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 Plus!: 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 ¼ 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).

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.

WARNING: EXPLOSIONS 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.

WARNING: EXPLOSIONS COULD OCCUR IF THE PROBE WIRING IS INTRINSICALLY SAFE ONLY WHEN CONNECTED TO VEEDER-ROOT'S MONITOR FORM NUMBER 7841.

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.

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


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 78420.2 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 5% 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 1/16 inch.

The TLS-250 Plus’ equipped with Series 8472 0.1 GPH Capacitance and or Series 8473 0.1 GPH Magnetostriuctive 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 5% 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. 570013-553.

☐ 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)

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

*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.


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.


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 VEEDE-R-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**

![Diagram of 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.
DISPLAY FUNCTIONS

KEY SWITCH: Set position to desired display mode.

NORMAL DISPLAY FUNCTIONS

<table>
<thead>
<tr>
<th>Code</th>
<th>Format*</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH:MM</td>
<td>HH:MM</td>
<td>Time of Day</td>
</tr>
<tr>
<td>GGGGGG</td>
<td>MM-DD</td>
<td>Month and Day</td>
</tr>
<tr>
<td>CCC</td>
<td>YYYY</td>
<td>Year</td>
</tr>
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<td>CCC</td>
<td>HH:MM</td>
<td>Leak Detect Start Time</td>
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<td>Leak Detect Stop Time</td>
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<td>CCC</td>
<td>0,1</td>
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</tr>
<tr>
<td>CCC</td>
<td>HH:MM</td>
<td>Auto Print Time #2</td>
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<td>HH:MM</td>
<td>Auto Print Time #3</td>
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<td>I.D.</td>
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</tr>
<tr>
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<td>GGGGGG</td>
<td>Theft Alarm Limit</td>
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<td>CCC</td>
<td>G.G.G</td>
<td>Leak Alarm Limit</td>
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<td>SNNN.N</td>
<td>Thermal Coefficient</td>
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<td>0.95 Height Volume Capacity</td>
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<td>MMM</td>
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<td>S.DD</td>
<td>Tank Tilt</td>
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<tr>
<td>CCC</td>
<td>nnnnn</td>
<td>Manifolded Tank Configuration</td>
</tr>
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<td>Relay 1 Configuration</td>
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<td>CCC</td>
<td>RRRRRR</td>
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<td>CCC</td>
<td>RRRRRR</td>
<td>Auto-Transmit Repeat Time</td>
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<td>CCC</td>
<td>SSS</td>
<td>Auto Transmit Deloy Time</td>
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<tr>
<td>CCC</td>
<td>n</td>
<td>Temperature Compensated Volume</td>
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<tr>
<td>CCC</td>
<td>n</td>
<td>Generator Offset mode (Emergency Generator versions only)</td>
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SETUP DISPLAY FUNCTIONS

