

TLS-3XX Series Consoles

Troubleshooting Guide

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1 Introduction

This manual contains troubleshooting information for the TLS-3XX Series Consoles. Most of the components discussed in this manual are replaceable and not repaired. The intent of this manual is to help you identify replaceable parts and assemblies, explain alarms and diagnostic displays, provide accepted troubleshooting guidelines for sensor, probe and DIM problems, and include actual examples illustrating methods for isolating CSLD and BIR problems. Information on individual plug-in modules is covered in manuals accompanying those components and/or systems.

Related Manuals

Troubleshooting of a TLS Console requires knowledge of the system site prep and installation as well as setup, and operation of all installed options. Refer to the Tech Docs CD-ROM (V-R P/N 331650-001) for all relevant manuals:

576013-879	TLS-3XX Series Site Prep and Installation Manual
576013-623	TLS-3XX Series System Setup Manual
576013-610	TLS-3XX Series Operating Manual
576013-635	TLS-3XX Series RS-232 Serial Interface Manual
577013-750	Sensor Products Application Guide
577013-874	Maintenance Service Codes

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank







VR Vapor Products Certification: Contractors holding a certification with the following designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- ISD – In Station Diagnostics
- PMC – Pressure Management Control
- CCVP - Veeder-Root Vapor Polisher
- Wireless – ISD/PMC Wireless
- A current Veeder-Root Technician Certification is a prerequisite for the VR Vapor Products course.




Warranty Registrations may only be submitted by selected Distributors.

Safety Precautions

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions

 <p>EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.</p>	 <p>FLAMMABLE Fuels and their vapors are extremely flammable.</p>
 <p>ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.</p>	 <p>TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.</p>
 <p>WARNING Heed the adjacent instructions to avoid damage to equipment, property, environment or personal injury.</p>	 <p>READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.</p>

Safety Warnings

 WARNING	
 	<p>This system operates near highly combustible fuel storage tanks.</p> <p>Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified or is used in any way other than its intended use. Serious contamination of the environment may also occur.</p> <p>FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.</p> <p>To ensure proper installation, operation, and continued safe use of this product:</p> <ol style="list-style-type: none"> 1. Read and follow all instructions in this manual, including all safety warnings. 2. Have equipment installed by a contractor trained in its proper installation and in compliance with all applicable codes including: the National Electrical Codes 70 and 30A; federal, state, and local codes; and other applicable safety codes. 3. Substitution of components may impair intrinsic safety. 4. Do not modify or use service parts other than those provided by Veeder-Root.

Explanation of Software Version Numbering

Software version numbers for TLS Consoles are designated in five formats: 0xx, 1xx, 3xx, 4xx, and 5xx. These formats are assigned based on the console's having a CPU or ECPU board, its model designation, and its enabled features:

TLS-300 CONSOLES

- **4XX** software (up to 8 tanks and 8 Sensors)

TLS-350* CONSOLES HAVING FORM NUMBERS 08470XX-XXX

- **020** software (up to 8 tanks and 6 PLLD line leak transducers)
- **520** software (up to 8 tanks and 9 WPLLD line leak transducers)

*Feature enhancements for this console will not be supported beyond V20 software.

TLS-350J* CONSOLES HAVING FORM NUMBERS 08470XX-XXX

- **020** software (up to 3 tanks and 3 PLLD line leak transducers)
- **520** software (up to 3 tanks and 3 WPLLD line leak transducers)

*Feature enhancements for this console will not be supported beyond V20 software.

TLS-350 PLUS CONSOLES HAVING FORM NUMBERS 08482XX-XXX

- **1XX** software (up to 8 tanks and 6 PLLD or 9 WPLLD line leak transducers)

TLS-350R CONSOLES HAVING FORM NUMBERS 08482XX-XXX

- **3XX** software (up to 16 tanks, 6 PLLD or 9 WPLLD line leak transducers, and/or BIR on manifolded tanks).

Verifying Installed System Features

CONSOLE HAS A PRINTER

If the console has a printer, you can determine which system features, such as Business Inventory Reconciliation (BIR), are available in your console as follows.

1. Press the MODE key until the front panel display reads:

DIAG MODE
PRESS <FUNCTION> TO CONT

2. Press the FUNCTION key until this message appears:

SYSTEM DIAGNOSTIC
PRESS <STEP> TO CONTINUE

3. Press the PRINT key and the printer prints:

SOFTWARE REVISION LEVEL

VERSION XXX.XX *(first 3 digits = software version e.g. 327. The second two are its rev level)*

SOFTWARE# XXXXXX-XXX-X

CREATED - YY:MM:SS:HH:MM

S-MODULE# XXXXXX-XXX-X

4. After the S-Module part number prints, a list of your system's current features follows. Press the MODE key to return to the main screen:

MMM DD, YYYY HH:MM:SM XM
ALL FUNCTIONS NORMAL

5. Close and secure the left front door.

CONSOLE DOES NOT HAVE A PRINTER

If the console does not have a printer, you can determine which system features, such as BIR, are available in your console by knowing the part number of the S-Module (SEM) installed on the CPU or ECPU board and following the steps below.

1. Press the MODE key until the front panel display reads:

DIAG MODE
PRESS <FUNCTION> TO CONT

2. Press the FUNCTION key until this message appears:

SYSTEM DIAGNOSTIC
PRESS <STEP> TO CONTINUE

3. Press the STEP key until this message appears:

SOFTWARE MODULE
S-MODULE# XXXXXX-XXX-X

Match the first 9 digits of the S-Module number to the SEM part numbers in the appropriate table in Appendix A to verify what enhancements are enabled in your console.

Alternately, If the console does not have a printer, but has a RS-232 serial port, connect a laptop to this port and using the laptop's Hyperterminal program, send a <Ctrl A> I90200 command (V14 or earlier software) or a <Ctrl A> I90500 command (V15 or later software) to the console to display the system features.

2 System Description

System Parts Identification

The following figures identify the components of TLS-3XX Series consoles. Plug-in modules are not shown.

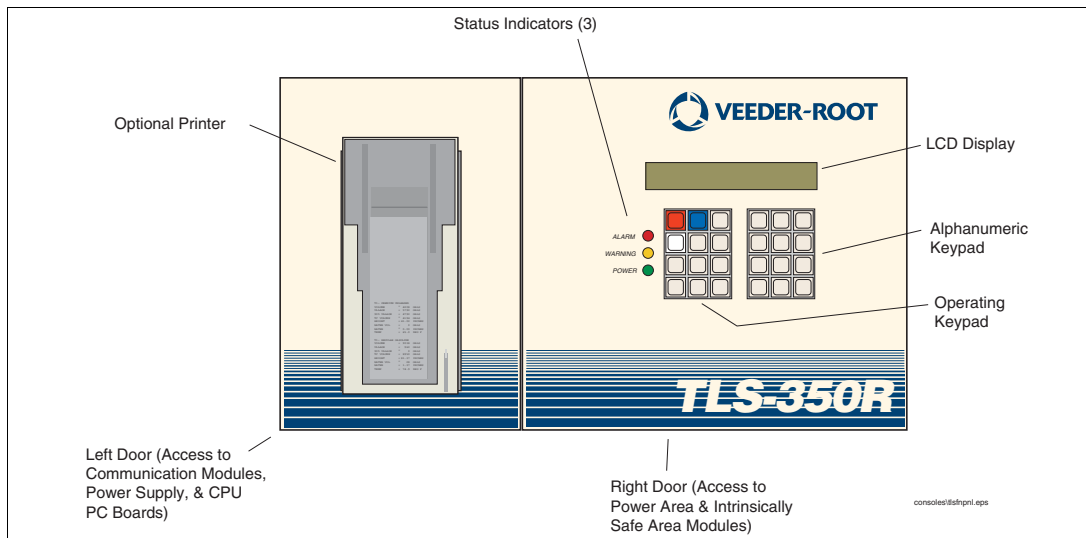


Figure 2-1. Console Front Panel (except for graphics, console doors are identical)

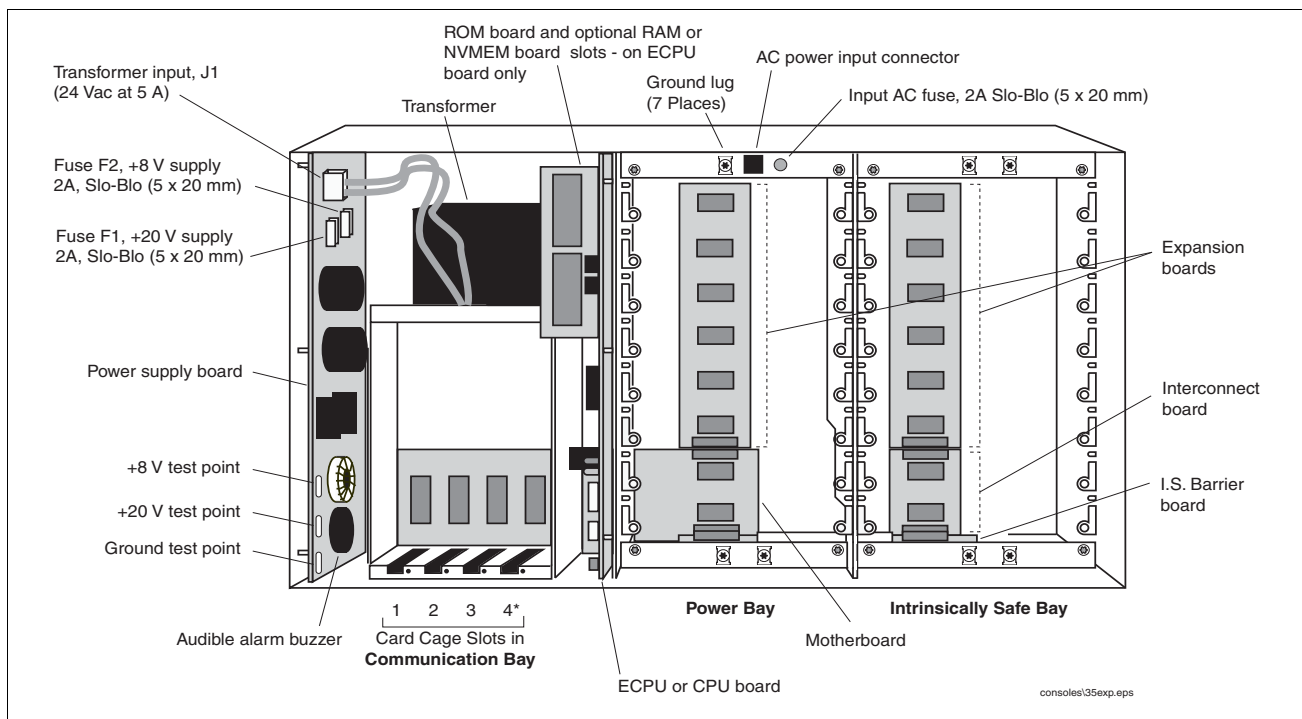


Figure 2-2. Communication Bay, Power Bay and Intrinsically Safe Bay Identification (TLS-350 Series consoles)

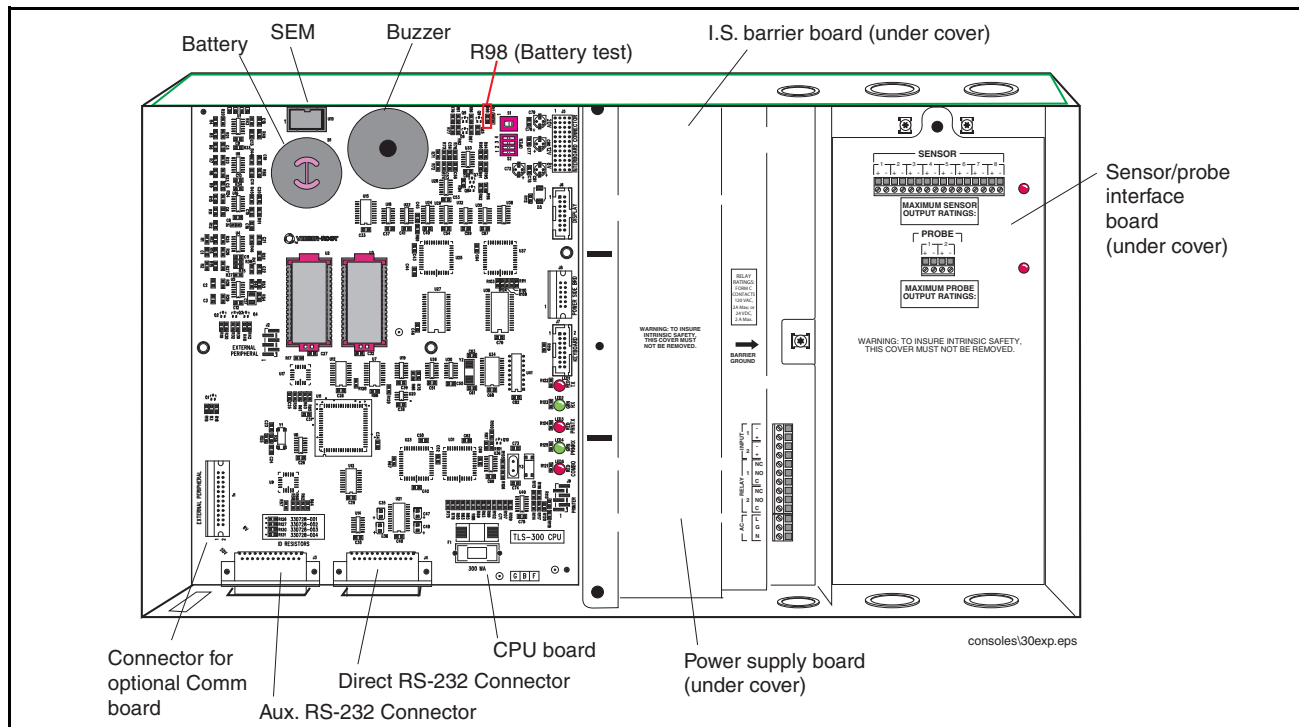


Figure 2-3. PC Board Identification (TLS-300 Series consoles shown with doors removed)

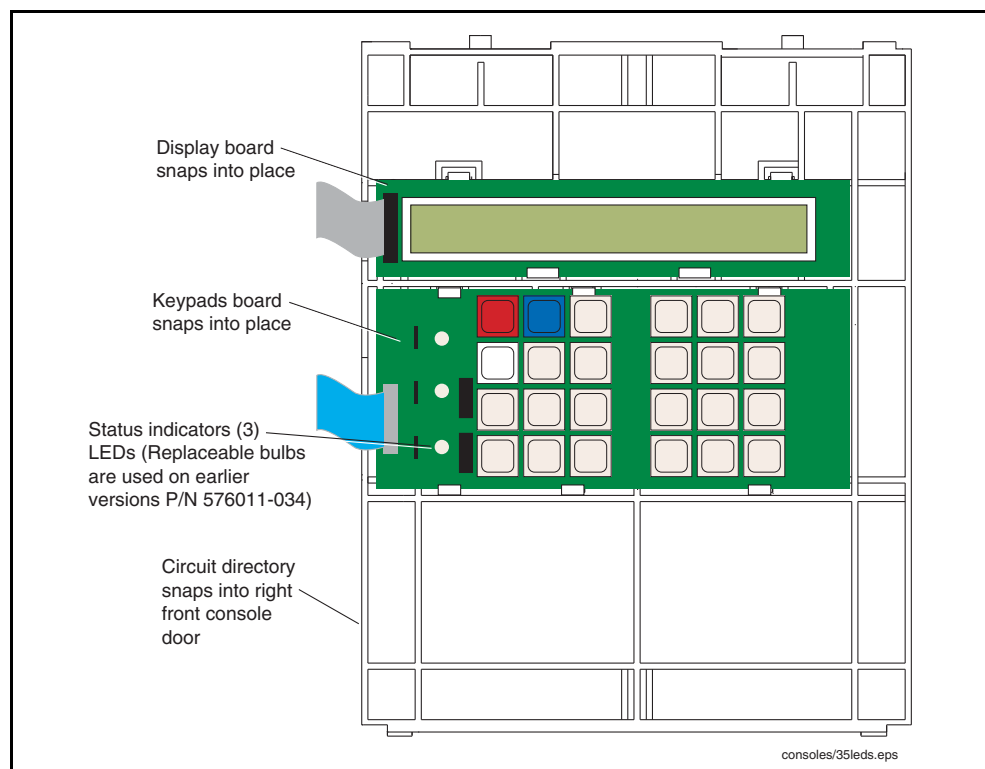


Figure 2-4. Console Display/Keyboard Board Components (behind right door)

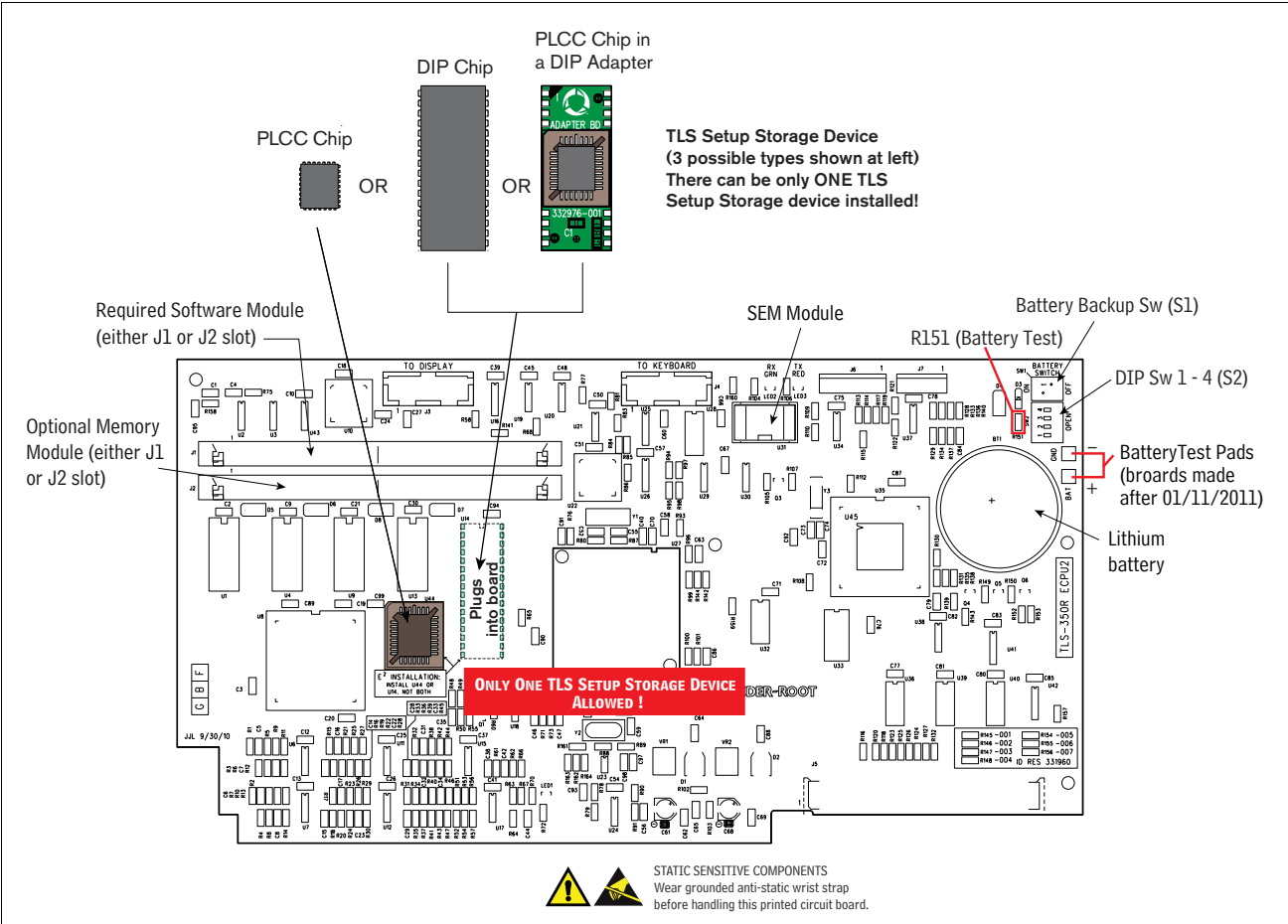


Figure 2-5. TLS-350 consoles ECPU2 board layout - (only one TLS Setup Storage Device can be installed at one time)

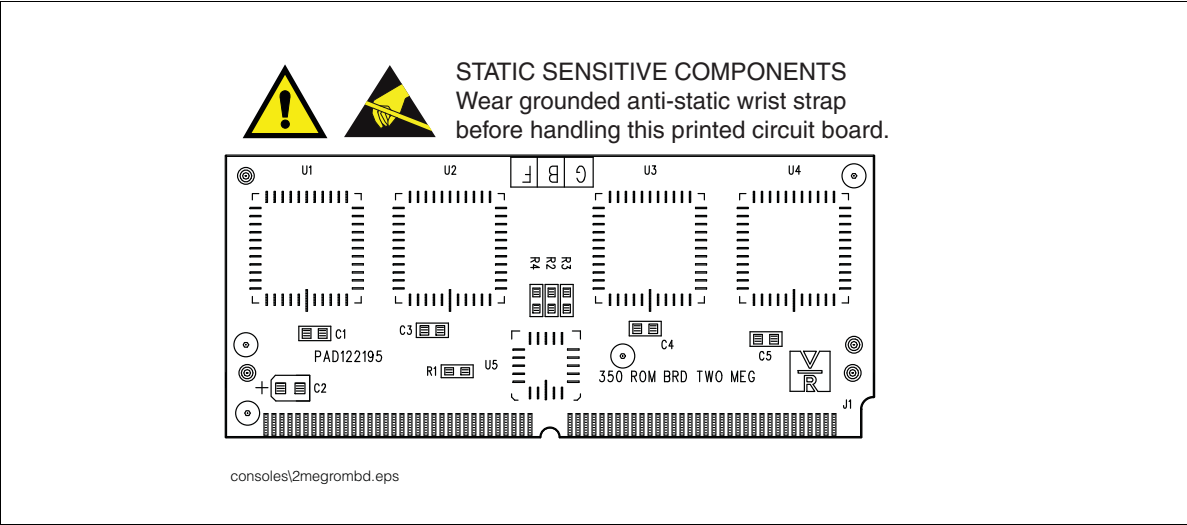


Figure 2-6. TLS-350 Series Console - 2 Meg ROM Board

**STATIC SENSITIVE COMPONENTS**

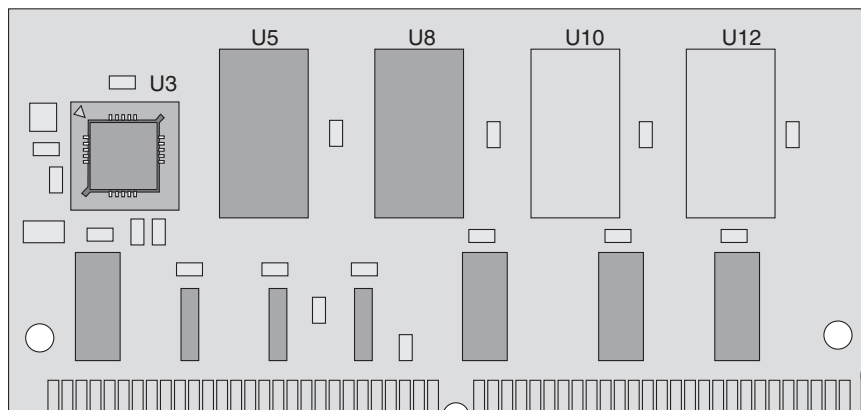
Wear grounded anti-static wrist strap before handling these printed circuit boards.

NVMEM 102 Card (Front side)

P/N 332966-102

P/N 331943-102 (discontinued)

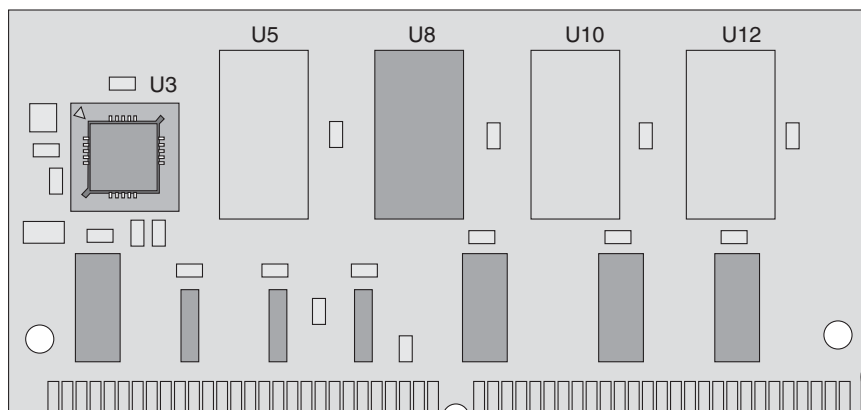
Used only on an ECPU w/o ISD
Replaces 1/2 Meg RAM cards in
consoles w/ more than 8 probes.

**NVMEM 201 Card (Front side)**

P/N 332966-201

P/N 331943-201 (discontinued)

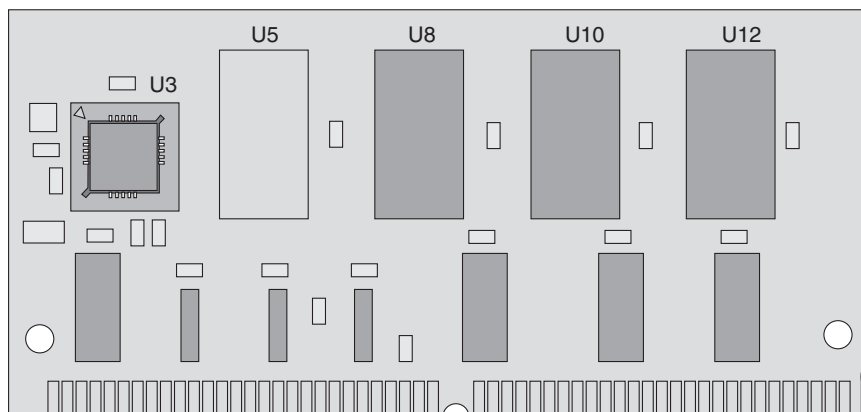
Used with ECPU2 when more
than 8 probes or BIR for mani-
folded tanks is configured.

