and TLS-250 Plus! Tank Level Sensing System



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

LEAK DETECT — Used to start and stop leak detect mode manually for one tank or the entire system. (Automatic leak detect start and stop times may be preset — see Section 3.)

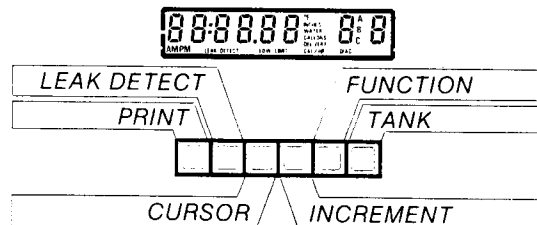
PRINT — Used to print inventory, setup and diagnostic information. First select the desired information using the key switch, **FUNCTION** and **TANK** buttons.

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

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

TANK — Used to select tank 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).

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



C. Mode Key Switch Functions

The TLS-250 Mode Key Switch is a management feature that lets you select 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 and tank parameters.

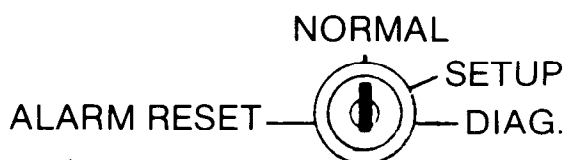
NOTICE: THE OWNER OF THIS PRODUCT SHOULD REMOVE THE FRONT PANEL KEY TO PREVENT MISUSE OF THE PRODUCT. UNAUTHORIZED CHANGES IN THE SETUP PARAMETERS COULD RESULT IN INACCURATE INVENTORY CONTROL OR UNDETECTED POTENTIAL ENVIRONMENTAL AND HEALTH HAZARDS.

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

NORMAL — For daily system operation. Displays inventory information, provides automatic and programmed operating reports, monitors limit values for indicator features.

Normal display functions include:

FUNCTION	UNITS
Time of Day	Hours/Minutes
Fuel Volume	Gallons
Temperature-Compensated Volume	Gallons
Fuel Height	Inches/Hundredths
Water Height	Inches/Tenths
Fuel Temperature	Degrees F/Tenths
Delivery Volume	Gallons- For the last delivery to the tank
Leak Rate	Gallons per hour/Hundreths



SETUP — Provides access to system and tank parameters. Used to enter and change setup values. Key switch limits setup mode to authorized personnel.

See Section 3 for System Setup procedures.



Systems Start-Up and Operating Instructions TLS-250 and TLS-250 *Plus!* Tank Level Sensing System

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

ALARM RESET — Used to reset indicator functions after leak, theft and overfill alarms have been triggered.



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

D. Operator's Instructions (Normal Mode)

1. To display inventory information:
 - a. Depress the **FUNCTION** button to select the desired display function (i.e., Fuel Volume, Water Height, . . .).
 - b. Depress the **TANK** button to select the desired tank for which the information is to be displayed.
2. To print inventory information:
 - a. Depress the **PRINT** button. A report will be printed showing all inventory information for all tanks in the system.
3. To print delivery information
 - a. With the Operating Mode keyswitch in the **NORMAL** position, press the **FUNCTION** button until the "Gallons Delivered" display appears.
 - b. Press the **TANK** button until the desired tank number appears.
 - c. Press the **PRINT** button. The latest Inventory Increase Report for the selected 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: The TLS-250 *Plus!* Systems equipped with 0.1 GPH Capacitance or Magnetrostrictive 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 Rate 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 "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 key switch 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 key switch 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.

6. To Print "Tank" Setup Information:

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

- a. Turn key switch to **SETUP** position.
- b. Depress **FUNCTION** button to advance display to any tank setup function.
- c. Depress **TANK** button to select desired tank.
- d. Depress **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.

7. To Print Alarm History Report.



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

- a. Turn key switch to "DIAG." (diagnostic) position.
- b. Depress **FUNCTION** button to advance display to 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 will be printed showing the dates and times of the last three occurrences of each type of alarm for this tank.
- e. Depress the **TANK** button to other tanks in the system and use the **PRINT** button to request printed reports.



Systems Start-Up and Operating Instructions

TLS-250 and TLS-250 Plus! Tank Level Sensing System

E. Alarm Type Recognition

The alarm indications from a TLS-250 are triggered by conditions in the tank exceeding programmed or predetermined limits in the system. Alarms are indicated by a flashing display and/or annunciators in the display and an alarm report printout (in systems equipped with a printer).