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<td>Time of Day</td>
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<tr>
<td>0B</td>
<td>MM-DD</td>
<td>Month and Day</td>
</tr>
<tr>
<td>0C</td>
<td>YYYY</td>
<td>Year</td>
</tr>
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<td>HH:MM</td>
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<td>1B</td>
<td>HH:MM</td>
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</tr>
<tr>
<td>1C</td>
<td>0,1</td>
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</tr>
<tr>
<td>2A</td>
<td>HH:MM</td>
<td>Auto Print Time #1</td>
</tr>
<tr>
<td>2B</td>
<td>HH:MM</td>
<td>Auto Print Time #2</td>
</tr>
<tr>
<td>2C</td>
<td>HH:MM</td>
<td>Auto Print Time #3</td>
</tr>
<tr>
<td>3</td>
<td>I.D.</td>
<td>High Water Alarm Limit</td>
</tr>
<tr>
<td>3A</td>
<td>GGGGGG</td>
<td>Overfill Alarm Limit</td>
</tr>
<tr>
<td>3B</td>
<td>GGGGGG</td>
<td>Low Level Alarm Limit</td>
</tr>
<tr>
<td>3C</td>
<td>GGGGGG</td>
<td>Theft Alarm Limit</td>
</tr>
<tr>
<td>3AB</td>
<td>GG.G</td>
<td>Leak Alarm Limit</td>
</tr>
<tr>
<td>3BC</td>
<td>SNNN.N</td>
<td>Thermal Coefficient</td>
</tr>
<tr>
<td>3ABC</td>
<td>MM</td>
<td>Inventory Increase Report Delay Time</td>
</tr>
<tr>
<td>4</td>
<td>GGGGGG</td>
<td>1.00 Height Volume Capacity</td>
</tr>
<tr>
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<td>GGGGGG</td>
<td>0.95 Height Volume Capacity</td>
</tr>
<tr>
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<td>GGGGGG</td>
<td>0.90 Height Volume Capacity</td>
</tr>
<tr>
<td>7</td>
<td>GGGGGG</td>
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</tr>
<tr>
<td>8</td>
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</tr>
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</tr>
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</tr>
<tr>
<td>11</td>
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</tr>
<tr>
<td>12</td>
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</tr>
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</tr>
<tr>
<td>14</td>
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<td>0.50 Height Volume Capacity</td>
</tr>
<tr>
<td>15</td>
<td>GGGGGG</td>
<td>0.45 Height Volume Capacity</td>
</tr>
<tr>
<td>16</td>
<td>GGGGGG</td>
<td>0.40 Height Volume Capacity</td>
</tr>
<tr>
<td>17</td>
<td>GGGGGG</td>
<td>0.35 Height Volume Capacity</td>
</tr>
<tr>
<td>18</td>
<td>GGGGGG</td>
<td>0.30 Height Volume Capacity</td>
</tr>
<tr>
<td>19</td>
<td>GGGGGG</td>
<td>0.25 Height Volume Capacity</td>
</tr>
<tr>
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<td>0.20 Height Volume Capacity</td>
</tr>
<tr>
<td>21</td>
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<td>0.15 Height Volume Capacity</td>
</tr>
<tr>
<td>22</td>
<td>GGGGGG</td>
<td>0.10 Height Volume Capacity</td>
</tr>
<tr>
<td>23</td>
<td>GGGGGG</td>
<td>0.05 Height Volume Capacity</td>
</tr>
<tr>
<td>24</td>
<td>MMM</td>
<td>Tank Diameter</td>
</tr>
<tr>
<td>25</td>
<td>S.DD</td>
<td>Tank Tilt</td>
</tr>
<tr>
<td>26</td>
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<td>Manifolded Tank Configuration</td>
</tr>
<tr>
<td>27</td>
<td>C.CC</td>
<td>Product Code and Product Label</td>
</tr>
<tr>
<td>28</td>
<td>nnnnn</td>
<td>System Security Code</td>
</tr>
<tr>
<td>29</td>
<td>RRRRRR</td>
<td>Relay 1 Configuration</td>
</tr>
<tr>
<td>30</td>
<td>RRRRRR</td>
<td>Relay 2 Configuration</td>
</tr>
<tr>
<td>31</td>
<td>RRRRRR</td>
<td>Auto-Transmit Message Mode</td>
</tr>
<tr>
<td>32</td>
<td>RRRRRR</td>
<td>Auto-Transmit Repeat Time</td>
</tr>
<tr>
<td>33</td>
<td>SSS</td>
<td>Auto Transmit Deloy Time</td>
</tr>
<tr>
<td>34</td>
<td>n</td>
<td>Temperature Compensated Volume</td>
</tr>
<tr>
<td>35</td>
<td>n</td>
<td>Generator Offset mode (Emergency Generator versions only)</td>
</tr>
</tbody>
</table>

DIAGNOSTIC DISPLAY FUNCTIONS

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

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.