**NVMEM 203 Card (Front side)**

P/N 332966-203

P/N 331943-203 (discontinued)

Used with the ECPU2 when
ISD is enabled, 16 probes
maximum.



consoles\nvmembd.eps

Figure 2-7.TLS-350 Series consoles - NVMEM Boards

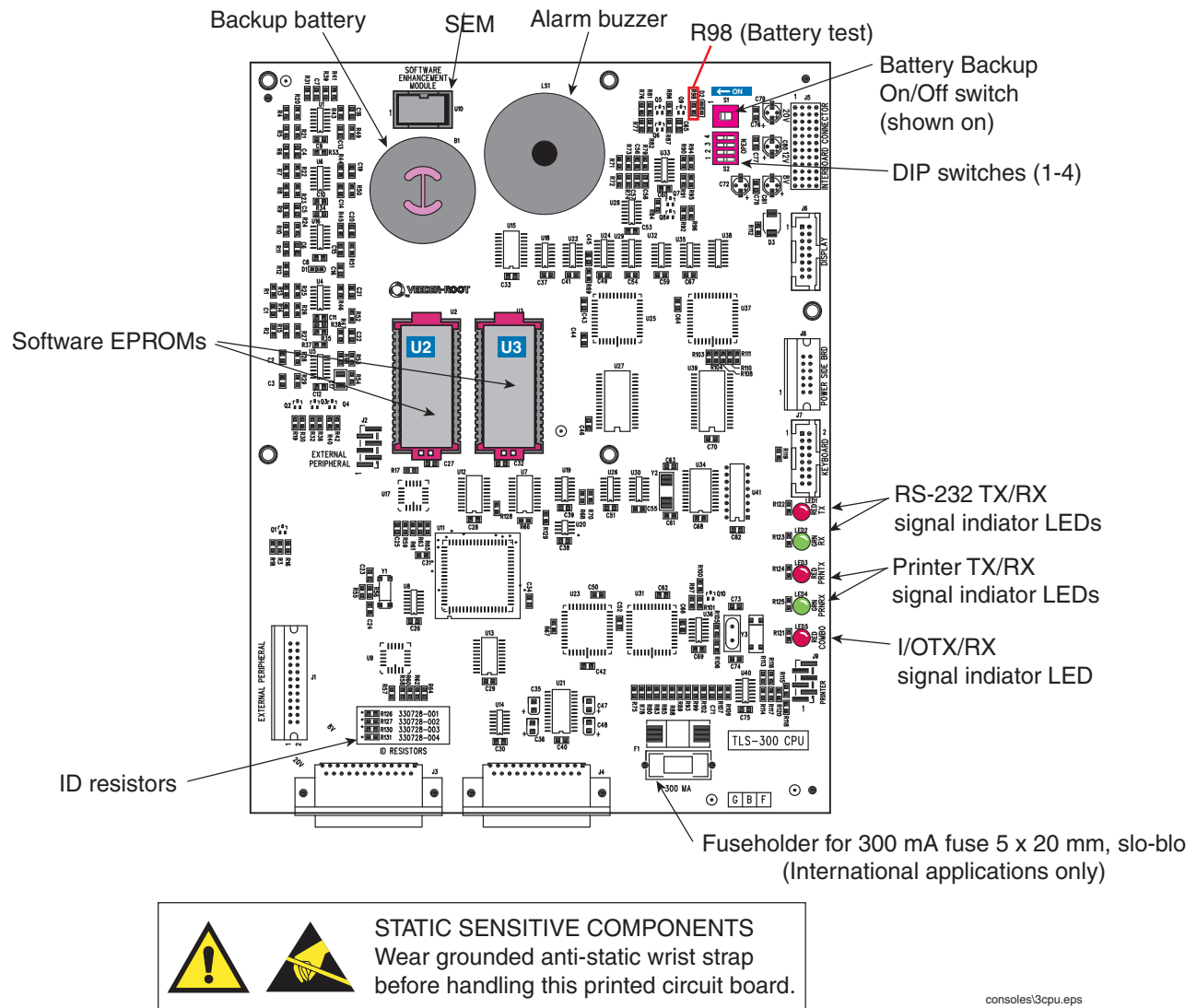


Figure 2-8.TLS-300 Series console CPU board layout with surface-mount components

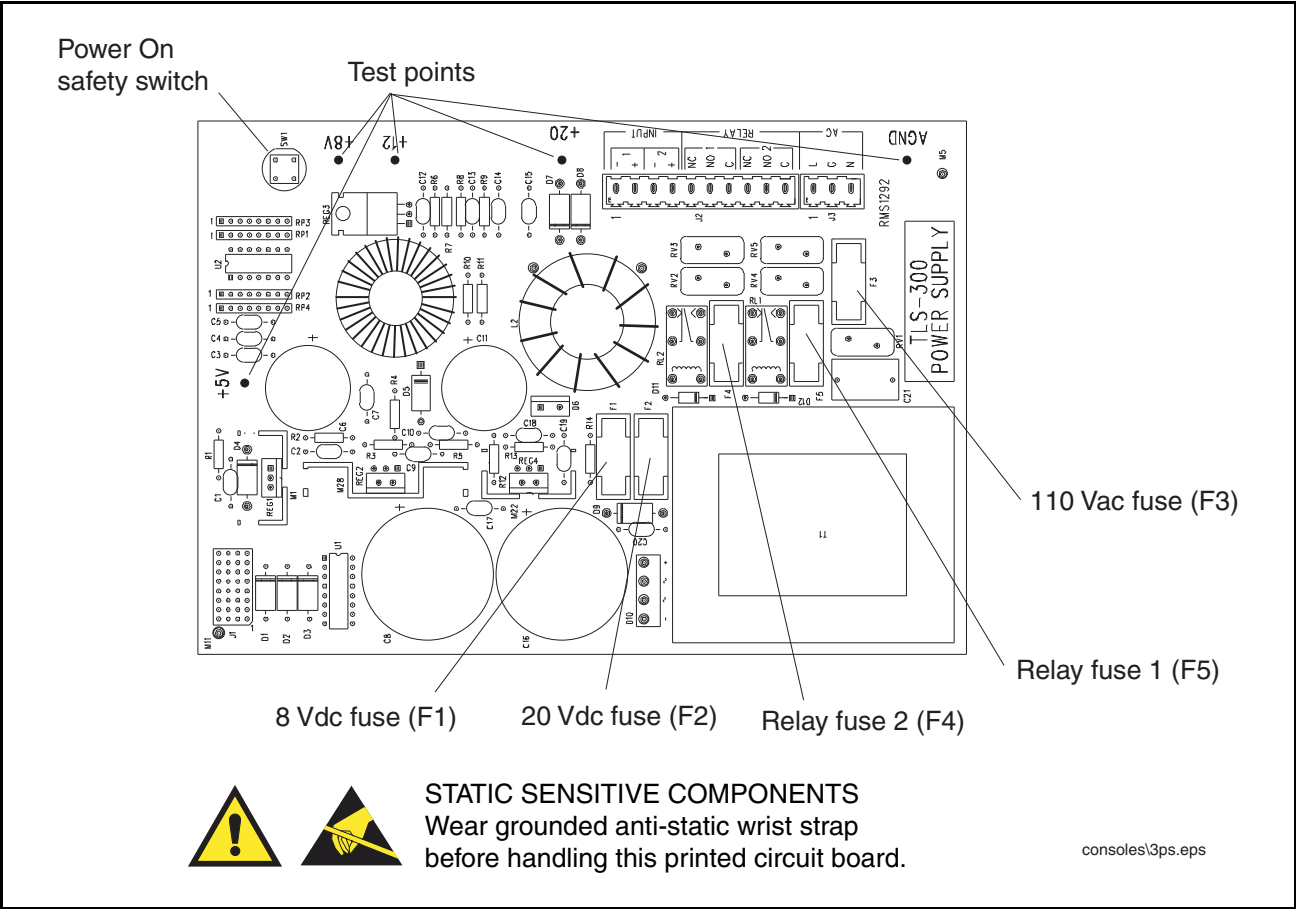


Figure 2-9.TLS-300 Series console Power Supply Board

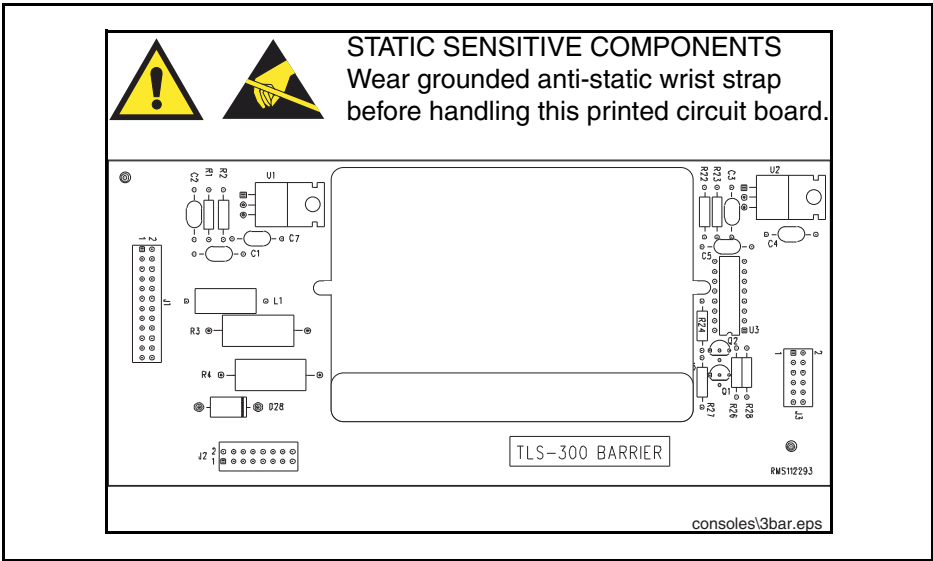


Figure 2-10.TLS-300 Series console I.S. Barrier Board

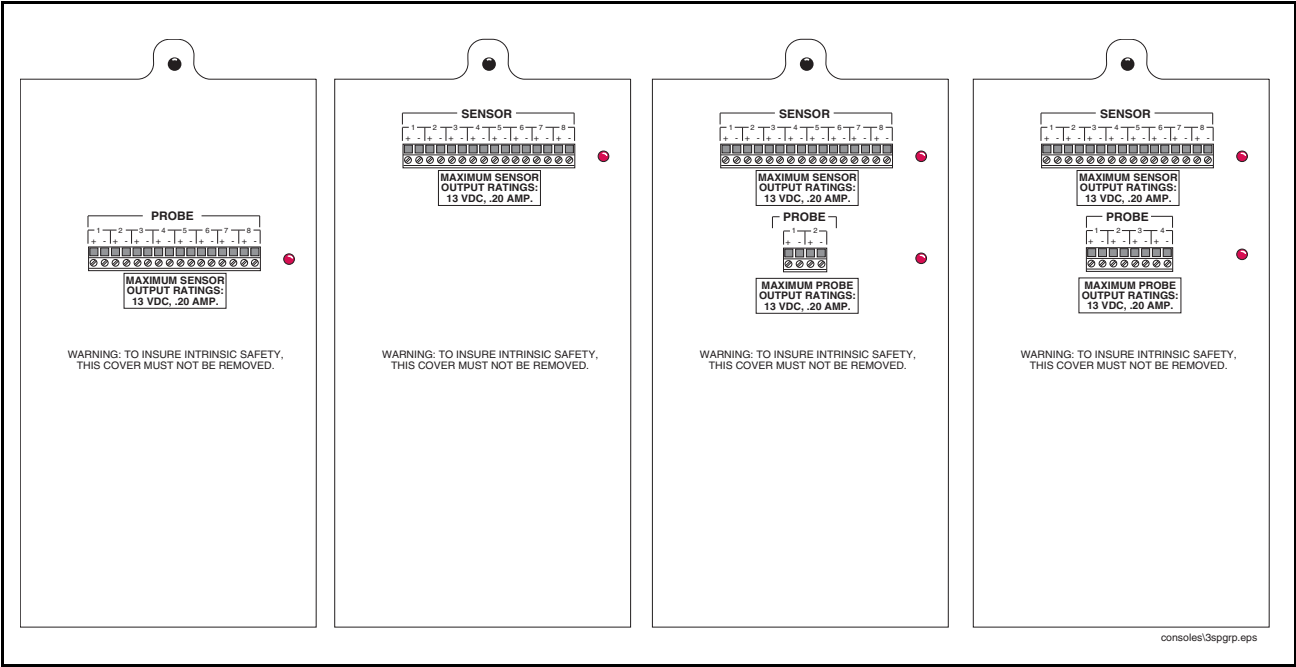


Figure 2-11.Example TLS-300 Series console Sensor/Probe Interface Boards (8P/0S, 8S/0P, 8S/2P, and 8S/4P)

Basic Troubleshooting Procedures

To help ensure proper and safe troubleshooting and repair procedures for the TLS consoles, the following steps should be taken in the order they appear, prior to servicing the system:

- 1. Review and thoroughly understand the "Safety Warnings" on page 1-2 of this manual.
- 2. Review the "System Parts Identification" on page 2-1 to locate components.
- 3. Perform an "Basic Troubleshooting Procedures" on page 2-8. If the system fails the Intrinsic Safety Check, turn the AC Power circuit breaker at the service panel to the OFF position, disconnect and cap the AC wires in the monitor, and disconnect and cap all probe and sensor field wires in the probe and sensor junction boxes.
- 4. Perform the "Visual Inspection of Console Interior" on page 2-9.
- 5. Print out all system and tank setup parameters. IMPORTANT! Setup parameters can be lost during some service procedures. This printout will allow you to re-profile the system with the same parameters when service is complete.
- 6. Refer to the appropriate section of this manual (or another manual, see "Related Manuals" on page 1-1) to troubleshoot a faulty component of the system.

Intrinsic Safety Check



Turn off, tag and lockout power to the console before starting this intrinsic safety check.

Definition of Intrinsic Safety Circuit and System- *An intrinsically safe circuit is one in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions. An intrinsically safe system is an assembly of interconnected intrinsically safe apparatus, associated apparatus, and interconnecting cables in that those parts of the system that may be used in hazardous (classified) locations are intrinsically safe circuits.

*Excerpt from latest National Electrical Code Handbook.

WARNING

Explosion could occur if other wires share conduits or troughs with TLS console intrinsically safe probe, sensor, and thermistor wiring. Conduits and wiring troughs from the console's probes, sensors, and thermistors must not contain any other wires and must enter the console through their designated preformed knockouts.

Improper system operation could result in inaccurate inventory control or undetected potential environmental and health hazards if probe-and sensor-to-monitor wiring runs exceed 1,000 feet. Probe-and sensor-to-monitor wiring runs over 1,000 feet are not UL approved for this application.

To avoid electrical shock resulting in personal injury, death, equipment damage or damage to the environment, switch OFF and tag the AC power circuit breaker at the service panel while inspecting, removing, or installing wiring and components.

- 1. Verify that the TLS console is installed indoors in an accessible location.
- 2. Verify that the TLS console has #12 AWG (or larger diameter) conductor from barrier to earth ground in the power panel.

3. Verify that the TLS Console has a chassis ground connected.
4. Verify that power conduit and sensor and probe conduits enter TLS Console only through preformed, designated knock-outs.
5. Verify that probe and sensor wiring and conduit meet Veeder-Root requirements (ref. manual P/N 576013-879).
6. If the system fails the intrinsic safety check, disconnect and cap the AC wires in the monitor, and disconnect and cap all probe and sensor field wires in the probe and sensor junction boxes.

IMPORTANT! Do not apply power to the system until its installation has been checked and found to be in accordance with the instructions outlined in the Veeder-Root TLS-3XX Series Site Prep and Installation manual; the National Electrical Code; federal, state, and local codes; and other applicable safety codes.

Visual Inspection of Console Interior

It is recommended that whenever troubleshooting, repairing, or replacing components, a visual inspection of the overall condition of the system be made.



Turn off, tag and lockout power to the console before starting this inspection.

1. Inspect for signs of corrosion inside the console.
2. Check for broken or frayed insulation on all wires and be sure that the wires are secure at their terminals.
3. Check all PC boards for cracks.
4. Check to see that there is no loose or missing hardware for components (transformers, PC boards, brackets, etc.).
5. Check to see that all interconnecting cable connectors are firmly seated. Check connector ends for cracks and flat cable for breaks.
6. Check fuse continuity and fuseholder contacts for corrosion.
7. Check monitor for cracked display lens and damaged or missing buttons.
8. Check the mounting of the equipment to be sure all components were mounted properly and in accordance with instructions contained in the Site Preparation and Installation manual.
9. Verify that no unapproved modifications to equipment have been made, no unapproved parts are being used, and previous repairs and modification bring the unit to original factory condition
10. All deficiencies should be corrected and damaged components replaced before continuing with procedures.

Test Front Panel LEDs, Display, and Console Beeper

Apply power to the console. The display should read the start-up message and the green POWER LED should illuminate. Press the ALARM/TEST button to verify that the red ALARM and yellow WARNING LEDs illuminate and the console beeper switches On.

Testing and Replacing the Battery - TLS-350

NOTE Veeder-Root recommends conducting the following procedure prior to any Annual Certification or Operability test. This procedure will help assist in identifying the operational status of the backup battery before removing power to the ATG system. During this procedure the TLS power should remain on at all times unless specified.

1. Print out the System Setup.
2. Refer to the TLS-3XX System Setup manual, Section 28 Archiving Utility, and perform the Archiving Setup Data procedure.
3. Again print out System Setup and verify that the Archived Setup matches the setup printed in Step 1.

NOTE 4. For easier access to the ECPU and Battery, you may want to remove the printer door group.

5. Carefully remove printer ribbon cable between the printer and ECPU. Do NOT shut the Battery Switch off (Down Position).

6. Using a Volt Meter, verify battery voltage for the applicable console by putting the positive lead on Resistor 151 shown in Figure 2-5) and the negative lead on any exposed metal of the console's chassis. Use the battery test pads for voltage measurement, if available.

NOTE: TLS-350/350R ECPU boards manufactured after January 19th 2011 have Battery Test points located below the dip switch area. The figure below shows the location of both the battery test pads and R151.

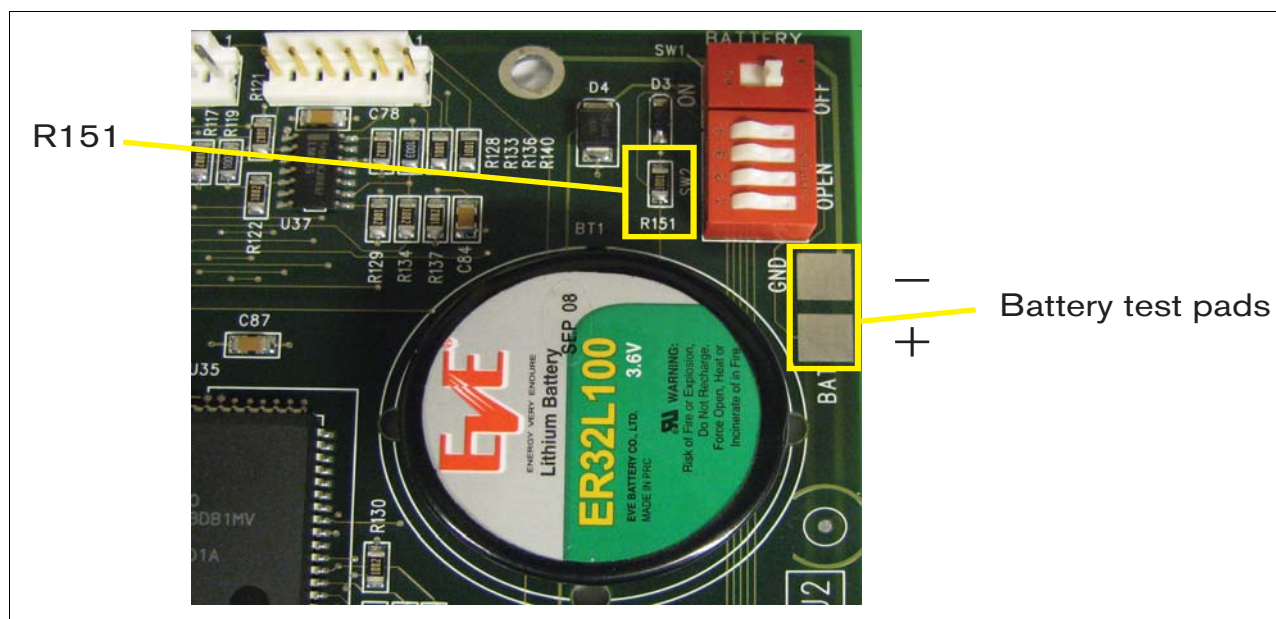
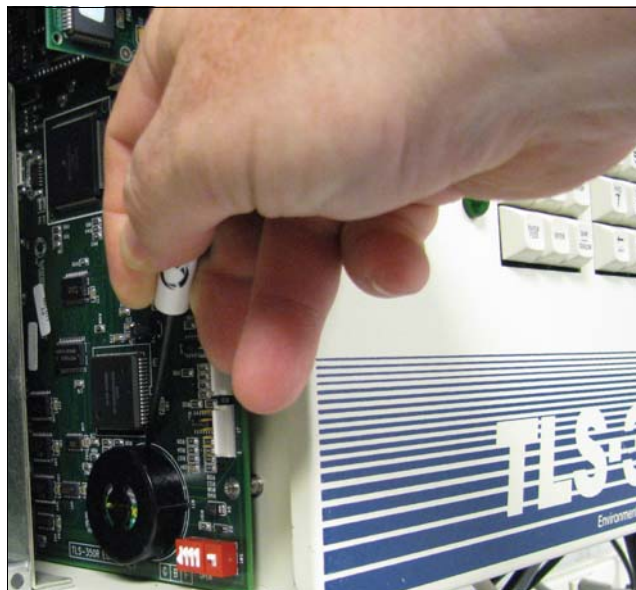
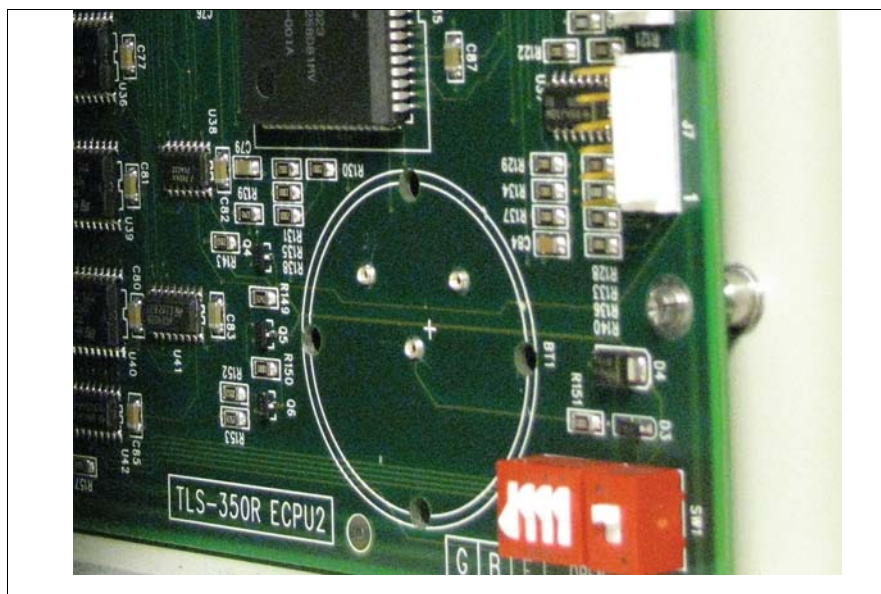


Figure 2-12. Battery voltage test locations on ECPU board

7. Does the volt meter read 3.4 to 3.6 Vdc? If Yes, Do not remove Battery. Battery is not defective do not remove it, go to Step 14. If No, go to Step 8.
8. Using an insulated screw driver, push down and pull away on the battery cover that is attached to the ECPU board. You may want to use your finger tips to help remove the battery cover. Please be careful you don't touch any other circuits on the board (see Figure 2-13, A). After the top of the battery cover has dislodged, you can pull the cover off with you finger tips (see Figure 2-13, B).

**A. Dislodging Battery Cover****B. Battery Cover Dislodged****Figure 2-13. Removing Battery Cover**

9. When removing battery, please ensure that you do not disconnect the ECPU board from the mother board (Back Plane).
10. Check new battery before installing on ECPU board. Confirm it reads 3.4 to 3.6 Vdc.
11. Install new battery (see Figure 2-14).

**Figure 2-14. Install New Battery**

12. Verify Voltage using the procedure in Step 6.
13. Re-install battery cover and printer door group.



Do not reconnect the Printer Ribbon Cable until you remove power from the TLS system. Doing so before power is removed, may cause damage to the ECPU or Printer.

14. If an annual ATG certification is being performed at this time, you can safely remove power to the TLS via the assigned dedicated circuit breaker so the fail safe procedure or annual certification procedure can be completed.
15. If the TLS produces an H8 or "UNRECOVERABLE DATA ERROR" while performing Step 14, please contact Technical Support for further assistance.

Testing and Replacing the Battery - TLS-300

NOTE Veeder-Root recommends conducting the following procedure prior to any Annual Certification or Operability test. This procedure will help assist in identifying the operational status of the backup battery before removing power to the ATG system. During this procedure the TLS power should remain on at all times unless specified.