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

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

1. Alarm Indications and Causes

ALARM	INDICATIONS	CAUSE
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.
External Input	External Input ON or OFF printout	An external monitoring device wired to the TLS-250 has turned on or off.

F. Alarm Operation

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

1. To find which tank has an alarm condition:
 - a. 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.
2. To identify the event that has triggered the alarm:
 - a. Depress the **FUNCTION** button to advance the display through the functions.
 - b. 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 showing the type of alarm, time and date 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 key switch to the ALARM RESET position and then back to the NORMAL position.

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

G. To Change Printer Paper Roll:



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

TLS-250 uses a 2-1/2 inch thermal paper. To order from Veeder-Root, specify: P/N 576008-424, TLS-250 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 5 — 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-250, TLS-250 Metric, TLS-250 Emergency Generator Version and TLS-250 *Plus!* 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-250 *Plus!* equipped with Series 8472 0.1 GPH Capacitance and/or Series 8473 0.1 GPH Magnetos-trictive 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-250 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-250 Inventory or Leak Test Reports! ALWAYS CONFIRM A SUSPECTED LEAK USING AN ALTERNATE TEST METHOD OR INSPECTION TECHNIQUE.

THE TLS-250 WILL FUNCTION ACCURATELY WITH ONLY CERTAIN APPROVED FLUIDS. See page 23 of this manual for the list of approved fluids.

A. General

Good inventory control practices are the first line of defense against the problems that can be caused by leaking underground tanks. TLS-250 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.

TLS-250 Systems have additional features that can aid an operator in determining if inventory losses are being caused by a leaking tank. Using a TLS-250, the operator has the option of monitoring a single tank or all tanks at the installation for product losses. TLS-250 leak detect routines can only be implemented when no dispensing is taking place and when no deliveries are being made. As a general practice, it is recommended that the system be set regularly in its leak detect mode whenever the facility is closed.

In addition, if the in-tank leak test feature is being used to comply with local, state and Federal UST regulations, regular leak tests must be conducted in accordance with these regulations.

The TLS-250 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.

Leak tests are only one element of a comprehensive inventory management program. All inventory and leak detect reports should be kept and reconciled.

B. Leak Detect Mode

The leak detect function can be started and run during any period when no dispensing from or deliveries to the tank are taking place. The **LEAK DETECT** button on the system console is used to start the test by depressing the button twice. Leak detect procedures may also be started and stopped using automatic start and stop times (see Section 3.B).

Immediately, 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 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. Fifteen minutes after generator shuts off, a new inventory report is then 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 Test Times

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

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

D. Leak Detection Operating Procedures

1. To Start Leak Detect — All Tanks

- a. Turn key switch to NORMAL position.
- b. Depress the **LEAK DETECT** 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-250, and its Theft Indicator 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.



Systems Start-Up and Operating Instructions TLS-250 and TLS-250 Plus! Tank Level Sensing System

2. To Start Leak Detect — Single Tank

- Turn key switch to NORMAL position.
- Depress the **LEAK DETECT** button once. Dashes (-----) will appear in the display. No tank number will appear.
- Depress the **TANK** button (the tank number will appear) and advance the tank digit to the desired tank.
- Depress the **LEAK DETECT** 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 test 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 **LEAK DETECT** button twice.

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

- Probe segment(s) out of range
- Delivery mix errors
- Temperature out of range
- Recent delivery
- Tank level low

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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
500 GALS ULLAGE
INCHES FUEL
INCHES WATER

START LEAK MONITOR
JUN 3, 1991
11:00 PM

TANK 1
PREMIUM UNLEADED
SEG 1 DLVY MIX ERR
SEG 2 DLVY MIX ERR

RECENT DELIVERY

TANK 2
REGULAR UNLEADED

TANK 3
DIESEL

Systems Start-Up and Operating Instructions TLS-250 and TLS-250 Plus! Tank Level Sensing System



During the leak detect procedure, 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 indicates 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 condition(s) will be printed after the leak rate report.

SHORT — Test duration was too short to yield valid test results. To print a complete Leak Test Results Report, see Section 6.B.6.