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.
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.
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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Format</th>
<th>Function</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0A</td>
<td>HH:MM</td>
<td>Time of Day</td>
<td>MANDATORY</td>
</tr>
<tr>
<td>0B</td>
<td>MM-DD</td>
<td>Month-Date</td>
<td>MANDATORY</td>
</tr>
<tr>
<td>0C</td>
<td>YYYY</td>
<td>Year</td>
<td>MANDATORY</td>
</tr>
<tr>
<td>1A</td>
<td>HH:MM</td>
<td>Leak Detect Start Time</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>1B</td>
<td>HH:MM</td>
<td>Leak Detect Stop Time</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>1C</td>
<td>0.n</td>
<td>Leak Report Type</td>
<td>OPTIONAL (Plus! Systems Only)</td>
</tr>
<tr>
<td>2A</td>
<td>HH:MM</td>
<td>Auto Prim Time #1</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>2B</td>
<td>HH:MM</td>
<td>Auto Print Time #2</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>2C</td>
<td>HH:MM</td>
<td>Auto Print Time #3</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>9</td>
<td>nnnnnn</td>
<td>System Security Code</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>9A</td>
<td>RRRRRR</td>
<td>Alarm Relay #1 Configuration</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>9B</td>
<td>RRRRRR</td>
<td>Alarm Relay #2 Configuration</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>9C</td>
<td>n</td>
<td>Auto-Transmit Message Mode</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>9AB</td>
<td>MMM</td>
<td>Auto-Transmit Repeat Time</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>9BC</td>
<td>SSS</td>
<td>Auto-Transmit Delay Time</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>9AC</td>
<td>n</td>
<td>Temperature-Compensated Volume</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>9ABC</td>
<td>n</td>
<td>Generator OFF Mode</td>
<td>OPTIONAL (EMERGENCY GENERATOR VERSIONS ONLY)</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Format</th>
<th>Function</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>JD</td>
<td>High Water Alarm Limit</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>3A</td>
<td>GGGGGG</td>
<td>Overfill Alarm Limit</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>3B</td>
<td>GGGGGG</td>
<td>Low Level Alarm Limit</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>3C</td>
<td>GGGGGG</td>
<td>Theft Alarm Limit</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>3AB</td>
<td>GG.0</td>
<td>Leak Alarm Limit</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>3BC</td>
<td>SNNN.0</td>
<td>Fuel Thermal Coefficient</td>
<td>MANDATORY*</td>
</tr>
<tr>
<td>3ABC</td>
<td>MM</td>
<td>Delivery Report Delay Time</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>4</td>
<td>GGGGGG</td>
<td>1.00 Height Volume Capacity</td>
<td>MANDATORY</td>
</tr>
<tr>
<td>H</td>
<td>GGGGGG</td>
<td>0.95 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>HA</td>
<td>GGGGGG</td>
<td>0.90 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>HB</td>
<td>GGGGGG</td>
<td>0.85 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>HC</td>
<td>GGGGGG</td>
<td>0.80 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>4A</td>
<td>GGGGGG</td>
<td>0.75 Height Volume Capacity</td>
<td>MANDATORY**</td>
</tr>
<tr>
<td>E</td>
<td>GGGGGG</td>
<td>0.70 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>EA</td>
<td>GGGGGG</td>
<td>0.65 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>EB</td>
<td>GGGGGG</td>
<td>0.60 Height Volume Capacity</td>
<td>OPTIONAL</td>
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<tr>
<td>EC</td>
<td>GGGGGG</td>
<td>0.55 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>4B</td>
<td>GGGGGG</td>
<td>0.50 Height Volume Capacity</td>
<td>MANDATORY**</td>
</tr>
<tr>
<td>L</td>
<td>GGGGGG</td>
<td>0.45 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>LA</td>
<td>GGGGGG</td>
<td>0.40 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
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</table>
Systems Start-Up and Operating Instructions
TLS-250 and TLS-250 Plus! Tank Level Sensing System