1. Print out the System Setup.

- NOTE**
2. For easier access to the CPU and Battery, you may want to remove the printer door group.
 3. Carefully remove printer ribbon cable between the printer and CPU. Do NOT shut the Battery Switch off.
 4. Using a Volt Meter, verify battery voltage for the applicable console by putting the positive lead on Resistor 98 shown in Figure 2-8) and the negative lead on any exposed metal of the console's chassis.
 5. Does the volt meter read 3.4 to 3.6 Vdc? If Yes, Do not remove Battery. Battery is not defective do not remove it, go to Step 12. If No, go to Step 6.
 6. Using an insulated screw driver, push down and pull away on the battery cover that is attached to the CPU board. You may want to use your finger tips to help remove the battery cover. Please be careful you don't touch any other circuits on the board (see Figure 2-13, A). After the top of the battery cover has dislodged, you can pull the cover off with you finger tips (see Figure 2-13, B).
 7. When removing battery, please ensure that you do not disconnect the CPU board from the mother board (Back Plane).
 8. Check new battery before installing on CPU board. Confirm it reads 3.4 to 3.6 Vdc.
 9. Install new battery (see Figure 2-14).
 10. Verify Voltage using the procedure in Step 4.
 11. Re-install battery cover and printer door group.



Do not reconnect the Printer Ribbon Cable until you remove power from the TLS system. Doing so before power is removed, may cause damage to the CPU or Printer.

12. If an annual ATG certification is being performed at this time, you can safely remove power to the TLS via the assigned dedicated circuit breaker so the fail safe procedure or annual certification procedure can be completed.

3 Software Version Feature List

Table 3-1 through Table 3-7 list the release dates of all system software versions and when major features were introduced or discontinued for TLS-3XX Series Consoles.

Table 3-1. TLS-350 Series Software Versions 1 - 9

FEATURE	TLS-350 SYSTEM SOFTWARE VERSION (Release Date)								
	1 (3/92)	2 (8/92)	3 (12/92)	4 (4/93)	5 (8/93)	6 (1/94)	7 (8/94)	8 (1/95)	9 (8/95)
Cap 0 Probes	C0	C0	C0	C0	C0	C0,E1	C0,E1	C0,E1,E3	C0,E1,E3
Cap 1 Probes	C0	C0	C0	C0	C0	C0,E1	C0,E1	C0,E1,E3	—
Mag 0, 1, 2 Probes	C0	C0	C0	C0	C0	C0,E1	C0,E1	C0,E1,E3	C0,E1,E3
Mag 3 Probes	—	—	—	C0	C0	C0,E1	C0,E1	C0,E1,E3	C0,E1,E3
Mag 4, 5, 6 Probes	—	—	—	—	—	—	C0,E1	C0,E1,E3	C0,E1,E3
Tank 9 - 16	—	C0	C0	C0	C0	C0,E1	C0,E1	E3	E3
Remote Display	C0	C0	C0	C0	C0	C0,E1	C0,E1	C0,E1,E3	C0,E1,E3
Remote Printer ¹	—	C0	C0	C0	C0	C0,E1	C0,E1	C0,E1,E3	C0,E1,E3
VLLD	C0	C0	C0	C0	C0	C0,E1	C0,E1	C0,E1,E3	C0,E1,E3
PLLD	—	—	—	—	—	—	C0,E1	C0,E1,E3	C0,E1,E3
CSLD	—	C0	C0	C0	C0	C0,E1	C0,E1	C0,E1,E3	C0,E1,E3
CSLD (manifolded tanks)	—	—	—	—	—	C0,E1	C0,E1	C0,E1,E3	C0, E1,E3
SiteFax	—	C0	C0	C0	C0	C0,E1	C0,E1	C0,E1,E3	C0, E1,E3
Fuel Manager	—	—	—	—	—	C0,E1	C0,E1	C0,E1,E3	C0,E1,E3
BIR	—	—	—	—	—	E1	E1	E1,E3	E1,E3
Inform/TLS-PC 32	—	—	—	—	—	—	—	C0,E1	C0,E1,E3

Board Type/Software Version Requirement Legend: — = Feature Not Available/Discontinued, C0 = CPU with 0XX Software, E1= ECPU with 1XX Software, E3 = ECPU with 3XX Software

¹Remote printer comm settings are: 1200 baud, 7 data bits, odd parity, & 1 stop bit.

3 Software Version Feature List

Table 3-2. TLS-350 Series Software Versions 10 - 19

FEATURE	TLS-350 SYSTEM SOFTWARE VERSION (Release Date)								
	10 (10/95)	11 (7/96)	12 (10/96)	14 (2/97)	15 (10/97)	16 (4/98)	17 (10/98)	18 (7/99)	19 (12/99)
Cap 0 Probes	C0	C0	C0	C0	C0	C0	C0	—	—
Mag 0, 1, 2 Probes	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, C5, E1, E3
Mag 3 Probes	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, C5, E1, E3
Mag 4, 5, 6 Probes	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, C5, E1, E3
Mag 7 - 12 Probes	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	E3	E3	E3	E3
Tank 9 - 16	E3	E3	E3	E3	E3	E1, E3	E1, E3	E1, E3	E1, E3
Remote Display	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3
Remote Printer ¹	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3
VLLD	C0, E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3
PLLD	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3
WPLLD	—	—	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C5, E1, E3
CSLD	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, C5, E1, E3
CSLD (manifolded tanks)	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, C5, E1, E3
SiteFax	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, C5, E1, E3
Fuel Manager	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	E1, E3	E1, E3	E1, E3	E1, E3
BIR	E1, E3	E1, E3	E1, E3	E1, E3	E1, E3	E3	E3	E3	E3
BIR (manifolded tanks)	E3	E3	E3	E3	E3	E1, E3	E1, E3	E1, E3	E1, E3
BIR Variance Analysis	—	—	—	—	—	E1, E3	E1, E3	E1, E3	E1, E3
IFSF	—	—	—	—	—	—	C0, E1, E3	C0, E1, E3	C0, C5, E1, E3
Inform/TLS-PC 32	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, E1, E3	C0, C5, E1, E3

Board Type/Software Version Requirement Legend: — = Feature Not Available/Discontinued, C0 = CPU with 0XX Software, C5 = CPU with 5XX Software, E1 = ECPU with 1XX Software, E3 = ECPU with 3XX Software

¹Remote printer comm settings are: 1200 baud, 7 data bits, odd parity, & 1 stop bit.

3 Software Version Feature List

Table 3-3. TLS-350 Series Software Version 20 - 27

FEATURE	TLS-350 SYSTEM SOFTWARE VERSION (Release Date)							
	20 (7/00)	21 (10/00)	22 (9/01)	23 (4/02)	24 (7/03)	25 (9/05)	26 (11/05)	27 (8/06)
Mag 0, 1, 2 Probes	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
Mag 3 Probes	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
Mag 4, 5, 6 Probes	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
Mag 7 - 12 Probes	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
Tank 9 - 16	E3	E3	E3	E3	E3N, E5	E3N, E5	E3N, E5	E7
Remote Display	E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
Remote Printer ¹	E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
VLLD	E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
PLLD	C0, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
WPLLD	C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
CSLD	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
CSLD (manifolded tanks)	C0, C5, E1, E3	E1, E3	E1, E3	E3	E3N,E5	E3N,E5	E3N,E5	E4, E7
SiteFax	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
Fuel Manager	C0, C5, E1, E3	E1, E3	E1, E3	E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
BIR	E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
BIR (manifolded tanks)	E3	E3	E3	E3	E3N,E5	E3N,E5	E3N,E5	E7
BIR Variance Analysis	E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
IFSF	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
330743-00X ECPU Board	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N	E3N	E3N	—
Inform/TLS-PC 32	C0, C5, E1, E3	E1, E3	E1, E3	E1, E3	E3N, E5	E3N, E5	E3N, E5	E4, E7
331960-001 ECPU2 Board	—	—	—	—	E5	E5	E5	E4, E7
Mag Sensor, Vac Sensor, ATMP Sensor	—	—	—	—	E3N, E5	E3N, E5	E3N, E5	E4, E7
ISD	—	—	—	—	—	E6	E6	E6
Maintenance Tracker ²	—	—	—	—	—	—	—	E6

BOARD TYPE/SOFTWARE VERSION REQUIREMENT LEGEND:

— = Feature Not Available/ Discontinued

C0 = CPU with 0XX Software

C5 = CPU with 5XX Software

E1= ECPU with 1XX Software

E3 = ECPU1 with 3XX Software & 1/2 Meg RAM

E3N = ECPU1 with 3XX Software & NVMEM102

E4 = ECPU2 with 1XX Software

E5 = ECPU2 with 3XX Software

E6 = ECPU2 with 3XX Software & NVMEM203

E7 = ECPU2 with 3XX Software & NVMEM201

¹Remote printer comm settings are: 1200 baud, 7 data bits, odd parity, & 1 stop bit.

²Requires an NVMEM 203 card, a MT Comm card, and a valid Contractor's ID key.

3 Software Version Feature List

Table 3-4. TLS-350 Series Software Version 28 and Higher

FEATURE	TLS-350 SYSTEM SOFTWARE VERSION (Release Date)							
	28 (3/08)	29 (10/08)	30 (7/10)	31 (2/11)	32 (7/11)	33 (7/13)		
Mag 0, 1, 2 Probes	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
Mag 3 Probes	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
Mag 4, 5, 6 Probes	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
Mag 7 - 12 Probes	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
Tank 9 - 16	E7	E7	E7	E7	E7	E7		
Remote Display	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	—		
Remote Printer ¹	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
VLLD	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
PLLD	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
WPLLD	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
CSLD	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
CSLD (manifolded tanks)	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
SiteFax	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
Fuel Manager	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
BIR	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
BIR (manifolded tanks)	E7	E7	E7	E7	E7	E7		
BIR Variance Analysis	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
IFSF	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
Inform/TLS-PC 32	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
331960-001 ECPU2 Board	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
Mag Sensor, Vac Sensor, ATMP Sensor	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
ISD/PMC	E6	E6	E6	E6	E6	E6		
Maintenance Tracker ²	E6	E6	E6	E6	E6	E6		
Service Notice, VCM	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7	E4, E7		
Ethanol Phase Separation	—	—	E4, E6, E7	E4, E6, E7	E4, E6, E7	E4, E6, E7		
Automatic Pressure Monitoring (APM)	—	—	—	E6	E6	E6		
Fiscal Height Security	—	—	—	—	E4, E7	E4, E7		
Alarm Reduction	—	—	—	—	E4, E6, E7	E4, E6, E7		
Programmable Inventory Alarm Threshold Units	—	—	—	—	—	E4, E6, E7		
Programmable Minimum Water Threshold	—	—	—	—	—	E4, E6, E7		

Board Type/Software Version Requirement Legend: E4 = ECPU2 w/1XX Software; E6 = ECPU2 w/3XX Software & NVMEM203; E7 = ECPU2 w/ 3XX Software & NVMEM201

¹Remote printer comm settings are: 1200 baud, 7 data bits, odd parity, & 1 stop bit.

²Requires an NVMEM 203 card, a MT Comm card, and a valid Contractor's ID key.

3 Software Version Feature List

Table 3-5. TLS-300 Series Software Versions 1 - 9

FEATURE	TLS-300 SYSTEM SOFTWARE VERSION (Release Date)								
	1 (3/92)	2 (8/92)	3 (12/92)	4 (4/93)	5 (8/93)	6 (1/94)	7 (8/94)	8 (1/95)	9 (8/95)
Cap 0 Probes	C0	C0	C0	C0	C0	C0	C0	C0	C0
Cap 1 Probes	C0	C0	C0	C0	C0	C0	C0	C0	—
Mag 0, 1, 2 Probes	C0	C0	C0	C0	C0	C0	C0	C0	C0
Mag 3 Probes	—	—	—	C0	C0	C0	C0	C0	C0
Mag 4, 5, 6 Probes	—	—	—	—	—	—	C0	C0	C0
CSLD	—	C0	C0	C0	C0	C0	C0	C0	C0
CSLD (manifolded tanks)	—	—	—	—	—	C0	C0	C0	C0
SiteFax	—	C0	C0	C0	C0	C0	C0	C0	C0
Fuel Manager	—	—	—	—	—	C0	C0	C0	C0
Inform/TLS-PC 32	—	—	—	—	—	—	—	C0	C0

Board Type/Software Version Requirement Legend: — = Feature Not Available/Discontinued, C0 = CPU with OXX Software

Table 3-6. TLS-300 Series Software Versions 10 - 19

FEATURE	TLS-300 SYSTEM SOFTWARE VERSION (Release Date)								
	10 (10/95)	11 (7/96)	12 (10/96)	14 (2/97)	15 (10/97)	16 (4/98)	17 (10/98)	18 (7/99)	19 (12/99)
Cap 0 Probes	C0	C0	C0	C0	C0	C0	C4	—	—
Mag 0, 1, 2 Probes	C0	C0	C0	C0	C0	C0	C4	C4	C4
Mag 3 Probes	C0	C0	C0	C0	C0	C0	C4	C4	C4
Mag 4, 5, 6 Probes	C0	C0	C0	C0	C0	C0	C4	C4	C4
Mag 7 - 12 Probes	C0	C0	C0	C0	C0	C0	C4	C4	C4
CSLD	C0	C0	C0	C0	C0	C0	C4	C4	C4
CSLD (manifolded tanks)	C0	C0	C0	C0	C0	C0	C4	C4	C4
SiteFax	C0	C0	C0	C0	C0	C0	C4	C4	C4
Fuel Manager	C0	C0	C0	C0	C0	C0	C4	C4	C4
IFSF ¹	—	—	—	—	—	—	C4	C4	C4
Inform/TLS-PC 32	C0	C0	C0	C0	C0	C0	C4	C4	C4

Board Type/Software Version Requirement Legend: — = Feature Not Available/Discontinued, C0 = CPU with OXX Software, C4 = CPU with 4XX Software

¹Requires 3464XX-3XX software.

3 Software Version Feature List

Table 3-7. TLS-300 Series Software Versions 20 - 28

FEATURE	TLS-300 SYSTEM SOFTWARE VERSION (Release Date)								
	20 (7/00)	21 (10/00)	22 (9/01)	23 (4/02)	24 (7/03)	25 (6/05)	26 (11/05)	27 (8/06)	28 (3/08)
Mag 0, 1, 2 Probes	C4	C4	C4	C4	C4	C4	C4	C4	C4
Mag 3 Probes	C4	C4	C4	C4	C4	C4	C4	C4	C4
Mag 4, 5, 6 Probes	C4	C4	C4	C4	C4	C4	C4	C4	C4
Mag 7 - 12 Probes	C4	C4	C4	C4	C4	C4	C4	C4	C4
CSLD	C4	C4	C4	C4	C4	C4	C4	C4	C4
CSLD (manifolded tanks)	C4	C4	C4	C4	C4	C4	C4	C4	C4
SiteFax	C4	C4	C4	C4	C4	C4	C4	C4	C4
Fuel Manager	C4	C4	C4	C4	C4	C4	C4	C4	C4
IFS ¹	C4	C4	C4	C4	C4	C4	C4	C4	C4
Inform/TLS-PC 32	C4	C4	C4	C4	C4	C4	C4	C4	C4

Board Type/Software Version Requirement Legend: C4 = CPU with 4XX Software

¹Requires 3464XX-3XX system software.

Table 3-8. TLS-300 Series Software Versions 29 and Higher

FEATURE	TLS-300 SYSTEM SOFTWARE VERSION (Release Date)								
	29 (10/08)	30 (7/10)	31 (2/11)	32 (7/11)					
Mag 0, 1, 2 Probes	C4	C4	C4	C4					
Mag 3 Probes	C4	C4	C4	C4					
Mag 4, 5, 6 Probes	C4	C4	C4	C4					
Mag 7 - 12 Probes	C4	C4	C4	C4					
CSLD	C4	C4	C4	C4					
CSLD (manifolded tanks)	C4	C4	C4	C4					
SiteFax	C4	C4	C4	C4					
Fuel Manager	C4	C4	C4	C4					
IFS ¹	C4	C4	C4	C4					
Inform/TLS-PC 32	C4	C4	C4	C4					
Ethanol Phase Separation	C4	C4	C4	C4					

Board Type/Software Version Requirement Legend: C4 = CPU with 4XX Software

¹Requires 3464XX-3XX system software.

4 Fuses

TLS Consoles use fuses in the input power circuitry and on various Interface Modules. Under no circumstances should you substitute a different rating or fuse type during service.

TLS-300 Series Console Fuses

TLS-300 Series Console fuses for input ac power, dc voltages, and relays are shown in Table 4-1.

Table 4-1. Console Fuses

Fuse	Circuit	Fuse Location	Fuse Size/Type	V-R Part No.
F1	+8 & +5 Vdc supply	Fuseholder on Power Supply board	2 A Slo-Blo (5 x 20 mm)	576010-784
F2	+20 & +12 Vdc supply	Fuseholder on Power Supply board	2 A Slo-Blo (5 x 20 mm)	576010-784
F3	110 Vac input power	Fuseholder on Power Supply board	2 A Slo-Blo (5 x 20 mm)	576010-784
F4	Relay fuse #2	Fuseholder on Power Supply board	2 A Slo-Blo (5 mm x 20 mm)	576010-784
F5	Relay fuse #1	Fuseholder on Power Supply board	2 A Slo-Blo (5 mm x 20 mm)	576010-784
F1	8 Vdc supply for external peripherals (UK only)	Fuse block on CPU board	300 mA (5 mm x 20 mm)	576010-855

TLS-350 Series Console AC Power Fuses

TLS-350 Console ac power fuses are shown in Table 4-2:

Table 4-2. Console AC Power Fuses

Fuse	Fuse Location	Fuse Size/Type	V-R Part No.
F1	Fuseholder on AC Input board - top of Power Area Compartment	2A Slo-Blo (5 mm x 20 mm)	576010-784
F1	Fuse block on Power Supply Board left side of Communication Area	2A Slo-Blo (5 mm x 20 mm)	576010-784
F2	Fuse block on Power Supply Board left side of Communication Area	2A Slo-Blo (5 mm x 20 mm)	576010-784

TLS-350 Series Interface Module Fuses

TLS-350 Console Interface Module fuses are shown in Table 4-3

Table 4-3. Interface Module Fuses

Interface Module	Fuse	Fuse Location	Fuse Size/Type	V-R Part No.
I/O Combination Module	F1 - F2	2 fuse blocks on board	2A Slo-Blo (5 mm x 20 mm)	576010-784
4 Relay Output Module	F1 - F4	4 fuse blocks on board	2A Slo-Blo (5 mm x 20 mm)	576010-784
Line Leak Interface Module	F1	Fuse block on board	2A Slo-Blo (5 mm x 20 mm)	576010-784
Pressure Line Leak Controller Module	F1 - F3	3 fuse blocks on board	2A Slo-Blo (5 mm x 20 mm)	576010-784
WPLLD Controller Module	F1 -F3	3 fuse blocks on board	2A Slo-Blo (5 mm x 20 mm)	576010-784
RS-232 (+8V)	HF1	Fuse block on board	300 mA (5 mm x 20 mm)	576010-855
Multiport	F1	Fuse block on board	300 mA (5 mm x 20 mm)	576010-855
TLS-350 EDIM (8V Link)	F1	Fuse block on board	300 mA (5 mm x 20 mm)	576010-855
Univ. CAB	F1	Soldered on board	125 mA Flatpak	576010-758
RS-232 CAB	F1	Soldered on board	500 mA Flatpak	577010-010
RS-485 CAB	F1	Soldered on board	500 mA Flatpak	577010-010
Tokheim 67 CAB	F1	Soldered on board	500 mA Flatpak	577010-010
Dispenser Controller	F1 - F4	4 fuse blocks on board	10A Slo-Blo (5 mm x 20 mm)	576010-955

5 Warning and Alarm Messages

The TLS console constantly monitors the entire system for warning and alarm conditions including fuel leaks, inventory limit excesses, and equipment problems. When an alarm occurs, a message displays the the type and location (tank or sensor number) of the warning or alarm followed by the alarm label.

Device Identifiers

C (2-Wire C.L. sensor [type A])	Q (Pressure line leak detector)
D (Receiver [phone, fax, etc.])	R (Output relay)
E (EDIM or CDIM module)	r (Pump Relay Monitor)
F (Product)	S (Pump sense)
G (Groundwater sensor)	s (Smart Sensor)
H (3-Wire C.L. sensor [type B])	T (Tank)
I (External input device)	V (Vapor sensor)
L (Liquid sensor)	W (Wireless pressurized line leak detector)
M (MDIM module)	X (VCMI interface module)
P (Volumetric line leak detector)	x (VMC controller)

Displayed Alarm Messages

This section contains a complete list of displayed TLS Console alarm messages, the device category(s) for which the alarm is posted and a possible cause of the alarm.

Actual alarms displayed by a particular system depend upon the options installed.

Message	Device	Cause
ANN-LINE SELF FAIL	P	0.1 gph line self-test failure. (2 consecutive self-test failures.)
ANN-LINE TEST FAIL	P	0.1 gph line test failure.
ANN-PUMP SELF FAIL	P	0.1 gph pumpside self-test failure.
ANN-PUMP TEST FAIL	P	0.1 gph pumpside test failure.
ANN TST NEEDED ALM	P,Q,T,W	System failed to perform an annual test (0.1 gph) in the programmed number of days.
ANN TST NEEDED WRN	P,Q,T,W	System failed to perform an annual test (0.1 gph) in the programmed number of days.
ANNUAL LINE FAIL	Q,W	0.1 gph line test failure.
ANNUAL TEST FAIL	T	System failed an annual in-tank leak test.

Message	Device	Cause
AUTODIAL FAILURE	SYSTEM	System failed to connect to a remote receiver after "n" tries.
BATTERY IS OFF	SYSTEM	Battery switch is off. You will lose system programming if ac power to the console is interrupted.
BDIM TRANSACTION ALARM	E	No transactions received from the block DIM.
CLOCK IS INCORRECT	SYSTEM	System clock is not within ± 10 seconds of last test. Dead battery or defective CPU/ECPU board.
CLOSE DAILY PENDING	SYSTEM	BIR is waiting for an idle period to close for a daily report.
CLOSE SHIFT PENDING	SYSTEM	BIR is waiting for an idle period to close for a daily or shift report.
COMMUNICATION ALARM	E,M	DIM module has stopped communicating with the external equipment or the cable adaptor box.
COMMUNICATION ALARM	s	Hardware failure - sensor or interconnecting wiring to console.
CSLD INCNR RATE WRN	T	A positive leak rate exceeded the threshold limit.
DELIVERY NEEDED	T	Product level dropped below programmed limit.
DELIVERY DENSITY WARN	T	Indicates when delivery density has not been entered
DISABLED DIM ALARM	E,M	DIM module has stopped communicating with central processing unit of the console.
DISABLED VMCI ALARM	X	The VMCI interface module is unresponsive.
EXTERNAL INPUT ALARM	I	External device changed from programmed condition.
EXTERN INPUT NORMAL	I	(Not displayed, printed out only) External device returned to preset condition.
FP SHUTDOWN ALM	x	Fuel position shutdown alarm.
FP SHUTDOWN WRN	x	Fuel position shutdown warning.
FEPROM WRITE FAILURE	SYSTEM	A memory error has occurred on the NVMEM board.
FUEL ALARM	SENSOR	Fuel is present in the area being monitored by the sensor.
FUEL ALARM	s	Monitored parameter exceeded preset threshold.
FUEL WARNING		
FUEL QUALITY ALARM	T	Potential Causes: High density fuel; Delivery of phase separated fuel; Delivery of incorrect fuel type.
FUEL OUT	P,Q,W	Tank product level below 10 inch level - cannot pump when active
GENERATOR OFF	I	Backup generator shut down, in-tank leak testing resumed.
GENERATOR ON	I	Backup generator switched on, in-tank leak testing halted.
GROSS LINE FAIL	Q,W	3.0 gph line test failure. Dispensing halts while the alarm is active.
GROSS TEST FAIL	T	In-tank leak test failed.
GRS LINE SELF FAIL	P	3.0 gph line self-test failure. (3 consecutive self-test failures.)
GRS LINE TEST FAIL	P	3.0 gph line test failure.

Message	Device	Cause
GRS PUMP SELF FAIL	P	3.0 gph pumpside self-test failure.
GRS PUMP TEST FAIL	P	3.0 gph pumpside test failure.
HANDLE ALARM	P,Q,W	Handle signal has been active 16 hours.
HIGH LIQUID ALARM	SENSOR	The sensor detects a high liquid level.
HIGH LIQUID ALARM	s	Monitored parameter exceeded preset threshold.
HIGH LIQUID WARNING		
HIGH PRODUCT ALARM	T	Product level in tank rose above programmed limit.
HIGH WATER ALARM	T	Water detected in tank exceeds programmed alarm limit.
HIGH WATER WARNING	T	Water detected in tank exceeds programmed warning limit.
INVALID FUEL LEVEL	T	Product level is too low, causing the fuel and water floats to be too close together.
INSTALL ALARM	s	Sensor not installed in correct position.
LEAK ALARM	T	A static in-tank leak test failed.
LINE LEAK SHUTDOWN	P	(VLLD) Line test or pumpside test failure.
LINE LEAK TEST FAIL	P	Line test or pumpside test failure.
LIQUID WARNING	SENSOR	The sensor detects a small amount of liquid.
LLD PRESSURE ALARM	P	Six consecutive attempts to run a test in which the pressure switch never opened (pump not running).
LLD PRESSURE WARN	P	Three consecutive attempts to run a test in which the pressure switch never opened (pump not running).
LLD SELF TEST FAIL	P	Line Leak Detector hardware failure.
LLD TEST FAULT-ANN	P	Line Leak Detector hardware failure.
LLD TEST FAULT-GRS	P	Line Leak Detector hardware failure.
LLD TEST FAULT-PER	P	Line Leak Detector hardware failure.
LN EQ FAULT	Q,W	A problem with the pressure measurement equipment has been detected.
LOW LIQUID ALARM	SENSOR	The sensor in a brine-filled interstice detects a decrease in the brine level. A hole is in the tank's inner wall, or in low groundwater areas, a hole is in the outer wall.
LOW LIQUID ALARM	s	Monitored parameter exceeded preset threshold.
LOW LIQUID WARNING		
LOW PRESSURE ALARM	Q	Low pump dispense pressure is detected during a dispense. Dispensing halts if programmed to do so.
LOW PRODUCT ALARM	T	Tank level dropped below the programmed limit.
LOW TEMP WARNING	T	Probe temperature dropped below -4°F.
MAX PRODUCT ALARM	T	Product level rose above the programmed limit.
MISSING TICKET WARN	T	Missing ticketed delivery.