STOP LEAK MONITOR

JUN 4, 1991
6:00 AM

LEAK MONITOR REPORT

TEST START TIME
JUN 3, 1991
11:00 PM

DURATION = 7 HOURS

	0.20
	GAL/HR
TANK	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 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

If a leak alarm is triggered during the test period, a leak alarm report showing tank number, product, date and time will be printed at the next even hour after occurrence.

--- LEAK ALARM ---
TANK 3
DIESEL

JUN 4, 1991
2:00 AM

SECTION 6 — SYSTEM REPORTS

A. General

TLS-250 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. 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. In addition, Temperature-Compensated volume (GALS NET) may be included in the report using setup procedures described in Section 3.

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

2. 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 3.K) 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.

3. Leak Detect Report

The Leak Detect Report is printed automatically during a leak test procedure. At the start of a leak test, a complete inventory report and a report of pre-test conditions which may affect test results are printed.

At the conclusion of the test, the system will produce an hour-by-hour print-out of the cumulative volume change to tenths of a gallon and final leak rates. In addition, the report will show any in-test conditions which may have affected the test results.

SEE SECTION 5 — “LEAK DETECTION” FOR COMPLETE INFORMATION ON LEAK DETECT REPORTS.

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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

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



4. Indicator Reports

The TLS system has programmable indicator limits that can warn of sudden losses due to theft or leakage, of a potential overfill during bulk delivery, low fuel inventory, and high water condition in a tank.

When an indicator limit is exceeded, an automatic printout occurs showing the type of indicator, date and time.

a. Theft Indicator detects a rapid drop in inventory during a leak test.

```
-----THEFT ALARM-----  
TANK 1  
PREMIUM UNLEADED  
  
JUN 20, 1991  
3:36 AM
```

b. Leak Indicator provides an automatic alert during a leak test if the cumulative volume loss exceeds the preprogrammed Leak Alarm Limit.

```
--- LEAK ALARM ---  
TANK 3  
DIESEL  
  
JUN 4, 1991  
2:00 AM
```

c. Overfill Indicator warns of a potential overspill during bulk delivery by a tank truck.

```
--OVERFILL ALARM--  
TANK 2  
REGULAR UNLEADED  
  
JUN 21, 1991  
5:38 PM
```

d. Low Limit Indicator warns when inventory drops below preset low limit amounts.

```
--LOW LIMIT ALARM--  
TANK 2  
REGULAR UNLEADED  
  
JUN 21, 1991  
9:14 AM
```

e. High Water Indicator warns when water level exceeds a preset limit.

```
--HIGH WATER ALARM--  
TANK 6  
PREMIUM UNLEADED  
  
JUN 25, 1991  
11:34 AM
```

f. External Input On ("Generator On" in Emergency Generator Version).

```
-- EXT. INPUT ON ---  
  
JUN 17, 1991  
9:09 PM
```

g. External Input Off ("Generator Off" in Emergency Generator Version).

```
-- EXT. INPUT OFF ---  
  
JUN 17, 1991  
9:09 PM
```



Systems Start-Up and Operating Instructions TLS-250 and TLS-250 *Plus!* Tank Level Sensing System

5. Alarm History Report

The 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 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. Leak Monitor Report

The Leak Monitor Report is printed in the NORMAL mode by pressing the **FUNCTION** button until the "Leak Rate" display appears, then pressing **PRINT**.

SEE SECTION 5 — "LEAK DETECTION" FOR COMPLETE INFORMATION ON LEAK DETECT REPORTS.



NOTE FOR EMERGENCY GENERATOR VERSION: The Leak Monitor Report must be called up using the front panel keyboard or via the RS-232 communications port. It will not be printed automatically. 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	TEST	MIX	ERR
SEG 1	TEST	MIX	ERR
SEG 2	TEST	MIX	ERR

SEG	DLVY	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	TEST
1	0.30	INVALID
2	0.00	PASSED
3	-1.55	FAILED
4	0.01	PASSED



Systems Start-Up and Operating Instructions TLS-250 and TLS-250 *Plus!* Tank Level Sensing System

7. 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 key switch 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

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

1. Turn the key switch 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 PARMS:

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

AUTO-REPEAT TIME:

60 MINUTES

TRANSMIT DELAY TIME:

5 SECONDS

8. 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; Leak 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 key switch 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 7 — LIMITATION OF REMEDY AND WARRANTY

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 March 21, 1991.

VEEDER-ROOT 
Environmental Products

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

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