<table>
<thead>
<tr>
<th>Code</th>
<th>Format†</th>
<th>Function</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB</td>
<td>GGGGGG</td>
<td>0.35 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>LC</td>
<td>GGGGGG</td>
<td>0.30 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>4C</td>
<td>GGGGGG</td>
<td>0.25 Height Volume Capacity</td>
<td>MANDATORY**</td>
</tr>
<tr>
<td>P</td>
<td>GGGGGG</td>
<td>0.20 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>PA</td>
<td>GGGGGG</td>
<td>0.15 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>PB</td>
<td>GGGGGG</td>
<td>0.10 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>PC</td>
<td>GGGGGG</td>
<td>0.05 Height Volume Capacity</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>5</td>
<td>III:DD</td>
<td>Tank Diameter</td>
<td>MANDATORY</td>
</tr>
<tr>
<td>6</td>
<td>II:DD</td>
<td>Tank Tilt</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>7</td>
<td>mmmm</td>
<td>Manifolded Tank Configuration</td>
<td>OPTIONAL</td>
</tr>
<tr>
<td>8</td>
<td>C CC</td>
<td>Product Code/Product Label</td>
<td>OPTIONAL***</td>
</tr>
</tbody>
</table>

†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.
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 (YY), the decades digit (YY) and the year digit (YY). 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:

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>TEST TYPE</th>
<th>PROBE TYPE</th>
<th>MINIMUM TEST TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLS-250</td>
<td>0.2 GPH</td>
<td>0.2 Capacitance</td>
<td>5 Hours</td>
</tr>
<tr>
<td>TLS-250 Metric</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLS-250 Eni. Gen.</td>
<td>0.2 GPH</td>
<td>0.2 Capacitance</td>
<td></td>
</tr>
<tr>
<td>TLS-250 Plus!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLS-250 Plus!</td>
<td>0.1 GPH</td>
<td>0.1 Capacitance</td>
<td>2 Hours</td>
</tr>
<tr>
<td>TLP-250 Plus!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLP-250 Plus!</td>
<td>0.1 GPH</td>
<td>0.1 Capacitance</td>
<td>3 Hours</td>
</tr>
<tr>
<td>TLP-250 Plus!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
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 IC in TLS-250 Plus! Systems or Auto Print Time (HH:MM), Code 2A in TLS-250 Systems.

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:
   a. The first digit to the right of the decimal point will be flashing indicating that its value may be changed. Press the INCREMENT button to toggle the value between 2 and 1.

   b. When the desired Leak Report Type is displayed, press the FUNCTION button to advance the display to the next function — Auto Print Time #1 (HH:MM), Code 2A.

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.
   a. The hours digits (HH:MM) of the Auto Print Time #1 will be flashing indicating that its value may be changed. Depress the INCREMENT button to select the desired value for these digits.

   b. Depress the CURSOR button and repeat this procedure to set the minutes digits (HH:MM) of the Auto Print Time #1 display. When all values have been entered, depress the FUNCTION button to complete the Auto Print Time #1 and advance the display to the next function — Auto Print Time #2 (HH:MM). Code 2B.

2. Set Auto Print Time #2 by repeating the instructions for Auto Print Time #1. When the desired values have been entered, depress the FUNCTION button to complete the Auto Print Time #2 and advance the display to the next function — Auto Print Time #3 (HH:MM), Code 2C.

3. Set Auto Print Time #3 by repeating the instructions for Auto Print Time #1. When the desired values have been entered, depress the FUNCTION button to complete the Auto Print Time #3 and advance the display to the next function — High Water Indicator (L.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
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TLS-250 and TLS-250 Plus! Tank Level Sensing System

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.

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.
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 (G G G G G G G G G G), 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 3.5, 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 (G G G G G G G G G G), Code 3B.

   a. The first digit of the Low Level Limit display (G G G G G G G) 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 (G G G G G G G G G G), Code 3C.
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:
   a. The first digit of the Theft Limit display in gallons (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 Theft Limit for tank #1 and depress the TANK button to advance the display to tank #2.
   e. Set the Theft Limits for each tank in the system following the same procedures outlined for tank #1.
   f. 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.
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.