Message	Device	Cause
METR NC ALM	x	The dispenser's meter is not connected.
NO DIAL TONE ALARM	D	System failed to detect an operational line after 3 tries.
NO CSLD IDLE TIME	T	System has not had enough idle time over previous 24 hours to run a statistical leak detection test.
NO MT COMM		Maintenance Tracker is enabled; the MT Comm board has been removed.
NO NVMEM		NVMEM board is needed to support Maintenance Tracker.
NO VACUUM ALARM	s	There is no vacuum in the interstitial space.
OVERFILL ALARM	T	Fuel level has exceeded a programmed limit. Potential overflow of tank may occur.
PAPER OUT	SYSTEM	Paper roll is empty.
PC(H8) REVISION WARN	SYSTEM	The CPU and the PC (H8) software versions are not compatible.
PER-LINE SELF FAIL	P	0.2 gph line self-test failure.
PER-LINE TEST FAIL	P	0.2 gph line test failure. (2 consecutive self-test failures.)
PER-PUMP SELF FAIL	P	0.2 gph pumpside self-test failure.
PER-PUMP TEST FAIL	P	0.2 gph pumpside test failure.
PER TST NEEDED ALM	P,Q,T,W	System failed to perform a periodic test (0.20 gph) in the programmed number of days.
PER TST NEEDED WRN	P,Q,T,W	System failed to perform a periodic test (0.20 gph) in the programmed number of days.
PERIOD FAIL	Q,T,W	0.2 gph test failure. Dispensing halts if programmed to do so.
PLLD OPEN ALARM	Q	PLLD transducer is disconnected or is not functioning properly.
PLLD SHUTDOWN ALARM	Q	A line disable occurred due to a 3.0 gph leak test failure or a programmed alarm.
PRINTER ERROR	SYSTEM	Printer feed roller release is open.
PROBE OUT	T	Hardware failure - interconnecting wiring to console, probe, or module problem.
PROD THRESHOLD ALM	F	The variance exceeded the BIR calculated threshold of an assigned product for the periodic report.
PUMP RELAY ALARM	r	If pump relay assigned - pump continues to run after it was instructed to stop. If pump relay not assigned - pump continues to run beyond preset maximum run time.
RAM ERR ADDR = 01E80000 RAM ERR DATA = XXXXXXXX	SYSTEM	V24 or higher software installed with older ECPU board.
RELAY ACTIVE	s	Monitored parameter exceeded preset threshold.
REMOTE DISPLAY ERROR	SYSTEM	The Remote Display is not communicating properly
ROM REVISION WARNING	SYSTEM	Software revisions do not match. The software was replaced in the unit with the backup battery switch SW1 in the ON position.
SELF TEST INVALID	P	A self-test failed after a requested test has occurred.

Message	Device	Cause
SENSOR FAULT ALARM	s	Mag Sensor - Monitored parameter exceeded preset threshold. Vac Sensor component inoperable.
SENSOR FAULT WARNING	s	Vacuum control valve inoperable
SENSOR OUT ALARM	SENSOR	The sensor setup was performed incorrectly or a sensor is disconnected or is not functioning properly.
SETUP DATA WARNING	SYSTEM	System setup problem or probe out on startup.
	P, Q, W	The default line length was not changed to reflect the actual line length.
	s	Programming error.
	r	Pump relay assigned, but not configured.
	X	More than one VMCI module is installed.
SHORT ALARM	SENSOR	A short has occurred in the sensor wiring or in the sensor.
SOFTWARE MODULE WARN	SYSTEM	The wrong software module is installed; or, the software module cannot be read or has an invalid checksum.
SUDDEN LOSS ALARM	T	System detects a loss of fuel: a) During a period when no pumping is occurring (with pump sense); or, b) During a static leak test. Clear this alarm by cycling pump on and off (a), or starting a static leak test (b).
SYSTEM SELF TEST ALM	SYSTEM	The backup battery switch was turned on before the system displayed the "BATTERY IS OFF" message. Defective NVMEM board or defective CPU/ECPU board.
TANK SIPHON BREAK	T	The siphon break valve has opened and a static leak test of one of the tanks in a manifolded pair is underway.
TANK TEST ACTIVE	T	In-tank leak test is underway.
TEMPERATURE WARNING	s	Ambient temperature exceeded sensor's operating range (-40 to +122°F [-40 to +50°C]).
TOO MANY TANKS	SYSTEM	The system detects more tank inputs than the system can accept. The maximum number of probes has been exceeded.
VACUUM WARNING	s	There is a leak in the monitored interstitial space. There is a possibility that a No Vacuum alarm will be posted.
VMC COM TIMEOUT	x	A VMC is powered off, not connected or the wrong serial number has been entered.
WATER ALARM	SENSOR	The sensor has detected water.
WATER ALARM	s	Monitored parameter exceeded preset threshold.
WATER OUT ALARM	SENSOR	The groundwater sensor is out of the water.
WATER WARNING	s	Monitored parameter exceeded preset threshold.
WPLLD COMM ALARM	W	Communication disrupted between the system and the WPLLD Comm Board.
WPLLD SHUTDOWN ALARM	W	System shut down line because of failed line leak test, or an alarm assigned to disable the line is active.

6 Diagnostic Mode

This section contains detailed diagrams, with notes, of all possible console's Diagnostic Mode Functions. Diagnostic functions display (and in certain cases, allow you to print) data useful in analyzing system performance and in troubleshooting.

You enter the DIAG MODE by pressing the MODE key until its display appears. Press the FUNCTION key until you display the desired diagnostic function within the mode, and the STEP key to view each of the Function's displays. Where you can enter changes to displayed data, you do so with the same front keys used enter to system programming selections (ENTER, CHANGE, etc.) See Figure 6-1 below for a legend of key symbols used in the Diag function diagrams that follow.

A display sequence index of all functions in the Diagnostic Mode is located the upper right corner of each diagnostic function diagram (ref. Figure 6-1). There is a mark beside currently viewed function diagram to indicate where you are in the Diag Mode.

Your system will display only the diagnostic functions of installed and configured modules and options.

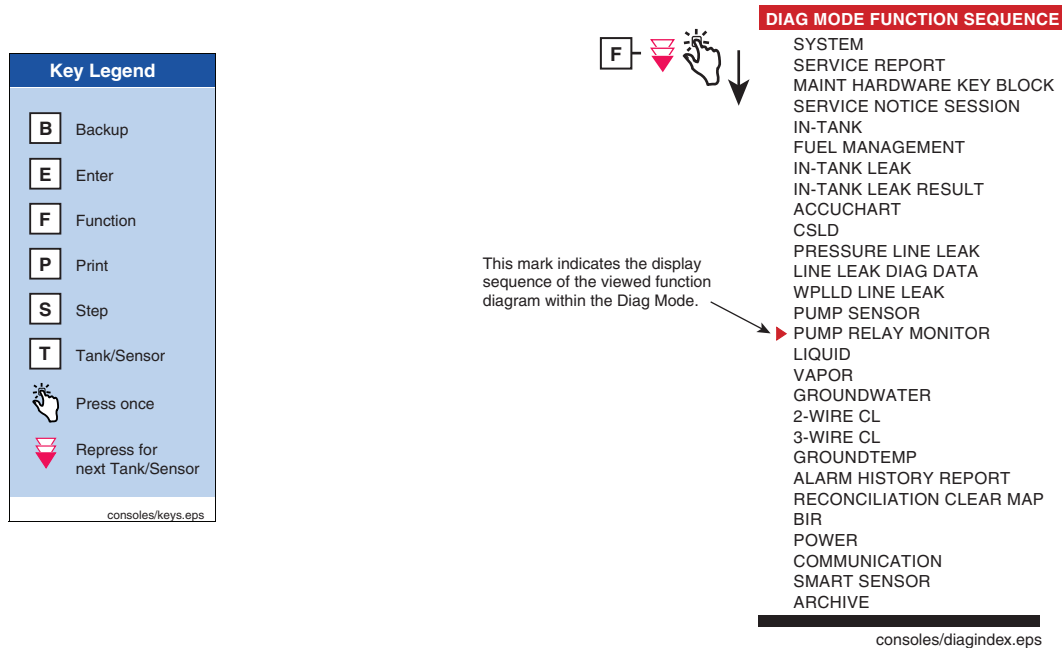


Figure 6-1. Key Symbols Used in Diagrams and Diagnostic Mode Function Sequence

6 Diagnostic Mode

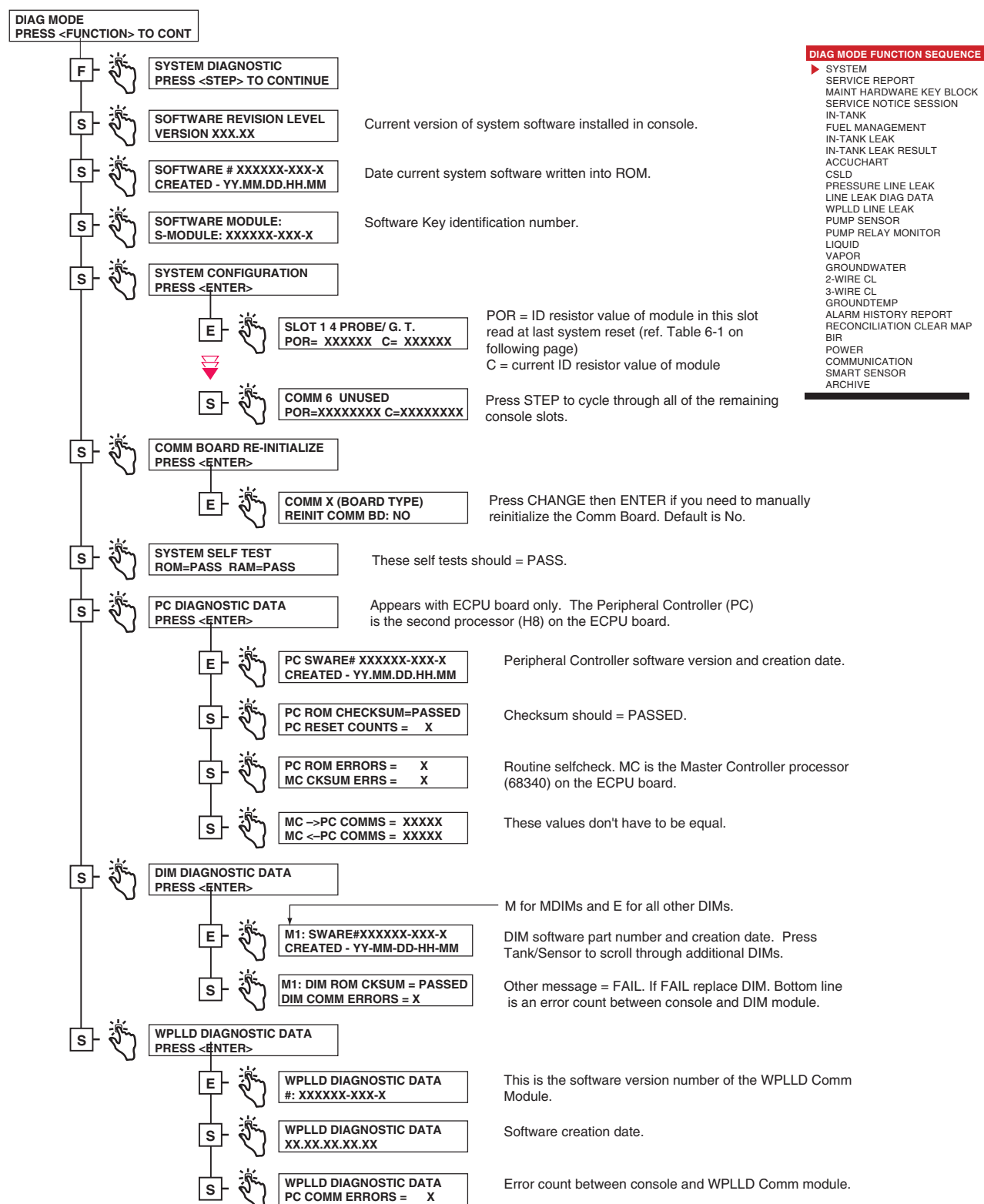


Figure 6-2. System Diagnostic Function Diagram

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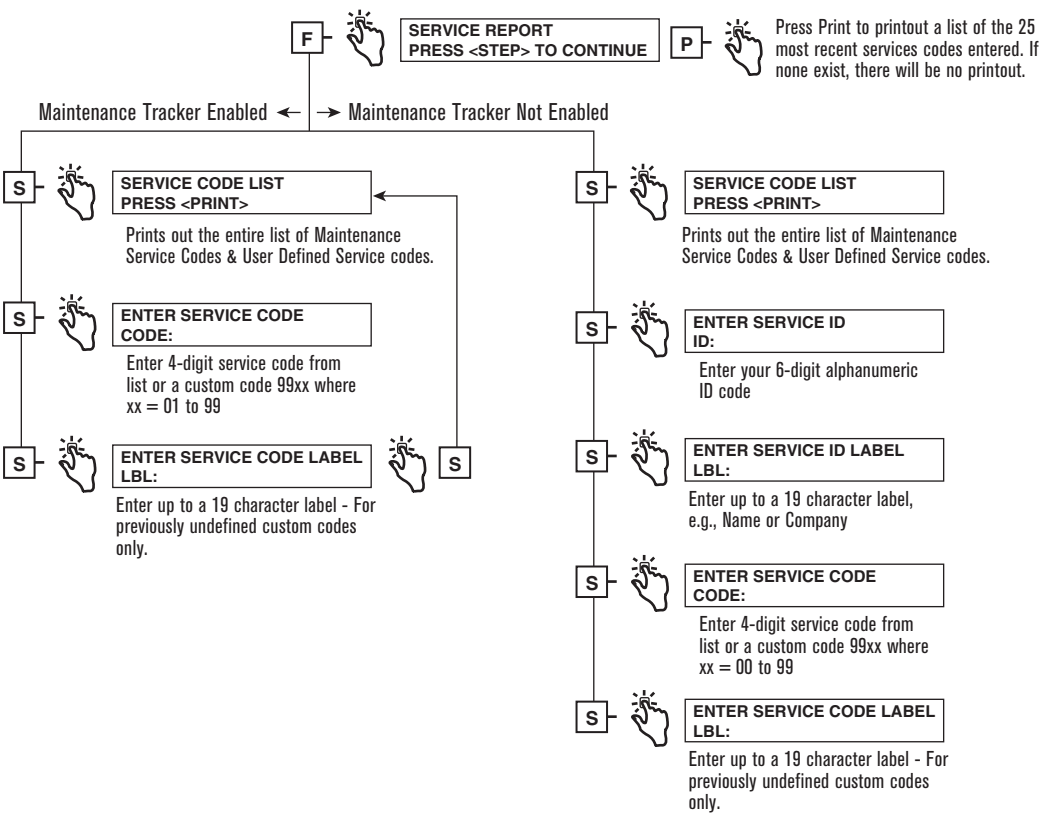
Note: Table 6-1 contains nominal resistance values used to identify TLS-350 Modules. The actual or measured resistance will differ slightly from the nominal value.

Table 6-1.- Console Modules - ID Resistances

Module	ID Resistance - Ohms
4 Probe	2K
PLLD Sensor	3.9K
I/O Combo	10K
Printer Interface	10K
4 Relay Output Interface	15K
RS232 Serial Interface	15K
Type B Sensor Interface	20K
1200 Baud Modem	20K
Remote Display Interface	27K
Universal Sensor	30.1K
Pump Sense	33K
Remote/Local Printer Interface	33K
8-Input Smart Sensor	39.2K
SiteFax Modem (old)	40.2K
SiteFax Modem (new)	47K
VLLD Interface	47K
8 Probe	47K
European 232	56K
Type A Sensor Interface	68K
Mechanical Dim	68K
DCD Interface	68K
ISD Comm	82.5K
Dispenser Interface Module	100K
PLLD Controller	100K
Vapor Sensor	15K
Remote Only Printer Interface	160K
4 Probe w/Temp Interface	160K
WPLLD AC Interface	162K
Interstitial/Liquid Sensor Interface	200K
WPLLD Comm	200K

Table 6-1.- Console Modules - ID Resistances

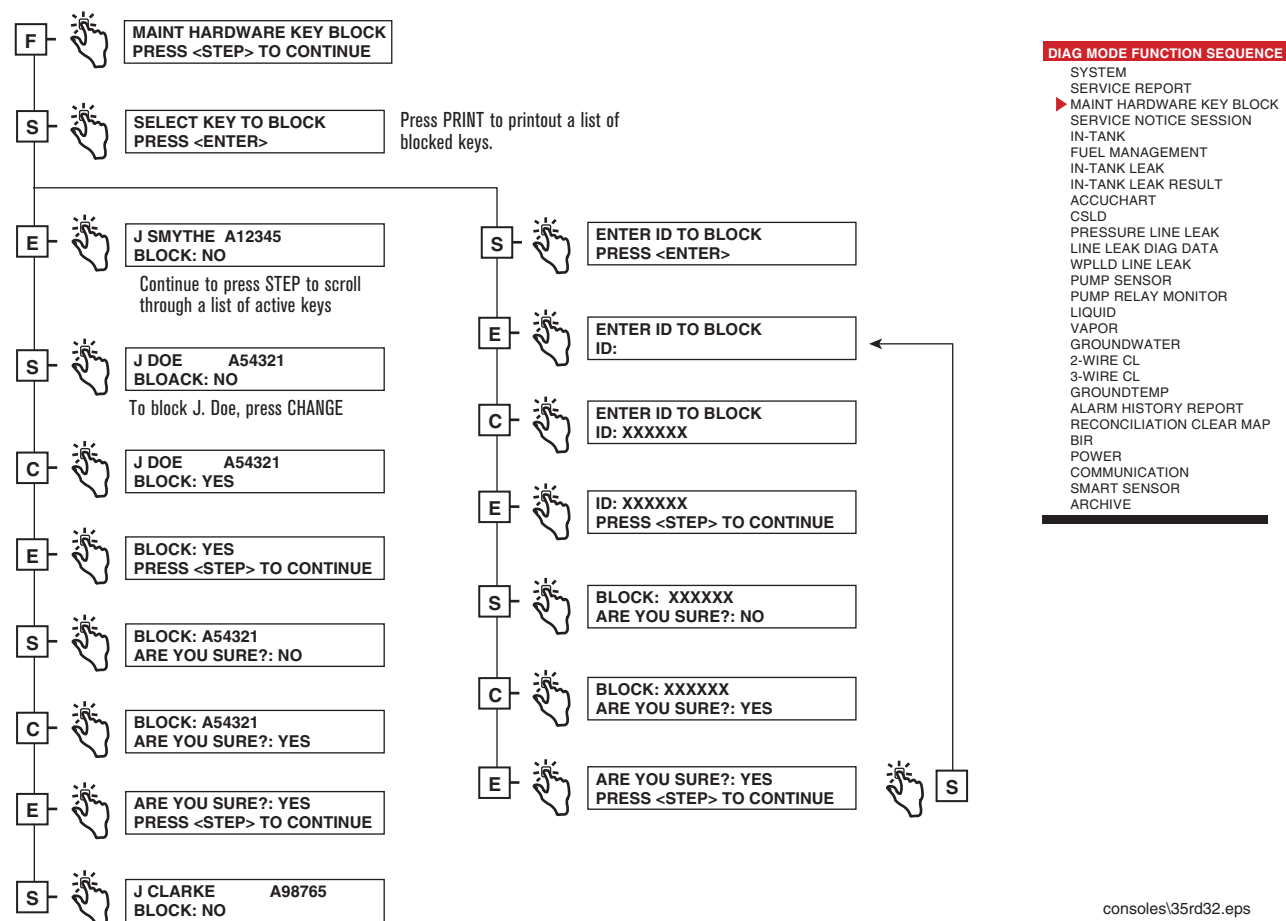
Module	ID Resistance - Ohms
WPLLD Controller	200K
Groundwater Sensor	270K
SiteLink Comm	270K
Hughes JBox Comm	330K
3 Probe, 3 Sensor Interface (TLS-350J only)	332K
3 PLLD Sensor Interface (TLS-350J only)	402K
Serial Satellite Comm	475K
Maintenance Tracker (Single and Dual Port)	402K
Smart Sensor / Press Module	499K



- DIAG MODE FUNCTION SEQUENCE**
- SYSTEM
 - SERVICE REPORT
 - MAINT HARDWARE KEY BLOCK
 - SERVICE NOTICE SESSION
 - IN-TANK
 - FUEL MANAGEMENT
 - IN-TANK LEAK
 - IN-TANK LEAK RESULT
 - ACCUCART
 - CSLD
 - PRESSURE LINE LEAK
 - LINE LEAK DIAG DATA
 - WPLLD LINE LEAK
 - PUMP SENSOR
 - PUMP RELAY MONITOR
 - LIQUID
 - VAPOR
 - GROUNDWATER
 - 2-WIRE CL
 - 3-WIRE CL
 - GROUNDTEMP
 - ALARM HISTORY REPORT
 - RECONCILIATION CLEAR MAP
 - BIR
 - POWER
 - COMMUNICATION
 - SMART SENSOR
 - ARCHIVE

consoles\35rd23.eps

Figure 6-3. Service Report Function Diagram



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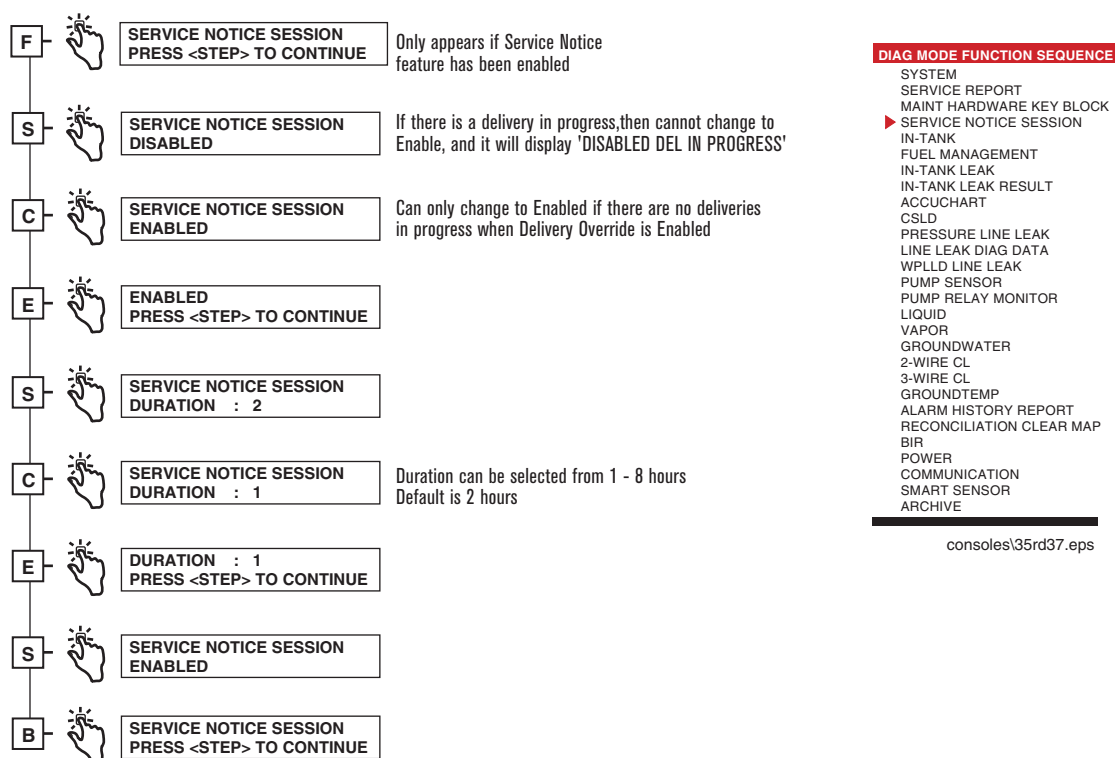