<table>
<thead>
<tr>
<th>Test Length (hours)</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak Limit (gallons)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>10.00</td>
<td>8.33</td>
<td>7.14</td>
<td>6.25</td>
<td>5.56</td>
<td>5.00</td>
</tr>
<tr>
<td>40</td>
<td>8.00</td>
<td>6.67</td>
<td>5.71</td>
<td>5.00</td>
<td>4.44</td>
<td>4.00</td>
</tr>
<tr>
<td>30</td>
<td>6.00</td>
<td>5.00</td>
<td>4.28</td>
<td>3.75</td>
<td>3.33</td>
<td>3.00</td>
</tr>
<tr>
<td>20</td>
<td>4.00</td>
<td>3.33</td>
<td>2.86</td>
<td>2.50</td>
<td>2.22</td>
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</tr>
<tr>
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<td>1.43</td>
<td>1.25</td>
<td>1.11</td>
<td>1.00</td>
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<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The total fuel loss is a temperature compensated value.

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

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.
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.

c. 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 4C.

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.
## 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.

l. 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.
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):
   a. The first digit of the display (III.DD) for tank #1 will be flashing.
   b. Depress the INCREMENT button to select the desired value for this digit. If the Tank Tilt adjustment is a negative value, enter a minus sign (−) in the digit.
   NOTE: Zeros must be set in the leading digits to enter a tank tilt value under three whole digits.
   c. Depress the CURSOR button to activate the second digit of the display and depress the INCREMENT button to select the desired value.
   d. Repeat these procedures for each digit of the Tank Tilt value for tank #1 and depress the TANK button to advance the display to tank #2.
   e. Enter the Tank Tilt values for each tank in the system following the same procedures outlined for tank #1.
   f. Once the Tank Tilt values have been entered and the tank indicator in the display has been returned to tank #1, depress the FUNCTION button to advance the display to the next function — Manifolded Tank Configuration, Code 7.

O. Manifolded Tank Configuration (MANDATORY 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.

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

EXAMPLE: For a manifolder 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
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Standard and Generator versions</td>
</tr>
<tr>
<td>00</td>
<td>None (Defaults to PRODUCT 1, 2, etc.)—070</td>
<td>-070</td>
</tr>
<tr>
<td>01</td>
<td>DIESEL</td>
<td>-047</td>
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<tr>
<td>02</td>
<td>DIESEL 1</td>
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<tr>
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<td>DIESEL 2</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>06</td>
<td>GASOLINE</td>
<td>-070</td>
</tr>
<tr>
<td>07</td>
<td>LEAD FREE</td>
<td>-070</td>
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<tr>
<td>08</td>
<td>LEADED</td>
<td>-070</td>
</tr>
<tr>
<td>09</td>
<td>LEADED GASOLINE</td>
<td>-070</td>
</tr>
<tr>
<td>10</td>
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<tr>
<td>11</td>
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<td>13</td>
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<tr>
<td>15</td>
<td>REGULAR</td>
<td>-070</td>
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<tr>
<td>16</td>
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<td>17</td>
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<td>-070</td>
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<tr>
<td>19</td>
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</tr>
<tr>
<td>20</td>
<td>REGULAR LEADED</td>
<td>-070</td>
</tr>
<tr>
<td>21</td>
<td>REGULAR UNLEADED</td>
<td>-070</td>
</tr>
<tr>
<td>22</td>
<td>SUPER</td>
<td>-070</td>
</tr>
<tr>
<td>23</td>
<td>SUPER 1</td>
<td>-070</td>
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<tr>
<td>24</td>
<td>SUPER 2</td>
<td>-070</td>
</tr>
<tr>
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<td>29</td>
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<td>33</td>
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<td>34</td>
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</tr>
<tr>
<td>35</td>
<td>UNLEADED SUPER</td>
<td>-070</td>
</tr>
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</table>
Systems Start-Up and Operating Instructions
TLS-250 and TLS-250 Plus! Tank Level Sensing System