Figure 6-5. Service Notice Session Function Diagram

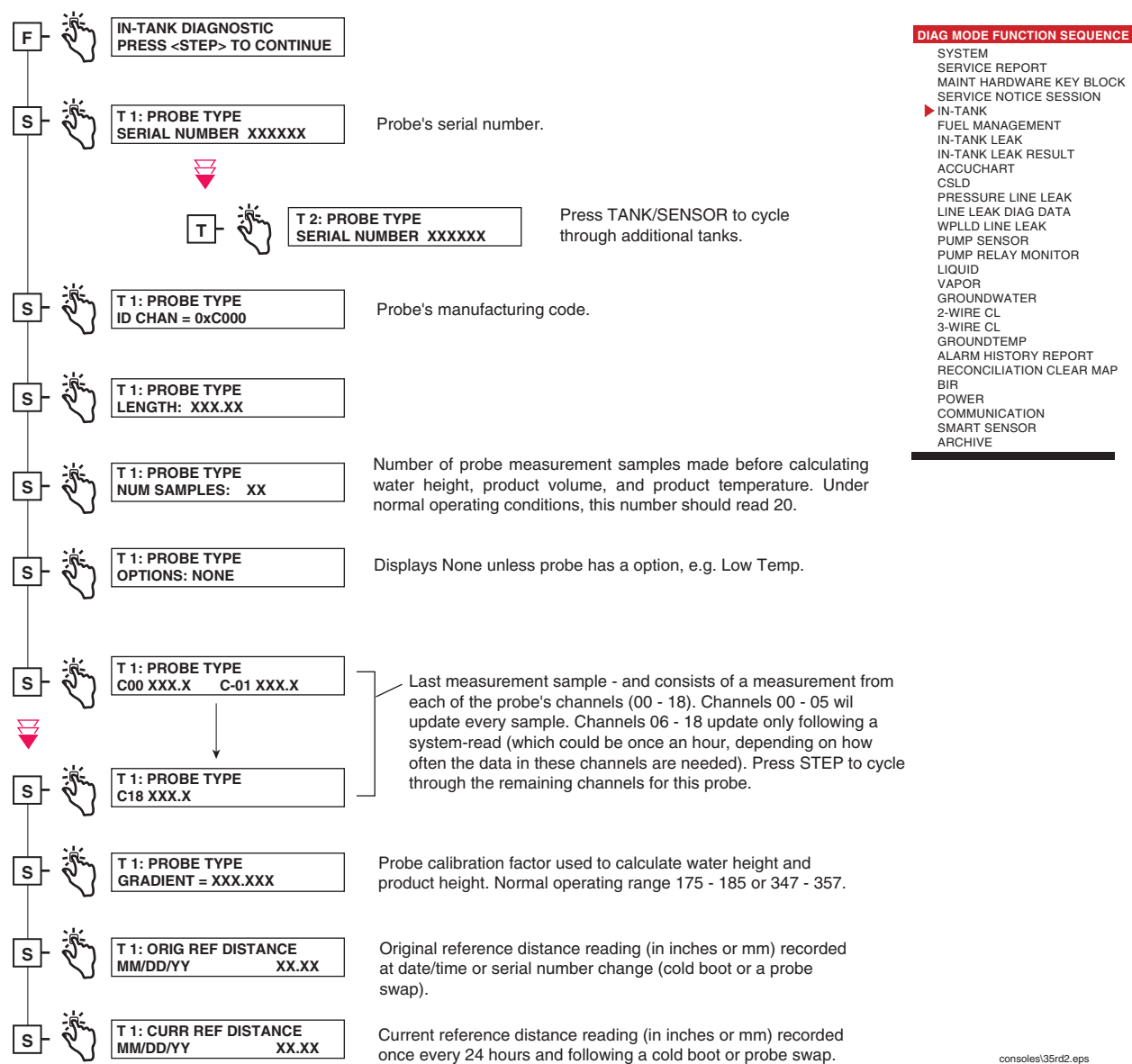
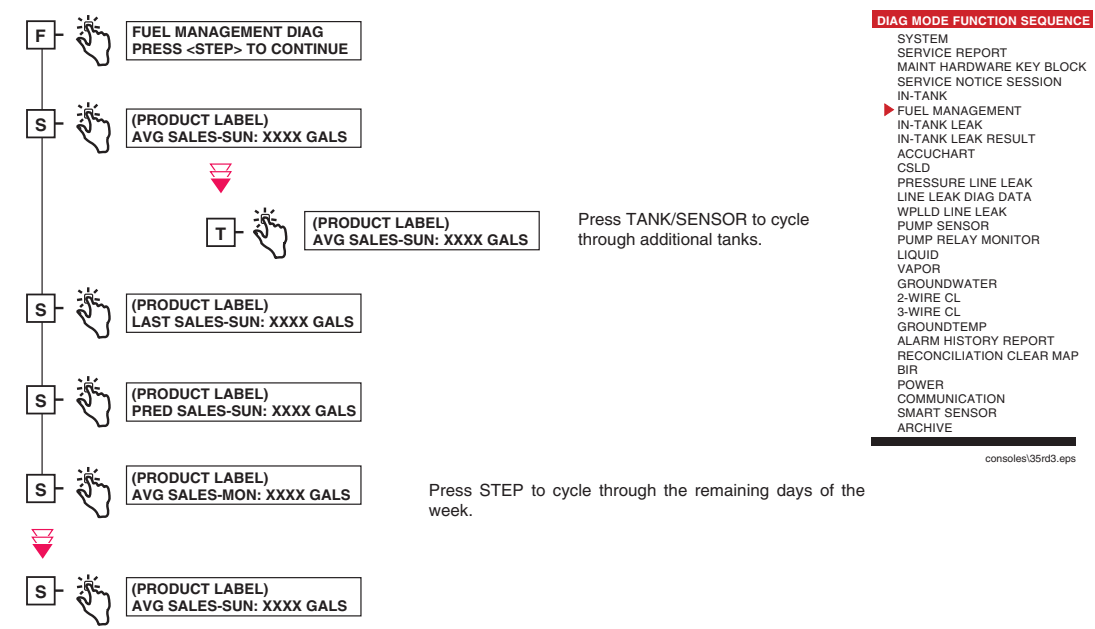


Figure 6-6. In-Tank Diagnostic Function Diagram



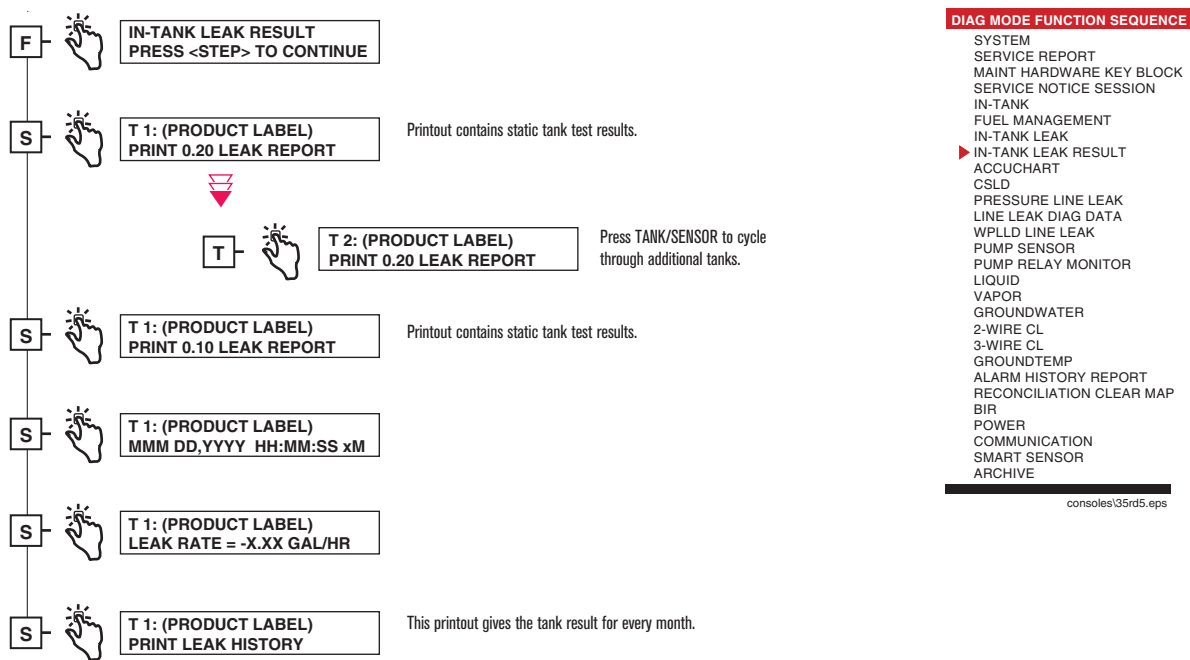
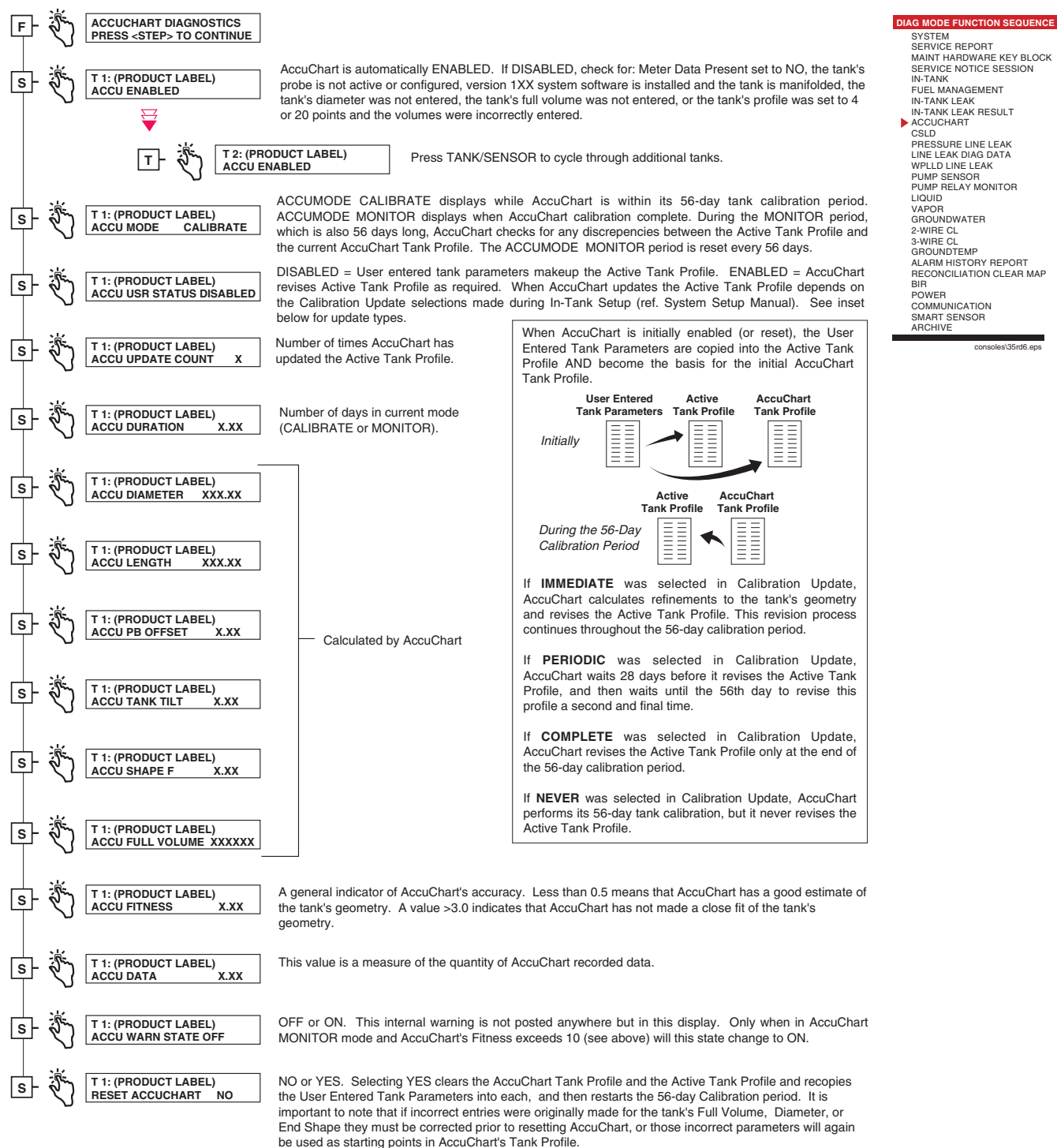


Figure 6-9. In-Tank Leak Result Diagnostic Function Diagram

6 Diagnostic Mode





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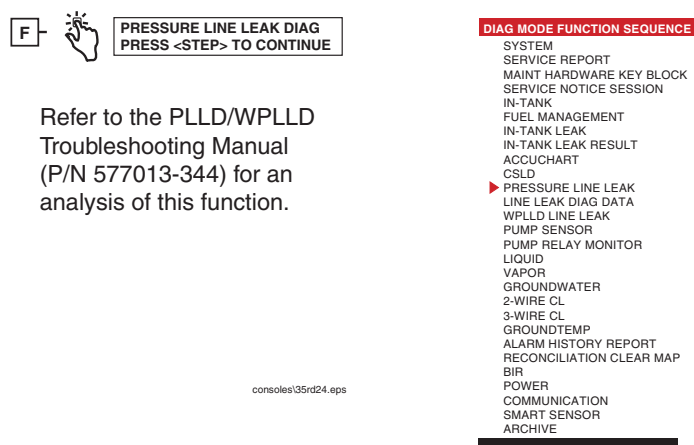