<table>
<thead>
<tr>
<th>Product Label Code</th>
<th>Product Label</th>
<th>Metric Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>XTRA</td>
<td>126</td>
</tr>
<tr>
<td>37</td>
<td>TOLUENE</td>
<td>-085</td>
</tr>
<tr>
<td>38</td>
<td>HYDRAULIC OIL</td>
<td>-085</td>
</tr>
<tr>
<td>40</td>
<td>AVGAS</td>
<td>-135</td>
</tr>
<tr>
<td>41</td>
<td>#2 HEATING OIL</td>
<td>-085</td>
</tr>
<tr>
<td>42</td>
<td>KEROSENE</td>
<td>-085</td>
</tr>
<tr>
<td>43</td>
<td>TURBINE OIL</td>
<td>-085</td>
</tr>
<tr>
<td>44</td>
<td>XYLENE</td>
<td>-085</td>
</tr>
<tr>
<td>45</td>
<td>MID-GRADE LEADED</td>
<td>126</td>
</tr>
<tr>
<td>46</td>
<td>MID-GRADE UNLEADED</td>
<td>126</td>
</tr>
</tbody>
</table>

*Must be entered manually.

**External Communications Interface Product Codes**

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

**Internal Product Label Codes**

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

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

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

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 (Thief Indicator enabled)
Relay #2 = 000100 (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.
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.
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):
   a. The first digit in the Auto-Transmit Repeat Time display (MMM) will be flashing.
   b. Depress the INCREMENT button to select the desired value for this digit.
   c. Depress the CURSOR button to activate the second digit and depress the INCREMENT button to select the desired value.
   d. Repeat the procedures outlined above to set the desired value for the third digit.
   e. Once the Auto-Transmit Repeat Time has been set, depress the FUNCTION button to advance the display to the next function — Auto-Transmit Delay Time, Code 9BC.

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):
   a. The first digit of the Auto-Transmit Delay Time display (MMM) will be flashing.
   b. Depress the INCREMENT button to select the desired value for this digit.
   c. Depress the CURSOR button to activate the second digit and depress the INCREMENT button to select the desired value.
d. Repeat the procedures outlined above to set the desired value for the third digit.

e. Once the Auto-Transmit Delay Time has been set, depress the FUNCTION button to advance the display to the next function — 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.

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.

Setup Procedures Are Complete

At this point, all “system” and “tank” parameters should have been entered.
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-292 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.
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).
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.

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**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:

<table>
<thead>
<tr>
<th><strong>FUNCTION</strong></th>
<th><strong>UNITS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of Day</td>
<td>Hours:Minutes</td>
</tr>
<tr>
<td>Fuel Volume</td>
<td>Gallons</td>
</tr>
<tr>
<td>Temperature-Compensated Volume</td>
<td>Gallons</td>
</tr>
<tr>
<td>Fuel Height</td>
<td>Inches/Hundredths</td>
</tr>
<tr>
<td>Water Height</td>
<td>Inches/Tenths</td>
</tr>
<tr>
<td>Fuel Temperature</td>
<td>Degrees F/Tenths</td>
</tr>
<tr>
<td>Delivery Volume</td>
<td>Gallons For the last delivery to the tank</td>
</tr>
<tr>
<td>Leak Rate</td>
<td>Gallons per hour/Hundredths</td>
</tr>
</tbody>
</table>

**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.
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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 key switch 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 Magnetostrictive probes have the ability to provide either 0.1 GPH or 0.2 GPH Leak Test Results Reports. This choice was made during the test setup process. If a 0.1 GPH Leak Report Type was selected, the small “c” annunciator will appear in the Leak Rate display. If a 0.2 GPH report was selected, the “c” annunciator will not appear.

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

   a. With the Operating Mode key switch 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.
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

<table>
<thead>
<tr>
<th>ALARM</th>
<th>INDICATIONS</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak</td>
<td>Flashing display</td>
<td>Cumulative product loss during leak test has exceeded the programmed Leak Limit at the end of any hour in the test period.</td>
</tr>
<tr>
<td></td>
<td>“Leak Detect” annunciator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leak Alarm printout</td>
<td></td>
</tr>
<tr>
<td>Theft</td>
<td>Flashing display</td>
<td>Cumulative product loss during a leak test has exceeded the programmed Theft Limit at any time in the test period</td>
</tr>
<tr>
<td></td>
<td>Theft Alarm printout</td>
<td></td>
</tr>
<tr>
<td>Overfill</td>
<td>Flashing display</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Overfill Alarm printout</td>
<td></td>
</tr>
<tr>
<td>Low Limit</td>
<td>Flashing display</td>
<td>The volume in a tank has dropped below the programmed Low Level Limit.</td>
</tr>
<tr>
<td></td>
<td>“Low Limit” annunciator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low Limit Alarm printout</td>
<td></td>
</tr>
<tr>
<td>Low Limit (Magnetostrictive Probes only)</td>
<td>Flashing display</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>“Low Limit” annunciator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Diag” annunciator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low Limit Alarm printout</td>
<td></td>
</tr>
<tr>
<td>High Water</td>
<td>Flashing display</td>
<td>Water collected in the bottom of a tank has exceeded the programmed High Water Limit.</td>
</tr>
<tr>
<td></td>
<td>“Water” annunciator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Water Alarm printout</td>
<td></td>
</tr>
<tr>
<td>External Input</td>
<td>External Input ON or OFF printout</td>
<td>An external monitoring device wired to the TLS-250 has turned on or off.</td>
</tr>
</tbody>
</table>
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 1/8 inch.

The TLS-250 Plus! equipped with Series 8472 0.1 GPH Capacitance and/or Series 8473 0.1 GPH Magnetostriective 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.

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>TEST TYPE</th>
<th>PROBE TYPE</th>
<th>MINIMUM TEST TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLS-250</td>
<td>0.2 GPH</td>
<td>0.2 Capacitance</td>
<td>5 Hours</td>
</tr>
<tr>
<td>TLS-250 Metric</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLS-250 Em. Gen. Version</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLS-250 Plus!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLS-250 Plus!</td>
<td>0.2 GPH</td>
<td>0.1 Capacitance</td>
<td>2 Hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 Magnetostriective</td>
<td></td>
</tr>
<tr>
<td>TLS-290 Plus!</td>
<td>U.1 GPH</td>
<td>U.1 Capacitance</td>
<td>3 Hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 Magnetostriective</td>
<td></td>
</tr>
</tbody>
</table>

**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 10 hours in systems of five or more tanks and 24 hours in systems of four or less tanks, and shut off automatically if no command from the operator is received to terminate the test. After the test, automatic start and stop times will again control the leak detect function.
2. To Start Leak Detect — Single Tank

   a. Turn key switch to NORMAL position.

   b. Depress the LEAK DETECT button once. Dashes (- - - -) will appear in
      the display. No tank number will appear.

   c. Depress the TANK button (the tank number will appear) and advance
      the tank digit to the desired tank.

   d. 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
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.

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

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 the occurrence.
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 printout 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.
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.