Figure 6-12. Pressure Line Leak Diagnostic Function Diagram

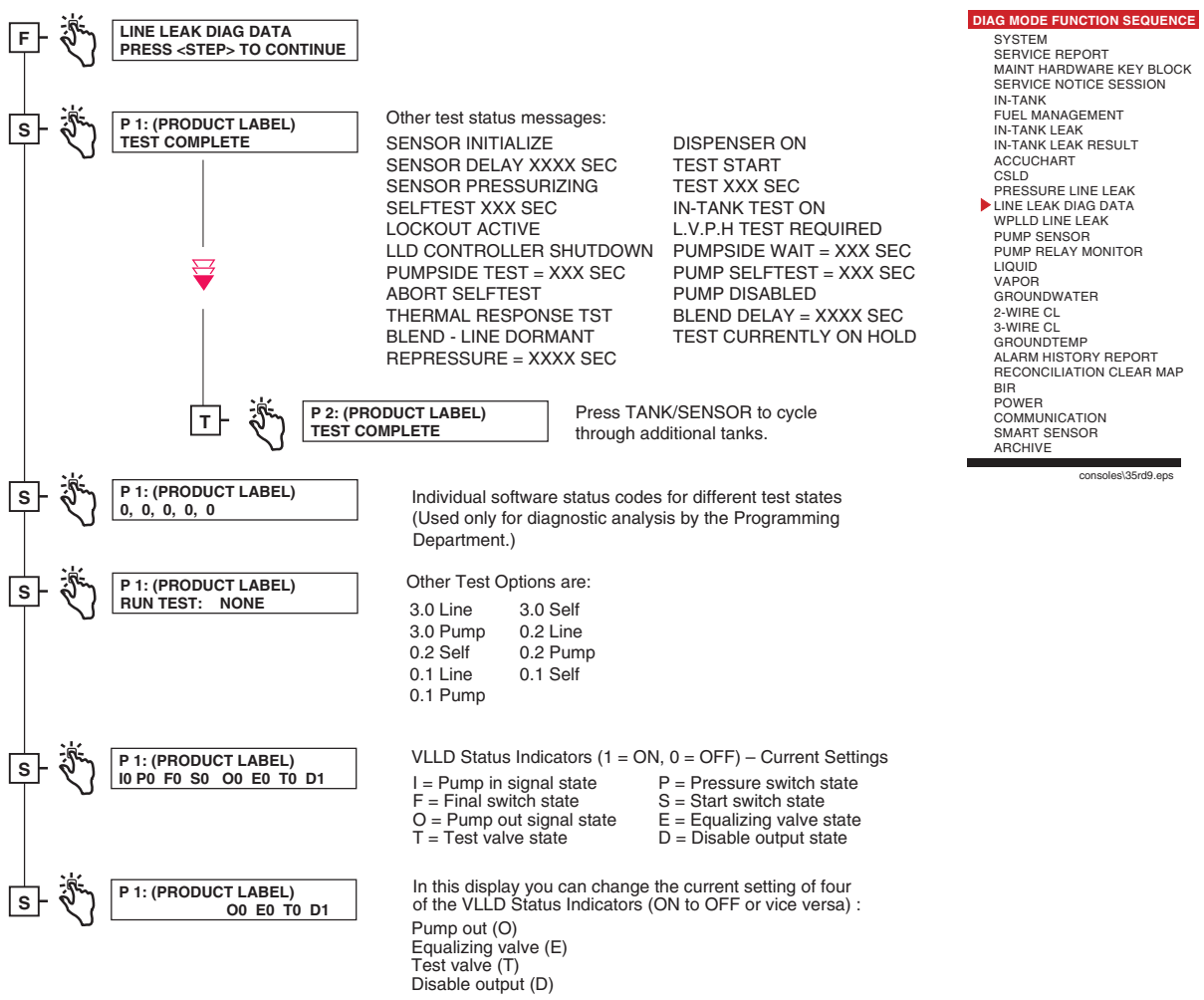


Figure 6-13. VLLD Diagnostic Function Diagram

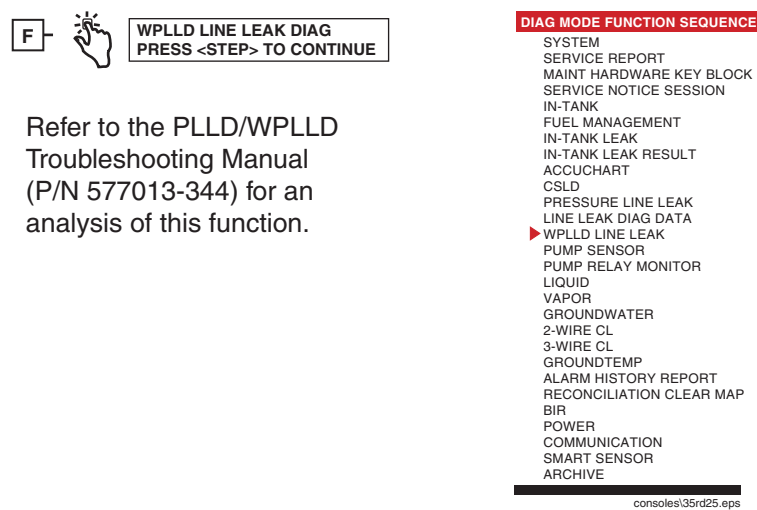


Figure 6-14. WPLLD Line Leak Diagnostic Function Diagram

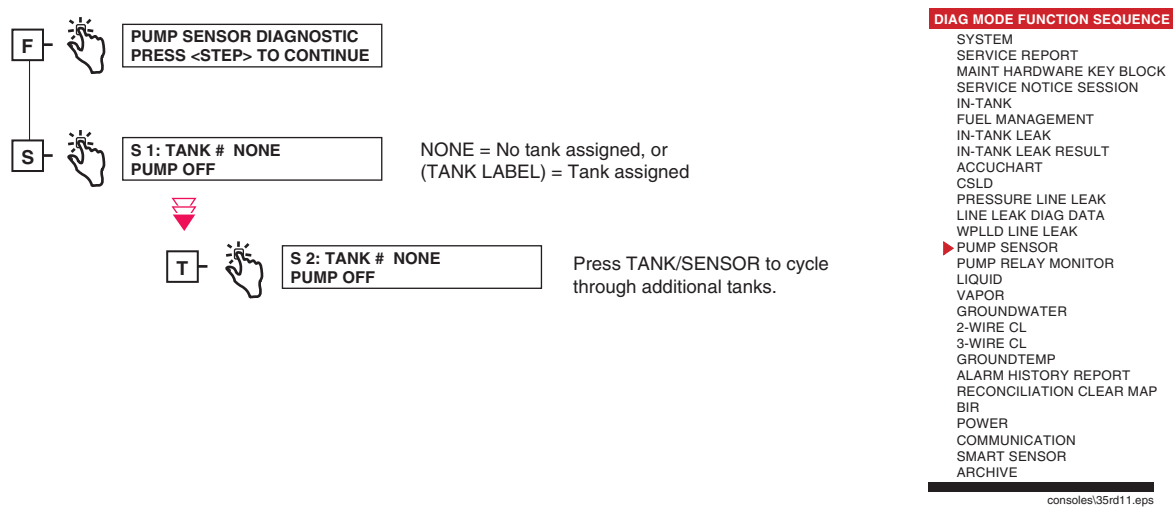


Figure 6-15. Pump Sensor Diagnostic Function Diagram

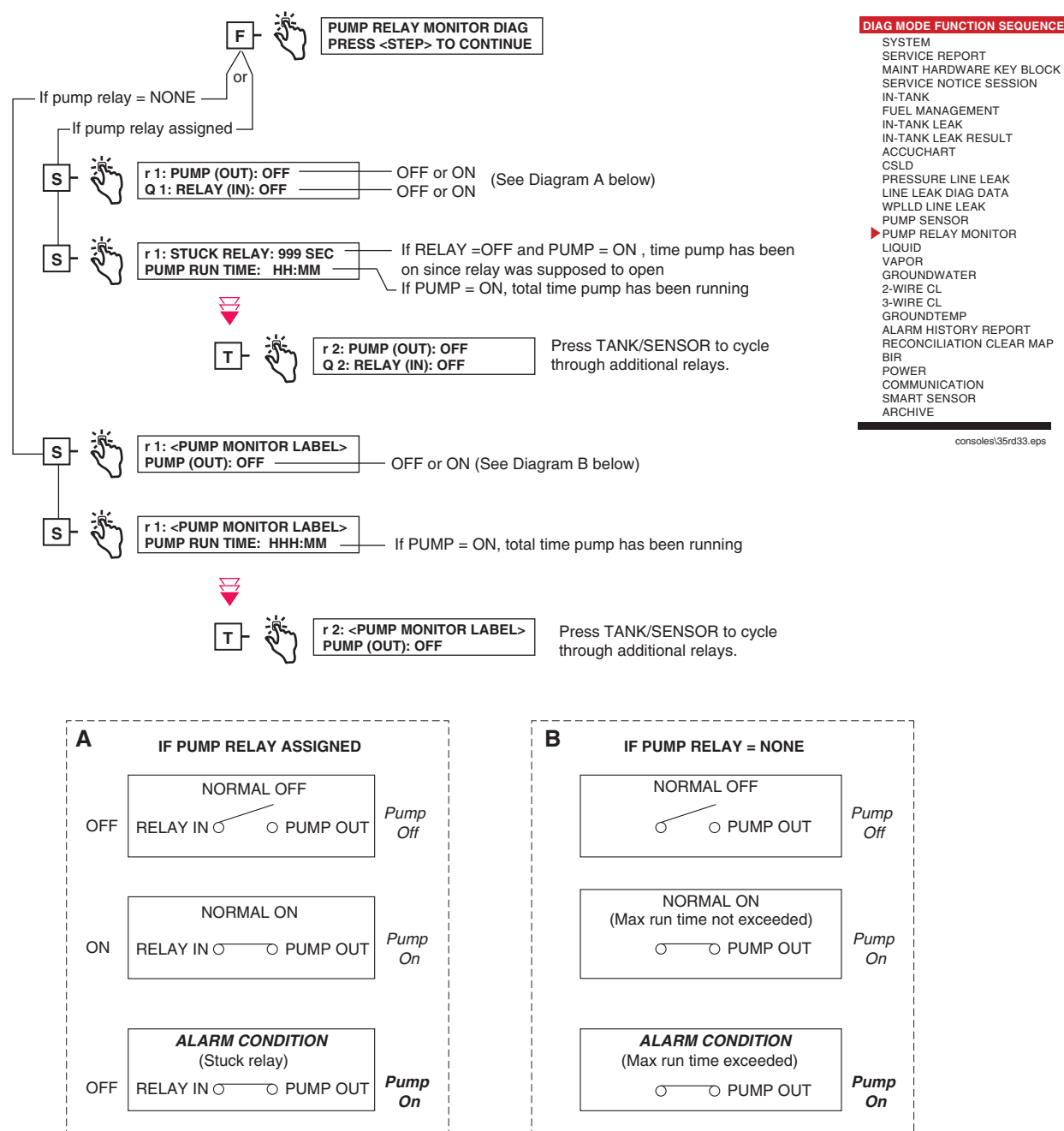


Figure 6-16. Pump Relay Monitor Diagnostic Function Diagram

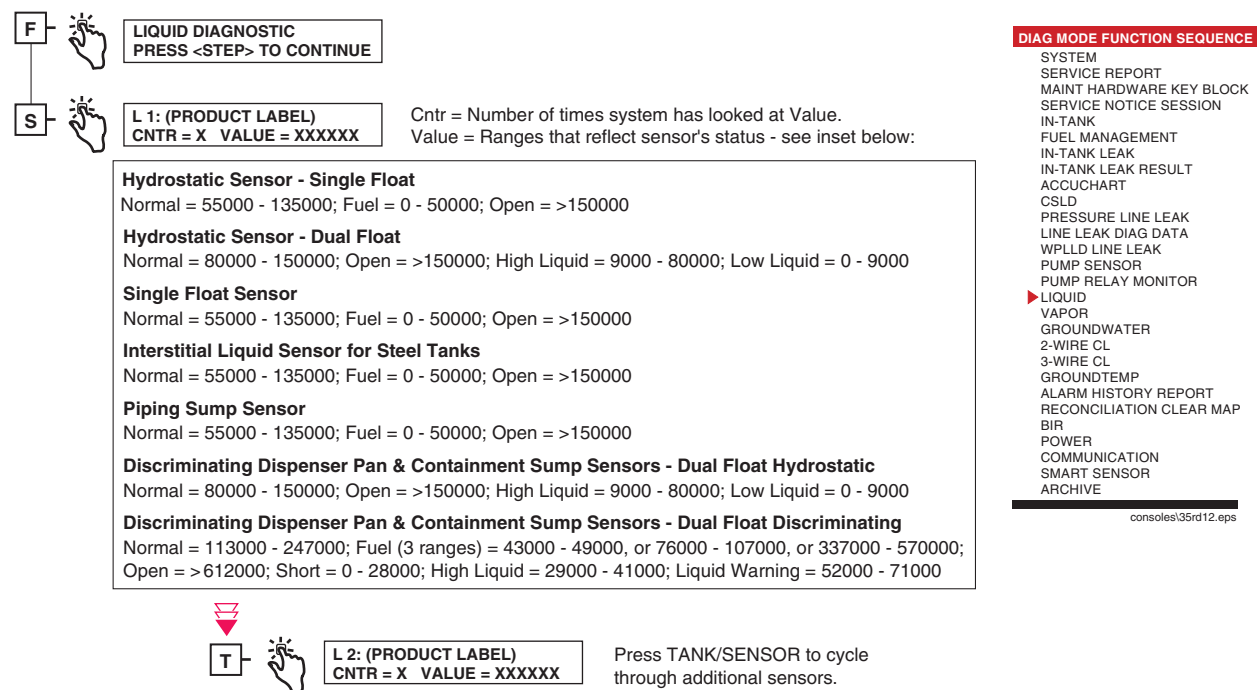


Figure 6-17. Liquid Sensor Diagnostic Function Diagram

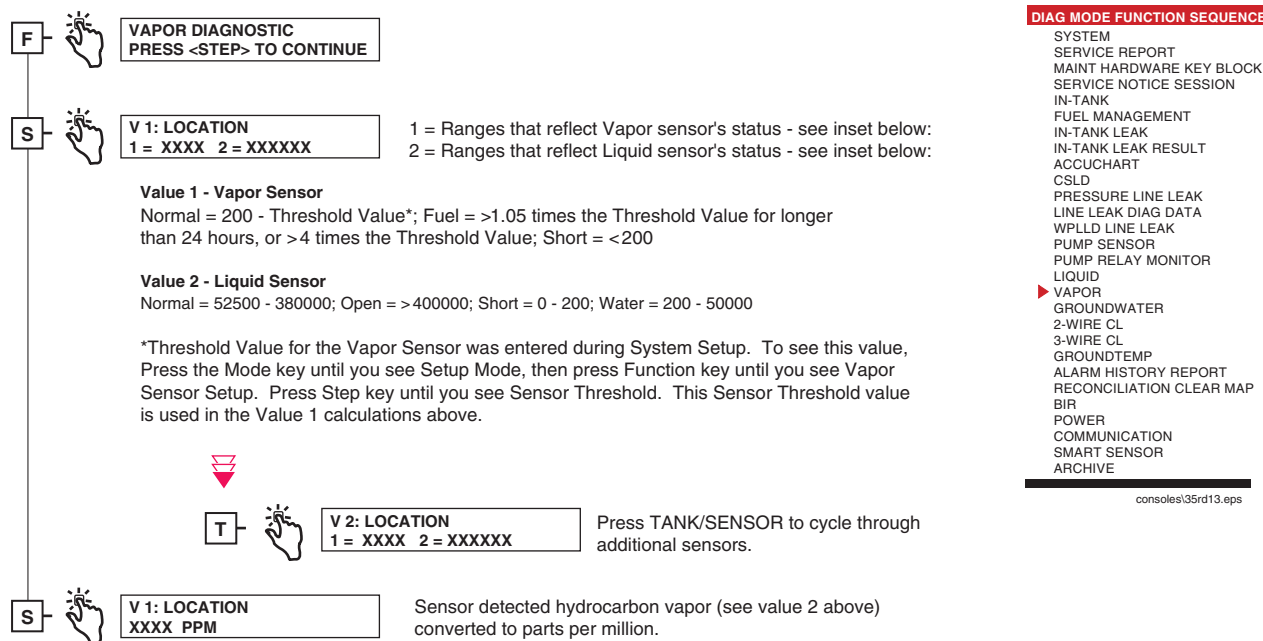


Figure 6-18. Vapor Sensor Diagnostic Function Diagram

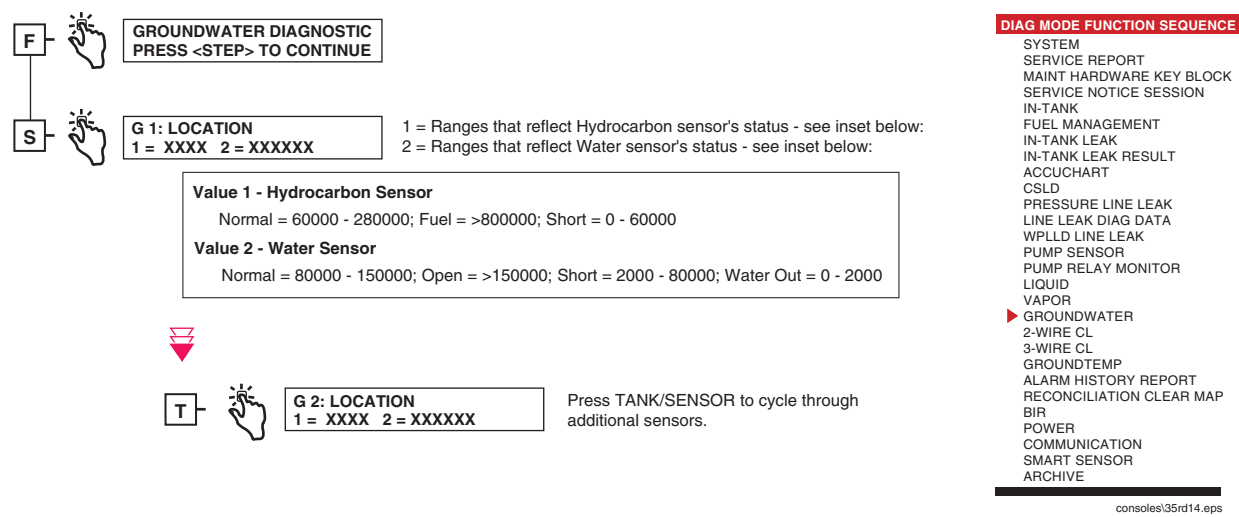


Figure 6-19. Groundwater Sensor Diagnostic Function Diagram

6 Diagnostic Mode

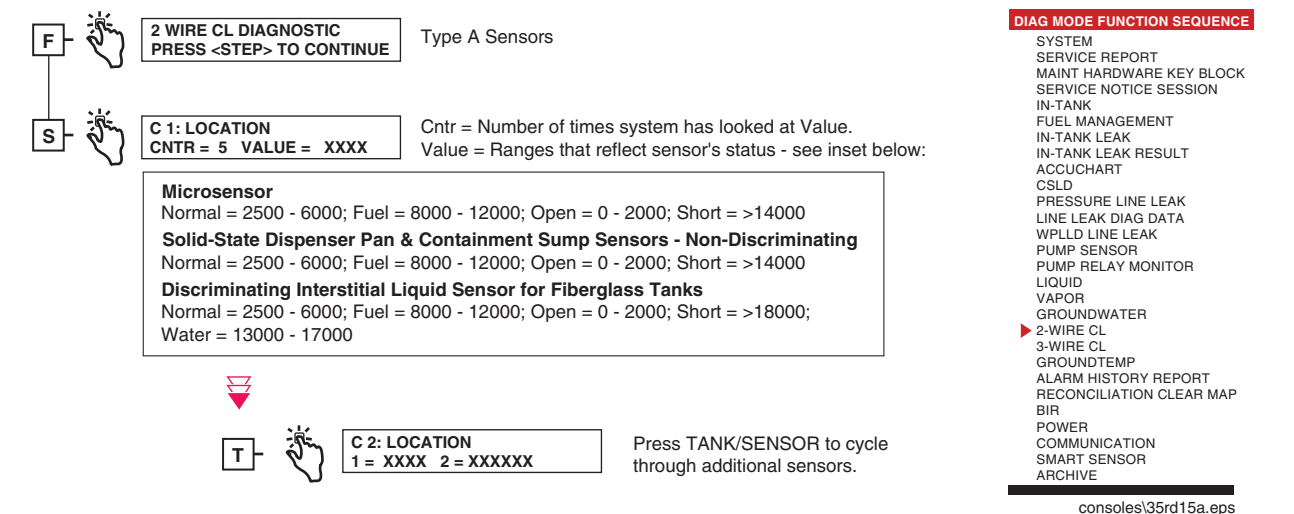


Figure 6-20. 2-Wire CL Sensors Diagnostic Function Diagram

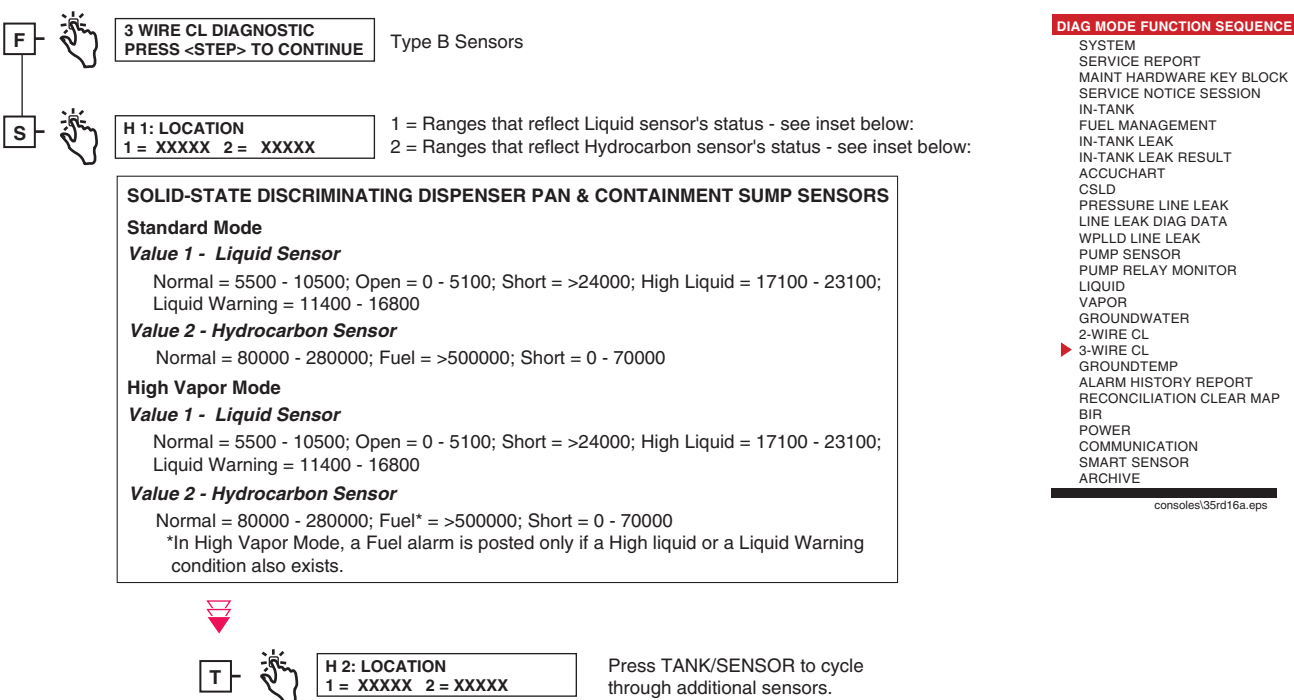


Figure 6-21. 3-Wire CL Sensors Diagnostic Function Diagram

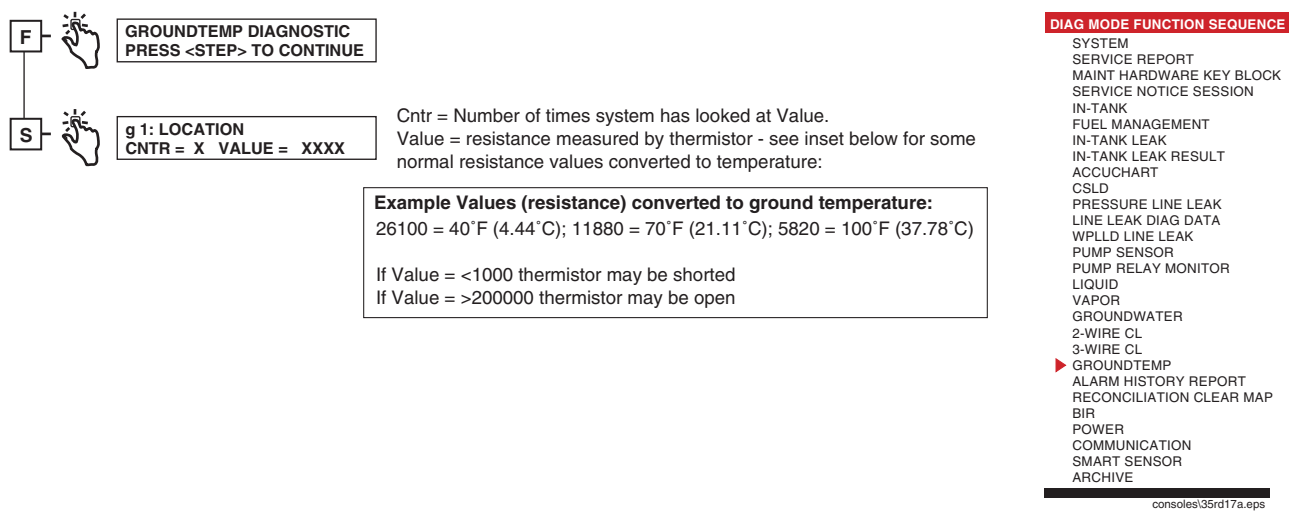


Figure 6-22. Groundtemp (VLLD Option) Diagnostic Function Diagram

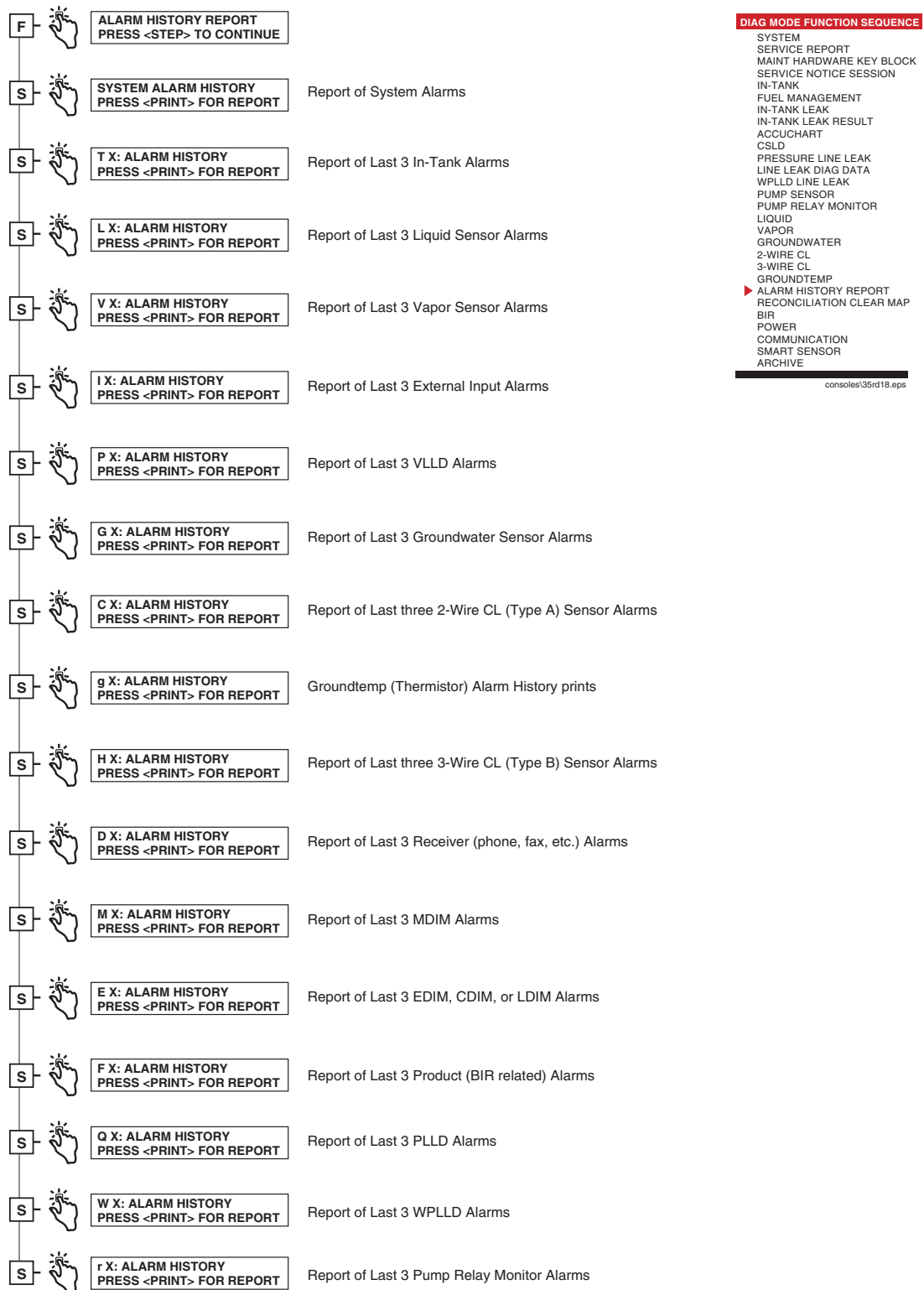


Figure 6-23. Alarm History Report Function Diagram

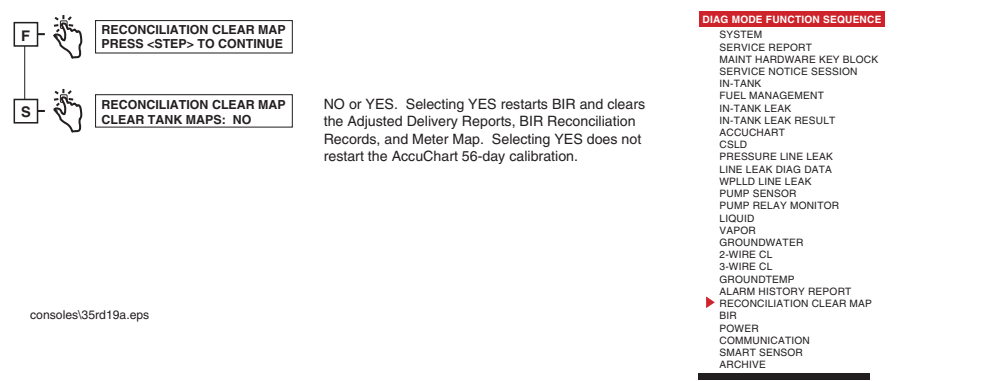


Figure 6-24. Reconciliation Clear Map Function Diagram

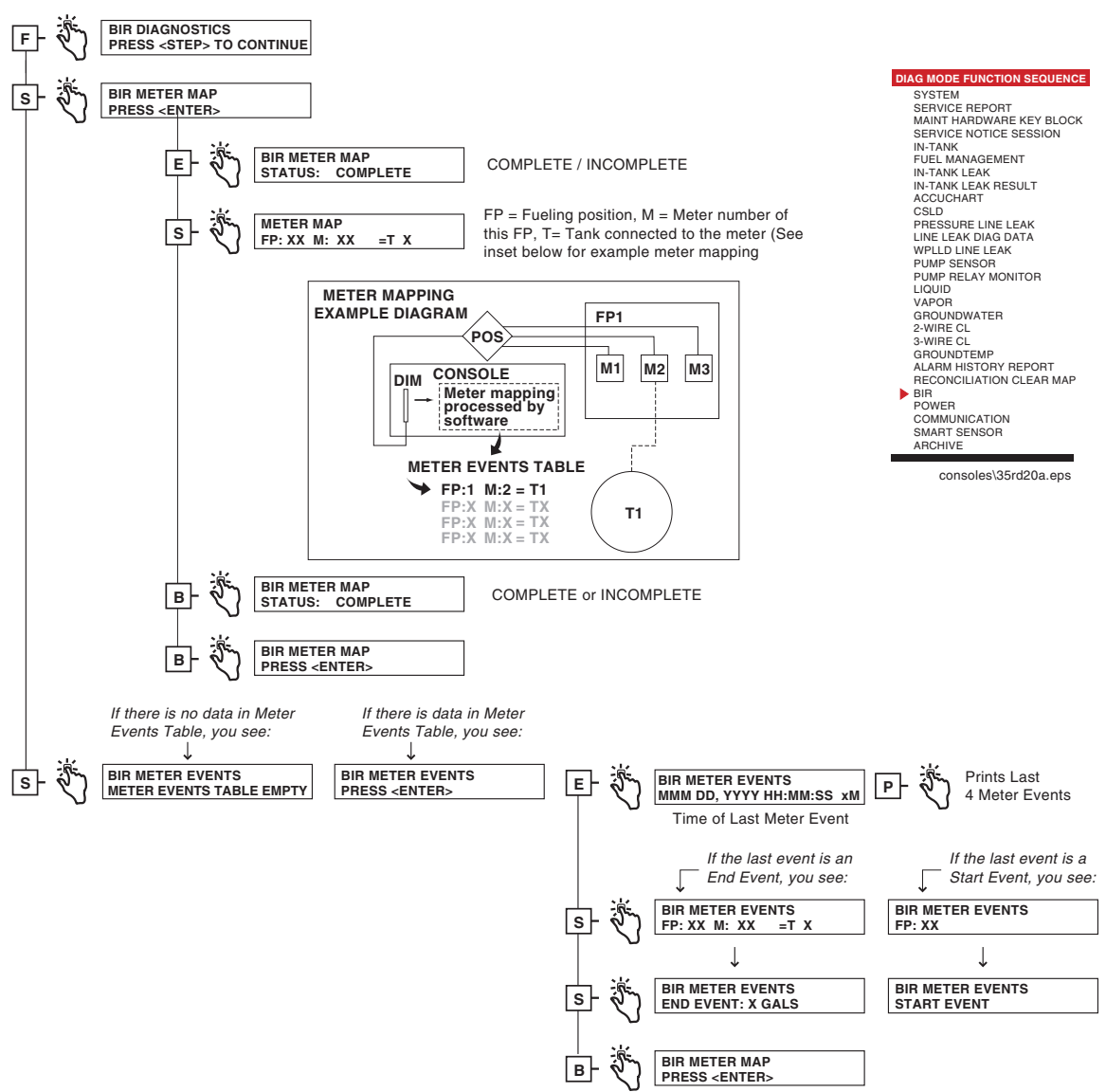


Figure 6-25. BIR Diagnostic Function Diagram

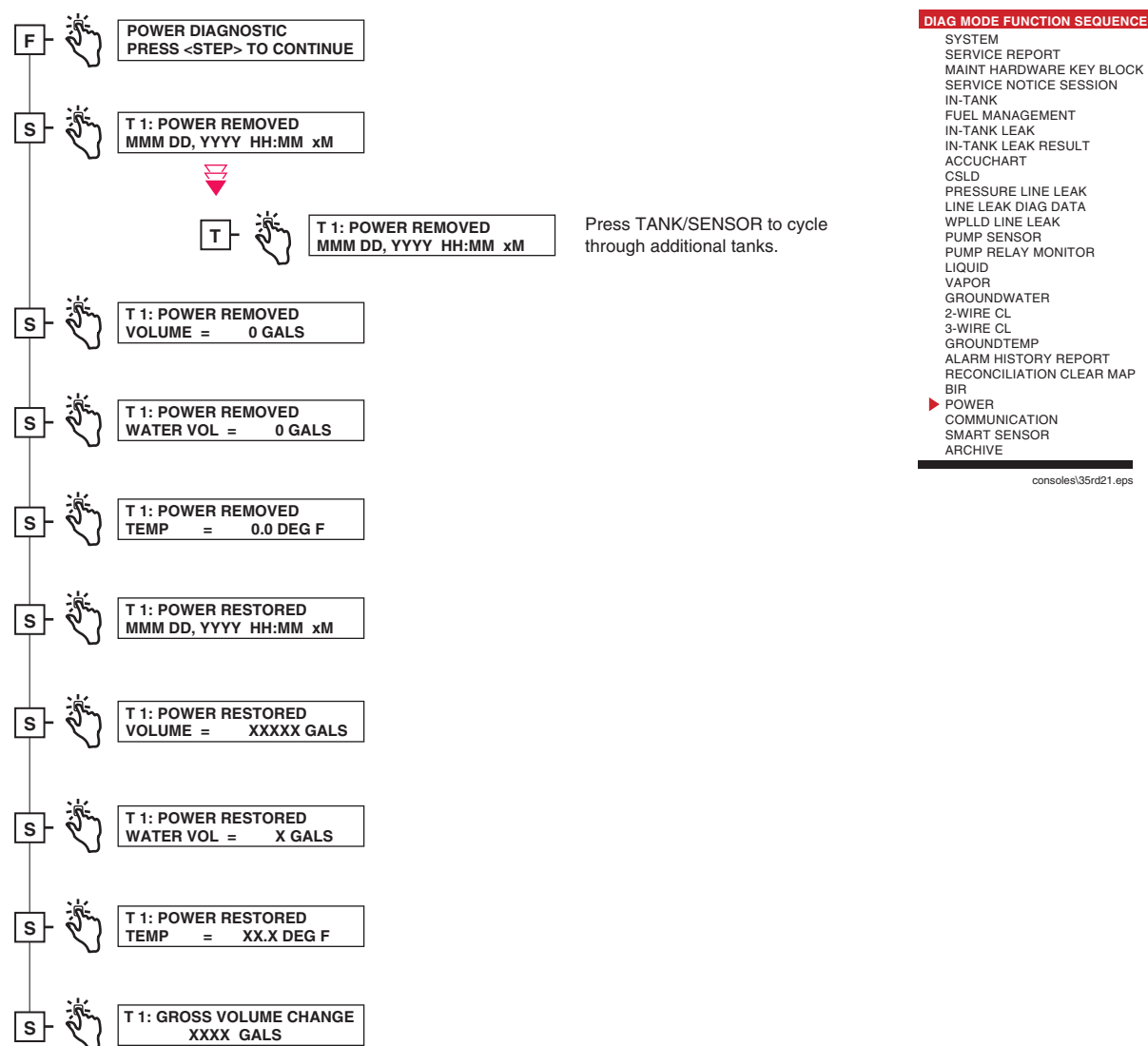


Figure 6-26. Power Diagnostic Function Diagram

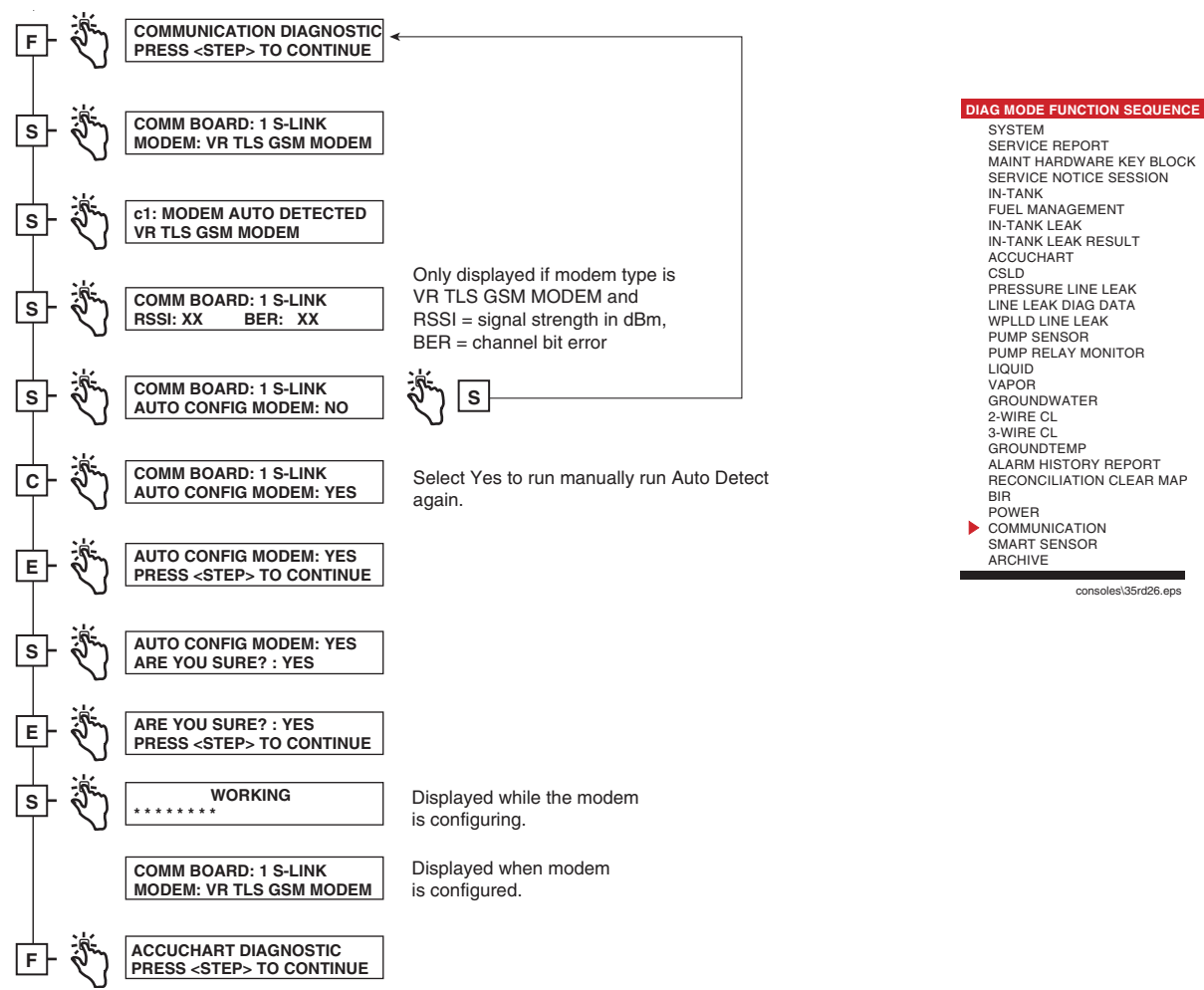


Figure 6-27. Communication Diagnostic Function Diagram

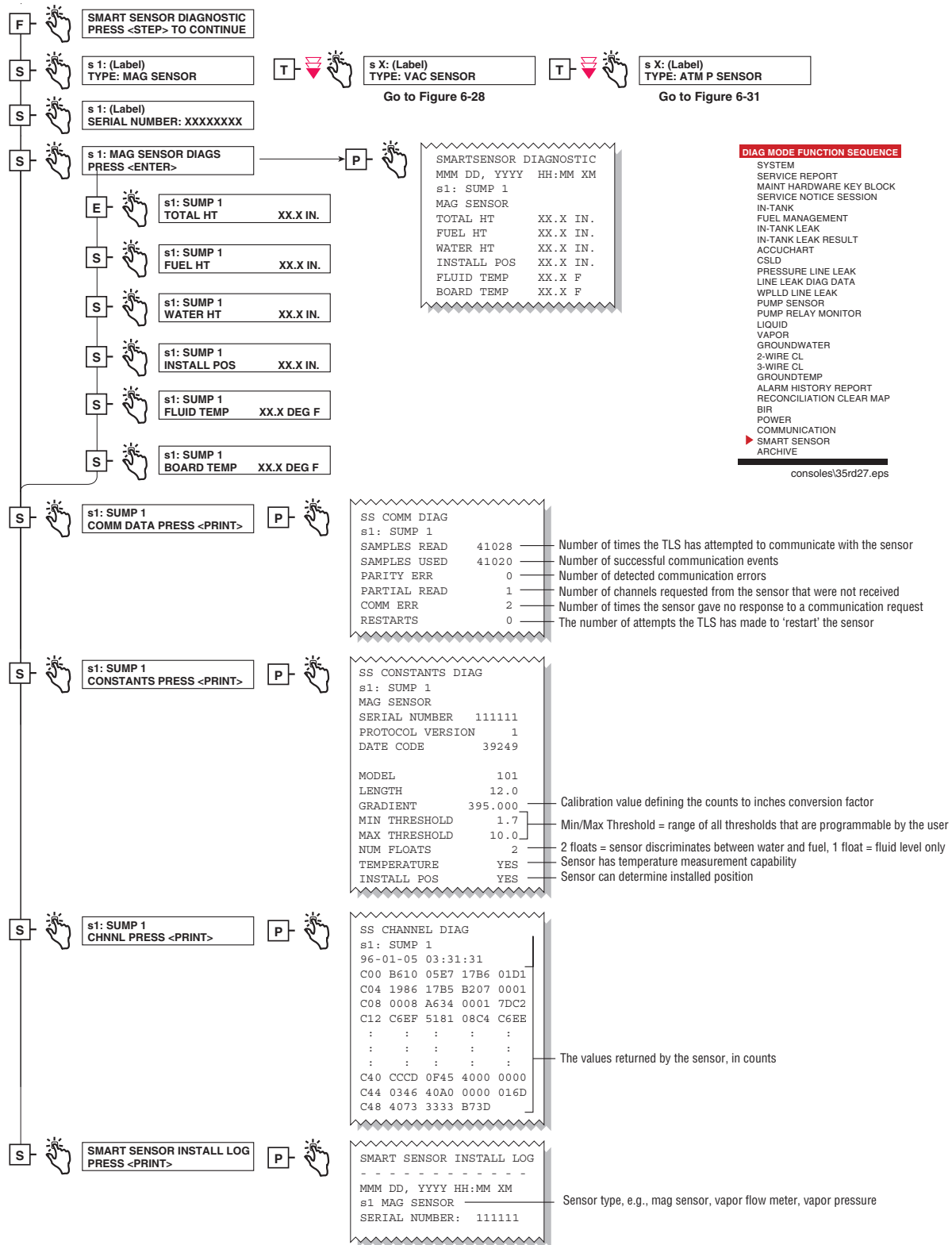


Figure 6-28. Smart Sensor Diagnostic - Mag Sensor Function Diagram

6 Diagnostic Mode

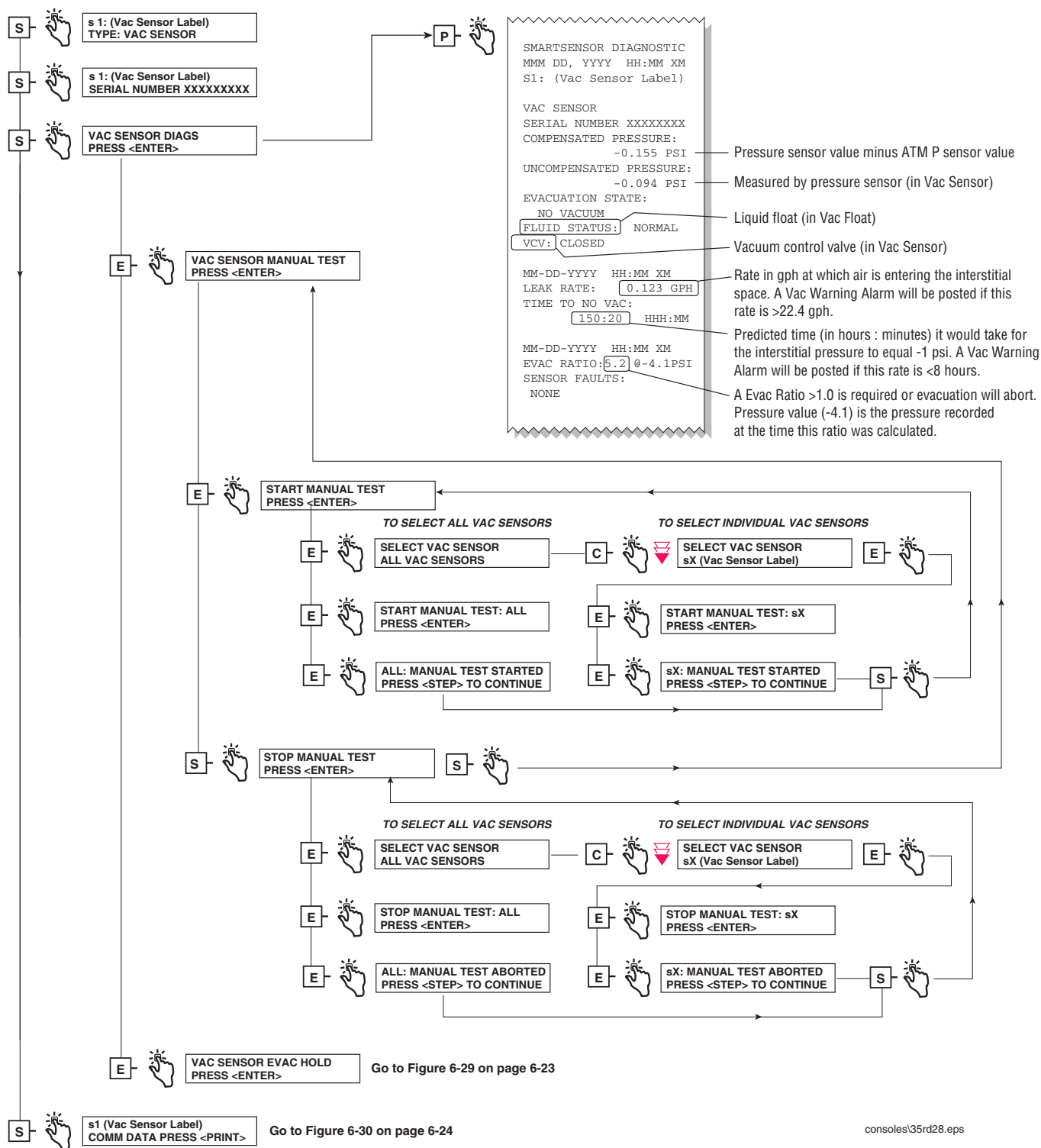


Figure 6-29. Smart Sensor Diagnostic - Vacuum Sensor Function Diagram



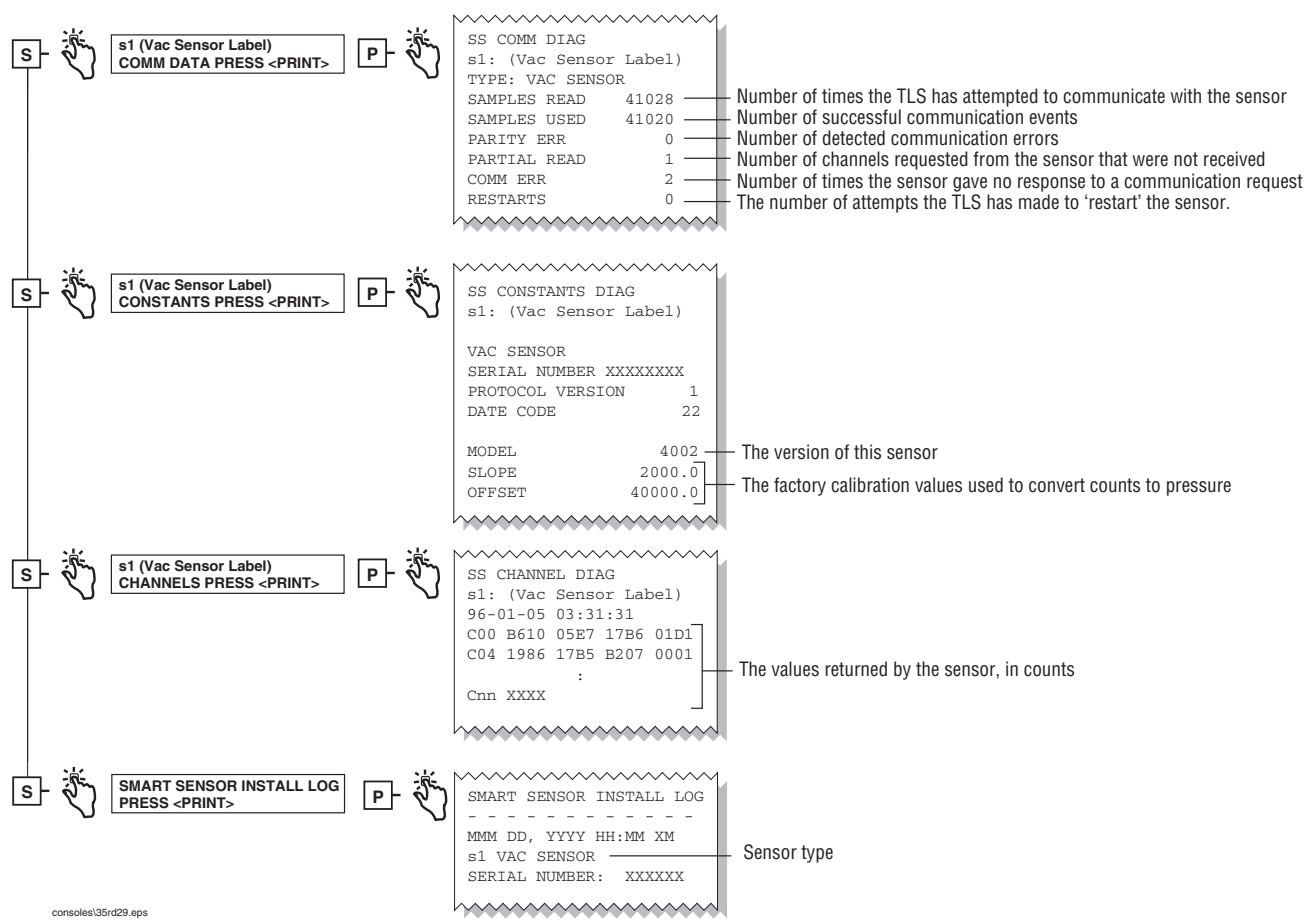
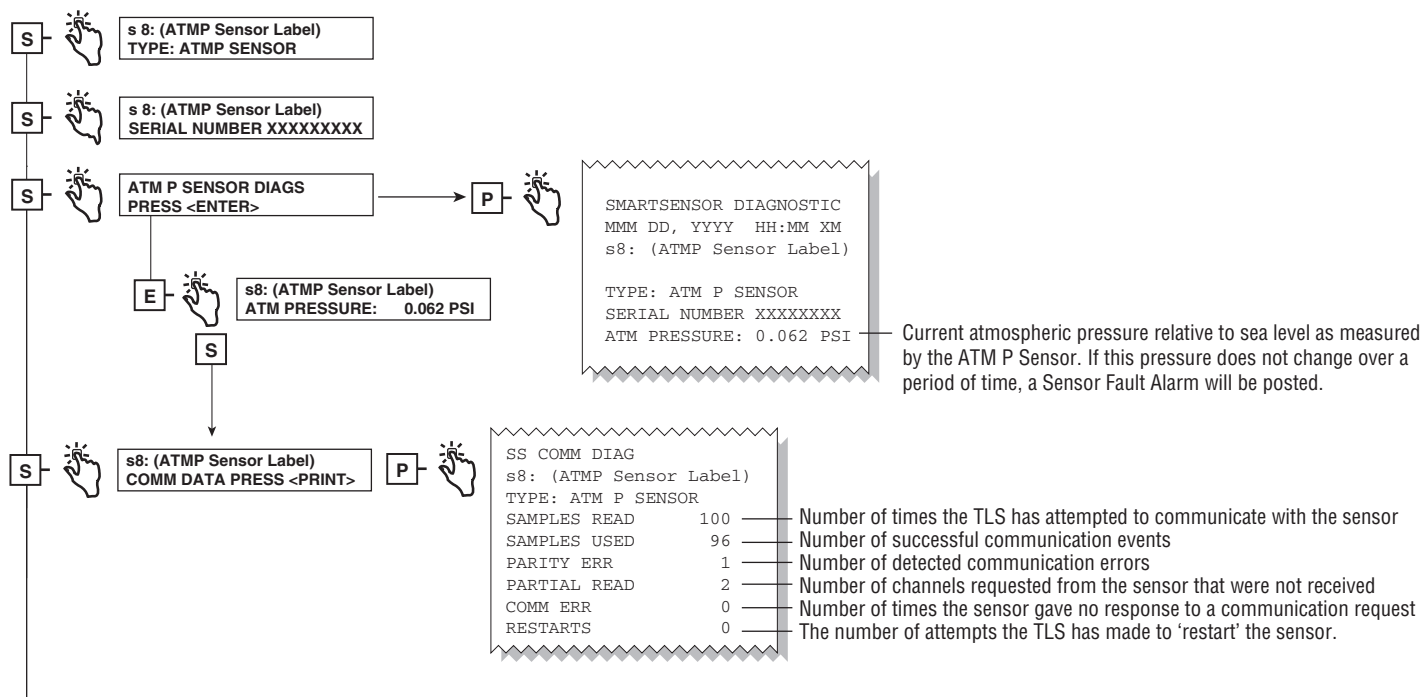


Figure 6-31. Smart Sensor Diagnostic - Vacuum Sensor Function Diagram (continued)



7 Console Troubleshooting

This section lists console (system) troubleshooting help for common system (Table 7-1) and data communication problems (Table 7-2). For parts locations see “System Parts Identification” on page 2-1.

Table 7-1. Console Troubleshooting

Symptom	Cause	Corrective Procedure
Blank printout from integral printer	Wrong paper type - not thermal paper.	Replace with thermal paper roll (Veeder-Root Part No. 514100-328).
	Printer paper in backwards.	Install paper properly.
	Defective printer communication module.	Replace printer communication module.
	Defective printer.	Replace printer.
Characters “Overprint”	Paper roll installed on take up spool.	Install paper in correct position.
	Defective printer.	Replace printer.
Clock is incorrect	Dead battery	Replace battery
	Defective CPU/ECPU board	Replace CPU/ECPU board
Display unintelligible	RAM corrupted.	Turn off AC power and battery switch and restart system.
	EPROMS U2 and U3 on CPU board in wrong sockets (U2 in U3 socket, etc.).	Check for correct positions.
Missing characters on printout	Defective printer.	Replace printer.
No display reading	No AC power to monitor.	Verify power circuit breaker is switched ON.
	#3 Dip Switch (S1 or SW1) on CPU/ECPU board in closed position.	Place #3 Dip Switch (S1 or SW1) in open position – Cycle power to console OFF/ON.
	AC fuse blown.	Check fuse on AC Input module front panel.
	Defective power supply.	Check power supply voltages.
	Defective display board.	Replace display board.
Partial display segments	Defective power supply.	Check power supply voltages.
	Defective display board.	Replace display board.

Table 7-1. Console Troubleshooting

Symptom	Cause	Corrective Procedure
Printer will not print or feed paper	Printer Error Alarm - Printer Traction lever in down position.	Raise printer traction lever to up position.
	Printer out of paper.	Load thermal paper (Veeder-Root Part No. 514100-328).
	Loose printer cable.	Check connections between printer communication module and printer.
	Defective printer.	Replace printer.
	Defective printer communication module.	Replace printer communication module.
System loses memory	Battery switch set to OFF.	Slide battery switch to ON.
	Bad battery.	Measure battery voltage. See Note 1.
	Defective CPU/ECPU board.	Replace CPU/ECPU board.
System self test alarm	Defective NVMEM board	Replace NVMEM board
	Defective CPU/ECPU board.	Replace CPU/ECPU board.

Table 7-2. Data Communications Chart

Symptom	Cause	Corrective Procedure
System will not communicate via internal SiteFax Module.	Modem Module in slot 4 of Comm Bay card cage.	Move module to slots 1, 2, or 3.
	Incorrect or defective interconnect cable.	Check cable between TLS and telephone jack.
	Problem with telephone line.	Call phone company.
	Incorrect baud rate, parity, data bits, or stop bit settings.	Set all to agree with host device. See <i>System Setup Manual</i> .
	Security code enabled when not required.	Disable security code. See <i>System Setup Manual</i> .