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

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

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

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


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

<table>
<thead>
<tr>
<th>ALARM HISTORY REPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-- EXT. INPUT ON --</strong></td>
</tr>
<tr>
<td>JUN 17, 1991</td>
</tr>
<tr>
<td>9:09 PM</td>
</tr>
<tr>
<td>JUN 9, 1991</td>
</tr>
<tr>
<td>4:25 PM</td>
</tr>
<tr>
<td>JUN 6, 1991</td>
</tr>
<tr>
<td>10:25 AM</td>
</tr>
<tr>
<td><strong>-- EXT. INPUT OFF --</strong></td>
</tr>
<tr>
<td>JUN 17, 1991</td>
</tr>
<tr>
<td>9:09 PM</td>
</tr>
<tr>
<td>JUN 9, 1991</td>
</tr>
<tr>
<td>4:25 PM</td>
</tr>
<tr>
<td>JUN 6, 1991</td>
</tr>
<tr>
<td>10:25 AM</td>
</tr>
<tr>
<td><strong>-------- LEAK --------</strong></td>
</tr>
<tr>
<td>JUN 4, 1991</td>
</tr>
<tr>
<td>2:00 AM</td>
</tr>
<tr>
<td>JUN 1, 1991</td>
</tr>
<tr>
<td>3:00 AM</td>
</tr>
<tr>
<td><strong>---- HIGH WATER ----</strong></td>
</tr>
<tr>
<td>JUN 25, 1991</td>
</tr>
<tr>
<td>11:34 AM</td>
</tr>
<tr>
<td><strong>-------OVERFILL-------</strong></td>
</tr>
<tr>
<td>JUN 21, 1991</td>
</tr>
<tr>
<td>5:38 PM</td>
</tr>
<tr>
<td><strong>------ LOW LIMIT ------</strong></td>
</tr>
<tr>
<td>JUN 21, 1991</td>
</tr>
<tr>
<td>9:14 AM</td>
</tr>
<tr>
<td><strong>------- THEFT -------</strong></td>
</tr>
<tr>
<td>JUN 20, 1991</td>
</tr>
<tr>
<td>3:36 AM</td>
</tr>
</tbody>
</table>
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.

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 -9.6 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:

0.20 GAL/HR

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

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.
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:

a. Turn key switch to SETUP position.

b. Depress the **FUNCTION** button to select any tank setup parameter function code.

c. Depress the **TANK** button to select the desired tank.

d. Depress the **PRINT** button. All setup information for that tank will be printed.

<table>
<thead>
<tr>
<th>TANK 1</th>
<th>PREMIUM UNLEADED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRODUCT CODE 1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH WATER LIMIT:</td>
<td>4.0 INCHES WATER</td>
</tr>
<tr>
<td>OVERFILL LIMIT:</td>
<td>9500 GALLONS FUEL</td>
</tr>
<tr>
<td>LOW LIMIT:</td>
<td>1000 GALLONS FUEL</td>
</tr>
<tr>
<td>THEFT LIMIT:</td>
<td>-99 GALLONS FUEL</td>
</tr>
<tr>
<td>LEAK LIMIT:</td>
<td>-25 GALLONS FUEL</td>
</tr>
<tr>
<td>THERMAL COEFF:</td>
<td>-0.00069 GL/GL/DEG F</td>
</tr>
<tr>
<td>DELIVERY REPORT DLY:</td>
<td>1 MINUTES</td>
</tr>
<tr>
<td>TANK CAPACITY</td>
<td></td>
</tr>
<tr>
<td>100000 GALLONS FUEL</td>
<td></td>
</tr>
<tr>
<td>0 GALLONS FUEL</td>
<td></td>
</tr>
<tr>
<td>0 GALLONS FUEL</td>
<td></td>
</tr>
<tr>
<td>0 GALLONS FUEL</td>
<td></td>
</tr>
<tr>
<td>0 GALLONS FUEL</td>
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<tr>
<td>TANK DIAMETER:</td>
<td>96.00 INCHES</td>
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<tr>
<td>TANK TILT ADDER:</td>
<td>0.00 INCHES</td>
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<tr>
<td>MANIFOLDED TANKS:</td>
<td>NONE</td>
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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, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, whether or not purposes or specifications are described herein. We further disclaim any responsibility whatsoever to you or to any other person for injury to person or damage to or loss of property or value caused by any product which has been subjected to misuse, negligence, or accident; or misapplied; or used in violation of product manuals, instructions, or warnings; or modified or repaired by unauthorized persons; or improperly installed.

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

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

F. COLLATERAL PROMISES. There are no representations, warranties, or conditions express or implied; statutory or otherwise except those herein contained, and no 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.