	Incorrect security code.	Input correct security code or disable security code. See <i>System Setup Manual</i> .
	Defective modem module.	Replace modem.
System will not communicate via RS-232 Module	RS-232 Module in slot 4 of Comm Bay card cage.	Move Module to slots Comm Cage slots 1, 2, or 3.
	Incorrect cable.	Use null cable when connecting to terminal/computer. Use straight cable when connected to external modem.
	Incorrect baud rate, parity, data bits, or stop bit settings.	Set all to agree with terminal/host device. See <i>System Setup Manual</i> .
	Incorrect security status.	Input security code or disable security code. See <i>System Setup Manual</i> .

8 Sensor Troubleshooting

This section contains suggested corrective actions for troubleshooting sensor problems.

Sensor Alarm Will Not Clear

Liquid or fuel in containment area.

Sensor Out Alarms

Follow these steps in sequence to troubleshoot Sensor Out alarms.

1. Verify that the distance from the sensor to the TLS is less than 1000 feet.
2. Verify that the sensor wiring conforms to the requirements detailed in the [Site Prep and Installation Manual](#) (P/N 576013-879) and that it connects the console to the sensor.
3. Verify that the console grounding is correct. Make sure there are two grounds and that one is at least a 12 AWG (or larger diameter) conductor. Check that the grounding conductors are properly connected to a good ground source. Measure the resistance to ground, it should be less than one ohm.
4. Verify that the console is on a separate circuit breaker with no shared branch circuits.
5. Verify that the sensor connects to the proper interface module or to the proper connector position (TLS-300 Consoles), and that polarity (required for some sensors) is maintained from the sensor to the console. If necessary, refer to the [Sensor Products Application Guide](#) (P/N 577013-750) for correct sensor/console compatibility and sensor specifications.
6. Enter the Diagnostic Mode (ref. Section 6) and step through the diagnostic menu for the problem sensor. These diagnostics provide information that may help you determine the root cause of the sensor's problem.
7. Consider directly connecting the sensor to the console to confirm a faulty sensor.

Setup Data Warning

This alarm could be posted by one of three setup errors:

1. A label for the sensor was not entered during setup (TLS-300/TLS-350 Consoles).
2. The wrong sensor type was selected during setup (TLS-300 only).
3. The sensor was not configured during setup but the console measures a resistive value and determines a device is connected (TLS-300/TLS-350 Consoles).

Unstable Sensor Readings

Unstable sensor readings may be the result of intermittent signals or electro-magnetic interference (EMI). Some causes of unstable sensor readings are discussed below.

1. Shielded cable was not used between the sensor and the console, or if it was, it was not grounded correctly. See the [Site Prep and Installation Manual](#) (P/N 576013-879) for installation requirements.
2. Extra wires (not connected to the console) in the sensor conduit. They should be removed.

3. Damaged wiring insulation exposing bare conductors to moisture in the conduit. This condition may also appear as readings showing lower than normal or the same reading, regardless of the state of the sensor.
4. Moisture causing the sensor wiring to short to the conduit. This can become evident after rainy wet weather or flooding. Measuring the resistance with a standard volt-ohm meter may not identify a short due to moisture.
5. Connect the sensor directly to the console to determine if the reading is still unstable. If it stabilizes, the problem is between the console and the sensor. If fluctuation continues with the sensor connected directly to the console, change the sensor.

Cleaning Fuel Contaminated Discriminating Sensors

DISCRIMINATING SENSORS 794380-320, -322, -350, -352, -360, -361, & -362

Sensors exposed to gasoline should be removed from the pan or sump, dried off, and be allowed to recover in a well-ventilated area for up to 7 days. Note: recovery time will vary depending on the ambient temperature and how long the sensor was exposed to fuel. Sensors exposed to diesel fuel must be soaked in Coleman® fuel for 30 minutes and be allowed to recover in a well-ventilated area for up to 7 days.

DISCRIMINATING SOLID-STATE SENSOR - OPTICAL (P/N 794380-343, -344)

To clean contaminated optical sensors, dip the sensor into a small container of alcohol and briefly swirl it around to rinse it off.

Smart Sensor Troubleshooting

COMM ALARMS - ALL SMART SENSOR TYPES

1. The console cannot reliably communicate with the sensor. This could be caused by a poor wiring connection, faulty sensor, faulty Smart Sensor module, or an electrically noisy line.
2. Connect the sensor directly to the console to troubleshoot field wiring, noisy line issues. If unit is ok, check wiring connections, wire conductivity, etc., to isolate the problem.

MAG SENSOR

1. Verify threshold parameters entered during setup for this sensor are correct.
2. Following the alarm upgrade delay period, if enabled, any designated Fuel, Water, Hi Liquid, and Lo Liquid 'warnings' will change to 'alarms' - even if the liquid in the containment area is only at the warning level.
3. For a Sensor Fault Alarm the console is reading the Mag Sensor, but the readings are unstable. The problem could be the sensor itself (float missing, bad probe, etc.) or electrical noise on the line (similar to effects on mag probes).
4. An Install Alarm is posted if the Mag Sensor is not firmly resting on the bottom of the monitored pan/sump. Check that the sensor is installed correctly.

VAC SENSOR

1. Verify volume and relief valve (if installed) parameters entered during setup for this sensor are correct.
2. Figure 8-1 shows a diagram of a typical Vac Sensor installation. The submersible pump is the vacuum source for the Vac Sensor system. Note: in this example diagram, only one Vac Sensor is shown, but multiple Vac

Sensors can be connected to one pump. When multiple Vac Sensors are connected to one pump, run the manual test on one Vac Sensor at a time.

The TLS Console turns the pump on, opens the vacuum control valve (in Vac Sensor), and then monitors the pressure sensor (in Vac Sensor). When the vacuum reaches either 1 psi above the entered relief valve pressure (relief valve installed), or -8 psi (no relief valve installed), the console closes the vacuum control valve and turns off the pump. Thereafter, the console continues to monitor the pressure sensor for signs of a decrease in vacuum (leak) and the liquid float for the presence of a liquid in the vacuum line. In the event of a decrease in vacuum the console turns on the pump in an attempt to restore the vacuum. Small leaks will be maintained by these periodic evacuations. If the system calculated leak rate exceeds approximately 25 gph, or if the rate of decay indicates the pressure will rise to -1 psi in less than 8 hours, or if the pressure is not dropping fast enough and the pressure is above -4 psi, a Vac Warning will be posted. The console also monitors the liquid float in the Vac Float module or tank interstice and will post a High Liquid Alarm if enough liquid accumulates in the vac line liquid reservoir to lift the float.

NO VACUUM ALARM

If the pressure rises above -1 psi, a No Vacuum Alarm will be posted and the system will not attempt to evacuate the interstitial space. To troubleshoot this alarm, first make sure that no alarms assigned to disable the pump are active and that the pump is operational. Second, visually inspect all tubing and fitting connections and repair/replace defects as required. Third, run a manual test to restore the vacuum (ref. Figure 6-29 on page 6-24 for menu steps). On the front panel display, observe the pressure decreasing (going more negative) while the test is running. When the pressure is below -3 psi, start the evac hold (refer to Figure 6-30 on page 6-25). Observe the interstitial pressure. If the pressure appears to hold, restart a manual test. If the pressure does not remain steady during the hold, abort the test and find and repair the leak.

VACUUM WARNING

For a Vac Warning there may be a leak larger than the capacity of the vac source, or the vac source may not be functioning properly. Use standard practice to verify vac source operation.

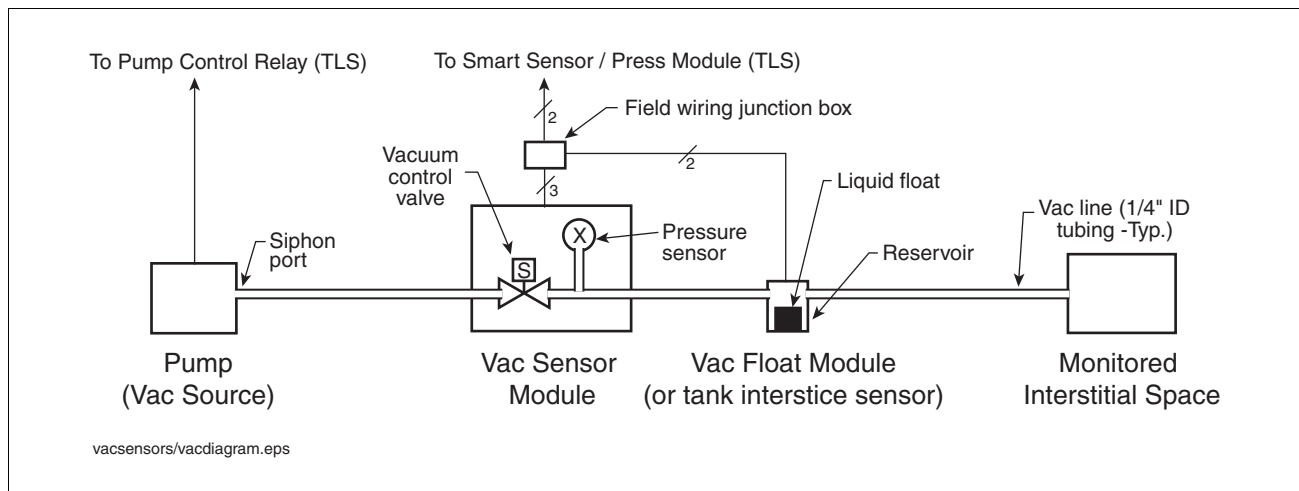


Figure 8-1. Vacuum sensor system components

9 Probe Troubleshooting

This section contains basic probe problem diagnosis and suggested corrected actions for troubleshooting Magnetostrictive Probes (Table 9-1). Refer to TLS-3XX *Site Prep and Installation Manual* (Veeder-Root No. 576013-879) and the appropriate probe installation manual for more information about probe, conduit, and wiring installation.

Note: Removing the probe from the tank while connected to the console will cause a “Sudden Loss Alarm” which must be cleared after the probe is reinstalled.

Table 9-1. Mag Probe Troubleshooting

Alarm	Problem	Probable Cause	Corrective Procedure
N/A	Incorrect height/volume reading	Incorrect float size programmed	Reprogram actual installed float size
		Incorrect or missing setup data	Print out setup data and check for errors.
		Incorrect tank tilt value	Check tank tilt and correct if necessary.
		Probe wired to wrong probe channel on probe module	Verify probe is wired to correct channel.
		Probe not sitting on bottom of tank	Check and correct position of probe, if necessary.
		Fuel float stuck in riser tube.	Remove float from riser and install split-ring collar (P/N 576008-617) on probe shaft below riser tube to prevent recurrence of problem.
		Water or fuel float assembly missing or ring magnet defective.	Replace float assembly.
		Fuel float assembly installed upside down	Correct float assembly installation.
		2-inch floats with consoles having Version 1 and 2 software.	See Note 1.
		Dirty probe shaft.	Clean probe shaft so that float moves freely up and down.
		Defective probe	Swap with probe from another tank. If problem follows probe, replace probe.
Water Warn/ High Water Alarm	Incorrect water height reading	Wrong or missing ballast	Install correct water float assembly.
		Water float sitting on debris at bottom of tank.	Check for debris on bottom of tank and clean if necessary.
Invalid Fuel Level	Invalid fuel height on warning display	Fuel level is too low and fuel float is sitting on the water float.	Call for delivery.

9 Probe Troubleshooting

Table 9-1. Mag Probe Troubleshooting

Alarm	Problem	Probable Cause	Corrective Procedure
Low Product Alarm	Low or invalid product	Fuel is too low	Call for delivery.
N/A	Fuel level reading equals full tank volume even though fuel level is below full volume.	Fuel float stuck in riser.	Remove float from riser and install split-ring collar (P/N 576008-617) on probe shaft below riser tube to prevent a recurrence of the problem.
	Probe reading on console display disappears or appears intermittently.	Defective probe cable	Replace cable.
	Ghost Deliveries.	Splices in wiring	See Note 2.
		Defective field wiring	Check for open or shorted wires, or absence of epoxy seal kits around field connections. Refer to "Field Troubleshooting Probe-Out Alarms" procedure below for more details.
		Other control wires in probe conduit	See Note 2.
		Conduit not grounded properly	See Note 2.
		Non-metallic conduit present	See Note 2.
		Variable speed submersible pump in use	See Note 2.
		Defective barrier board	Replace barrier board.
		Defective probe	Replace probe.
	Ghost tank reading	Defective barrier board	Replace barrier board.
	Fuel temperature reading is incorrect	Defective thermal sensor in probe.	Replace probe.
	Probe does not read out and there is no probe alarm	Probe channel not configured in tank setup	See System Setup Manual.
		Incorrect software for probe/thermistor module	See Note 3.
	Leak Test Invalid - Recent delivery	A delivery occurred during the leak detect test or within 8 hours prior to the console's entering the leak detect mode.	Retest, waiting longer than 8 hours after last delivery.
	Leak Test Invalid - Tank level low	Fluid level is too low. Insufficient product in tank for satisfactory thermal compensation.	Fill tank to half full or more.
	Leak Test Invalid - First hour error	Consult factory.	Consult factory.
	Leak Test Invalid - Last hour error	Consult factory.	Consult factory.

Table 9-1. Mag Probe Troubleshooting

Alarm	Problem	Probable Cause	Corrective Procedure
N/A	Leak test invalid - temp out of range	Fuel temp reading is below 0°F or above 100°F.	Retest when product temperature is between 0 - 100°F.
		Defective probe.	Replace probe.
	Temp change error - w/0.1 gph test	Temp of fuel changed by more than 1/10th degree per hour during the leak test.	Retest.
	Temp change error - w/0.2 gph test (Mag 2 probe only).	Temp of fuel changed by more than 2/10th degree per hour during the leak test.	Retest.
	Temp change error - zone change error	Temp of any covered thermistor changed more than 3/10th degree per hour during leak test.	Retest.
	Temp change error - head change error	Temp in head of probe changed more than 1/10th degree per hour during leak test.	Retest.
Fuel Quality Alarm - Tank has Ethanol-Blended Gasoline floats.	Water/phase separation	Water/phase separation may be present in tank.	Test fuel at bottom of tank to ensure water/phase separation is not present.
Fuel Quality Alarm - Tank has Density probe.	Fuel density	The tank density is either greater than the tank density low limit plus 1.00 KG/M ³ (0.062 LBS/FT ³) , or is less than the tank density high limit minus 1.00 KG/M ³ (0.062 LBS/FT ³)	Verify fluid density. Retest when product density is within the tank density low and high limits.

NOTE 1. When 2-inch float kits are installed on mag probes, the fuel height reading will not be correct with older systems still using console software Version 1 and two EEPROMS. These versions require a tank tilt adder of +2.25 when used with Mag probes with 2-inch floats. Systems with Version 3 software or higher do not require this adder.

NOTE 2. Refer to *Site Prep and Installation Manual* (Veeder-Root No. 576013-879).

NOTE 3. The Four-Input Probe/Thermistor Module can only be used in systems with Version 1 software, Rev. F or higher. In Version 2 software or higher, all revision levels are compatible.

Field Troubleshooting Probe-Out Alarms

You must verify all locations utilizing shielded cable are wired correctly. Verify that the drain wire of the shielded cable is connected to the console end only. If the drain wire is connected on both ends this creates a ground loop which can produce Probe-Out Alarms. Remove power from the console before disconnecting the probe cable from the probe.

Follow these steps in sequence to troubleshoot probe-out alarms.

All probes returned for a warranty claim must be accompanied with the documentation produced during the following troubleshooting procedures to document the failure.

For any of the following steps that produce a printout from the console, those printouts must be provided with any returned probe.

If no printer is available then you must record the information specified below:

1. Press Alarm Test Button- (Verify System Alarms)
 - Print / record the active alarms
2. Press Mode Button to display Diag Mode.
3. Press Function until In-Tank Diagnostics appear.
4. Press Print. (If the console does not have a printer, manually record the diagnostic data from each diag screen).
 - Print / record the In-Tank Diagnostics
5. The Probe distance from the console must be less than 1000 feet. If the distance is greater than this probe operation is not guaranteed.
6. Ensure the probe wiring conforms to the requirements detailed in the TLS-3XX Site Prep and Installation Manual (Veeder-Root No.576013-879).
7. Verify the console is grounded correctly.
 - Is the ground wire at least a 12AWG conductor? Remove ground cable from the grounding lug inside the console, use an ohmmeter to measure resistance from the ground wire to a known good ground. The resistance reading should be less than 1 ohm.
 - If resistance is greater than 1 ohm, the console is not properly grounded. Either repair the ground connection or contact the installation company to ensure proper grounding is established.
8. Verify the console is on a separate circuit breaker with no shared branch circuits.
9. Verify the polarity of the probe wiring is correct from the probe to the console. The probe cable black conductor must be connected to the probe module (-) Negative. The probe cable white conductor must be connected to the probe module (+) Plus.
10. Disconnect the probe cable connector from the probe and inspect both the probe cable female pins and the male pins on the probe for corrosion. If corrosion or contamination is suspected clean with electrical cleaning solution and reconnect probe cable. Verify alarm condition is cleared.
11. Open probe junction box and inspect connections for the probe wires and the connecting field wiring. These connections must have Veeder-Root supplied epoxy packs on the splices. Corroded splices will create Probe Out alarms. If Veeder-Root supplied epoxy packs are present, inspect them to make sure there is no water inside the packs where the connections are made. Verify that the wire nuts and cable sheathing are immersed in epoxy. The epoxy should be "rock hard". If no epoxy packs were utilized, the Veeder-Root installation procedures were not followed. Refer to the appropriate installation manual for correct installation procedures.
12. Before proceeding, ensure that console power is Off. (If only one tank exists or the suspect probe cannot be installed in another tank at the site, proceed to step 13). Swap the non-working probe with a working one from another tank to determine if the problem follows the probe or stays with the tank. When swapping probes, disconnect the probe cable connector on the top of the probes and swap the probes between the tanks. Do not swap probes and cables at the same time. If the problem moves to the other tank, replace the probe. If the problem stays with the original tank after swapping probes, go to step 13. If the Probe Out clears and does not return on either tank wait 30 minutes to see if alarm returns. If it does not return, leave the probes in-place and wait for the customer to contact you if the problem reoccurs. If problem reoccurs within a reasonable period of time on the tank the suspect probe is now in, then replace the probe. If it returns on the original tank then follow the steps for troubleshooting wiring and connectors.

13. Replace the probe cable. If the problem persists, move the wires on the probe module from the non-working channel to a known working channel (if possible). If the probe works on the known working channel, replace the probe module. If the problem still exists on the known working channel, remove the probe from the tank and bring it to the console. Connect it directly to the console (you will need a spare probe cable). If the Probe-Out Alarm clears with the probe wires connected directly to the console, then there is a problem with the field wiring.
14. Measure the resistance of the probe wiring from the probe end of the cable to its connections at the console. First disconnect the cable from the console and twist the two ends together. Then remove the connector from the probe canister. Measure the resistance across the two connector pins. The resistance should be low. It should equal (approximately) the cable manufacturer's single conductor resistance per foot times the length of the cable run times two:
- 14 AWG should measure 2.52 ohms/1000 feet
 - 16 AWG should measure 4.02 ohms/1000 feet
 - 18 AWG should measure 6.39 ohms/1000 feet
- If the resistance is higher than the cable manufacturer's specification, either the cable is defective or there are poor connections between the console and the probe. If the resistance is within the cable manufacturer's specification, measure the resistance between one of the connector pins and the field wiring conduit to verify it is not shorted (this resistance should be very high [megohms to infinity]). If the cable is good, reconnect the cable at the probe and the console.
15. Verify that the probe riser is not magnetized. This can be accomplished by using a metal paper clip on a string. Dangle the paper clip suspended by a string into the probe riser to determine if the riser pipe is magnetized. If the paper clip is attracted to one side of the riser pipe, replace the riser (this is rare, but it has occurred).

Minimum Detected Fluid Levels

Table 9-2. Mag Probe Minimum Detected Fluid Levels

Circuit Code	Mag Probe Type	Leak Detect	Name Plate Color	Water Detect	4" Ethanol-Blended Gasoline Floats		4" Floats		3" Floats		2" Floats	
					Min. Fuel Level	Min. Water Level	Min. Fuel Level	Min. Water Level	Min. Fuel Level	Min. Water Level	Min. Fuel Level	Min. Water Level
Mag Probes - Form Number 8473												
C000	Std., 2 float	0.10 gph	Black	Yes	—	—	8"	0.75"	—	—	9.5"	0.75"
C001	Std., 2 float	0.20 gph	Red	Yes	—	—	8"	0.75"	—	—	9.5"	0.75"
D000	Std., Inv. only, 2 ft	None	Green	Yes	—	—	8"	0.75"	—	—	9.5"	0.75"
D001	Alt., 1 float	0.10 gph	Black	No	—	—	5"	—	—	—	7"	—
D002	Alt., 1 float	0.20 gph	Red	No	—	—	5"	—	—	—	7"	—
D003	Alt., Inv. only	None	Green	No	—	—	5"	—	—	—	7"	—
Mag Probes - Form Numbers 8463 & 8493												
D004	2 float	0.10 gph	Black	Yes	7.000"	0.38"	3.04"	0.63"	3.04"	0.63"	3.23"	.867"
D005	2 float	0.20 gph	Red	Yes	7.000"	0.38"	3.04"	0.63"	3.04"	0.63"	3.23"	.867"
D006	Inv. only, 2 ft	None	Green	Yes	7.000"	0.38"	3.04"	0.63"	3.04"	0.63"	3.23"	.867"

Table 9-2. Mag Probe Minimum Detected Fluid Levels

Circuit Code	Mag Probe Type	Leak Detect	Name Plate Color	Water Detect	4" Ethanol-Blended Gasoline Floats		4" Floats		3" Floats		2" Floats	
					Min. Fuel Level	Min. Water Level	Min. Fuel Level	Min. Water Level	Min. Fuel Level	Min. Water Level	Min. Fuel Level	Min. Water Level
D007	1 float	0.10 gph	Black	No	—	—	0.985"	—	0.985"	—	3"	—
D008	1 float	0.20 gph	Red	No	—	—	0.985"	—	0.985"	—	3"	—
D009	Inv. only, 1 flt	None	Green	No	—	—	0.985"	—	0.985"	—	3"	—
Mag Probes - Form Number 8468												
D021	Inv. only 2 flt	None	Blue	Yes	—	—	3.04"	0.63"	3.04"	0.63"	3.23"	0.867"
D022	Inv. only, 2 flt	None	Blue	Yes	—	—	3.04"	0.63"	3.04"	0.63"	3.23"	0.867"
D023	Inv. only, 1 flt	None	Blue	No	—	—	0.985"	—	0.985"	—	3"	—
D024	Inv. only, 1 flt	None	Blue	No	—	—	0.985"	—	0.985"	—	3"	—
Density Mag Probes - Form Number 8860												
D041	Mag- D	0.10 gph	Black	Yes	—	—	—	—	—	—	8.0"	0.87"
D042	Mag- D	0.20 gph	Red	Yes	—	—	—	—	—	—	8.0"	0.87"
D043	Inv only, Mag- D	None	Green	Yes	—	—	—	—	—	—	8.0"	0.87"

Mag Probe Channel Counts in Common Liquids

Table 9-3 below shows the normal operating range of channel counts for magnetostrictive probes in common liquids (fuels).

Table 9-3. Mag Probe Channel Counts in Common Liquids

Probe Length	Channel	Normal Count Range*
All Probes	C00 (No Water)	0 - 1500
4 Foot Probe	C01-C10	700 - 17040
5 Foot Probe	C01-C10	700 - 21300
6 Foot Probe	C01-C10	700 - 25560
7 Foot Probe	C01-C10	700 - 29820
7 Foot, 6 Inch Probe	C01-C10	700 - 31950
8 Foot Probe	C01-C10	700 - 34080
9 Foot Probe	C01-C10	700 - 38340
10 Foot Probe	C01-C10	700 - 42600
*Channels C06 - C10 are only updated when necessary. Therefore the counts for C01 - C05 will normally be different from the counts for C06 - C10. Channel counts outside of this range indicate a defective probe – replace probe.		

Example Probe Status Printouts

MAGNETOSTRICTIVE PROBE - NORMAL

PROBE DIAGNOSTICS

T1: PROBE TYPE MAG7

SERIAL NUMBER 212617

ID CHAN = 0xD004

GRADIENT = 351.69*

NUM SAMPLES = 20

C40	760.0	C41	28090.8
C42	28090.8	C43	28090.8
C44	28090.9	C45	28091.0
C46	28090.9	C47	28090.9
C48	28090.6	C49	28090.9
C10	28090.6	C11	43915.1
C12	34038.4	C13	34247.9
C14	34274.7	C15	34379.1
C16	34715.3	C17	34929.8
C18	43915.9		

SAMPLES READ = 450255

SAMPLES USED = 449269

MAGNETOSTRICTIVE PROBE - MISSING WATER FLOAT

PROBE DIAGNOSTICS

T1: PROBE TYPE MAG7

SERIAL NUMBER 212617

ID CHAN = 0xD004

GRADIENT = 351.6900*

NUM SAMPLES = 20

C40	27057.2	C41	55118.2
C42	55117.9	C43	55117.9
C44	55118.4	C45	55117.6

C46	29493.6	C47	29493.3
C48	29493.4	C49	29493.7
C10	29493.4	C11	43914.8
C12	34048.5	C13	34239.1
C14	34270.4	C15	34378.2
C16	34718.6	C17	34934.3
C18	43915.6		

SAMPLES READ = 249626

SAMPLES USED = 249561

*Gradient may be 175 - 185, or 348 - 358.

10 Dispenser Interface Modules (DIMs)

Table 10-1. DIM Quick Reference Chart

DIM Part Number	Software Revision	Description	Hardware Type	Default Settings				Notes
				Baud	Parity	Length	Stop	
330280-401	349643	Gilbarco GSite	EDIM	1200	Even	7	1	
330404-020	349634	Gilbarco GL	CDIM	Proprietary				1
331354-001	331353	Tokheim 67A&B	CDIMII ⁴	9600	None	8	1	1, 6
330280-201	330384	Tokheim DHC	EDIM	1200	Even	7	1	5
330404-010	349633	Wayne CL	CDIM	Proprietary				1
330404-001	330435	Schlumberger	CDIM	1200	Even	7	2	2, 5
331001-002	349753	Gasboy RS422	LDIM	9600	None	8	1	
331001-003	349753	Gasboy CFN	LDIM	9600	None	8	1	5
330280-001	330273	BIR	EDIM	9600	Odd	7	1	METRIC , 3
331001-003	330270	Mechanical	MDIM	N/A				2
331313-001	330270	Low Volt Mech	LVDIM	N/A				2
332328-002	349806	Wayne IDPOS	TDIM	N/A				1
332328-003	349806	Smart Crind	TDIM	N/A				1
331001-001	349646	Tominaga	LDIM	19,200	Even	8	1	1, 3, 5
330404-040	349633	Bennett	CDIM	4800	Even	8	1	1
330280-511	349631	UK Block	EDIM	2400	Even	7	1	2
330280-601	349641	Scheidt & Bach	EDIM	1200	None	8	1	2
<p>1. Parameter string is never required.</p> <p>2. Will not generate Communication Alarm.</p> <p>3. Metric is the default setting for unit conversion. Requires 'G' in parameter string for gallon units.</p> <p>4. A 2 port CDIM. Normal CDIMs have 3 ports, CDIMII has 2 ports, each of which monitors two communication channels.</p> <p>5. No blending.</p> <p>6. Use 'P' in parameter string for Tokheim 2+1, 3+1, and 4+1 blending dispensers.</p>								

Table 10-2. DIM Parameter Definitions

Baud		Parity		Stop Bits		Data Bits		Conversion	
String	Rate	String	Type	String	Bits	String	Bits	String	Unit
B9	9600	N	None	H	1	V	7	G	Gallons
B4	4800	E	Even	S	2	D	8	M	Metric
B2	2400	O	Odd					I	Imperial
B1	1200								
B6	600								
B3	300								
BG	***								

Table 10-3. DIM Specific Parameters

String	Description
Gilbarco GSite	
	None
Gilbarco CL	
T	Do not collect cumulative totals
R	Send captured message to TLS (Engr. use only)
W	Transaction field precision is hundredths (thousandths default)
C	Cumulative field precision is hundredths (thousandths default)
Tokheim 67A&B	
T	Blender Only Site – collects only blender messages
R	Send captured message to TLS (Engr. use only)
P	Plus one dispensers at site – use plus one algorithm
Tokheim DHC	
T	Tank volume enabled. TLS will report to DHC Tank Volumes
Wayne CL	
R	Send protocol to TLS (Engr. use only)
Schlumberger	
R	Send protocol to TLS (Engr. use only)
Schlumberger SAM	
T	Send protocol of controller transmit line to TLS (Engr. use only)

Table 10-3. DIM Specific Parameters

String	Description
R	Send protocol of controller receive line to TLS (Engr. use only)
Gasboy RS422	
	None
Gasboy CFN	
	None
BIR VR Protocol	
J	Suppress Communication Alarm
Tidel	
U	Do not allow time updates to the TLS
Mechanical	
L	Pulse out loop back signal. See Pulse Conversion Parameters - Table 10-4 below.
Low Volt Mech	
L	Pulse out loop back signal. See Pulse Conversion Parameters - Table 10-4 below.
Wayne IDPOS	
	None
Smart Crind	
	None
Tominaga	
	None
Bennett	
T	Send protocol of controller transmit line to TLS (Engr. use only)
R	Send protocol of controller receive line to TLS (Engr. use only)
UK Block	
M	Manifold set
:	Manifold start (followed by manifold tank numbers)
Scheidt & Bach	
	None

Table 10-4. Pulse Conversion Parameters for MDIM

String	Pulses per Unit Volume
P	100 (7697 Pulser)
F	10 (7697 on High Volume Pump)
T	25 (7874 Pulse/Totalizer) MDIM/LVDIM Default
Q	25 (7874 on High Volume Pump)
A	1/2
S	1
W	250
X	500
Y	1000

Table 10-5. Female D Connector Pin Outs

PIN	Function
2	Transmit Data
3	Receive Data
7	Signal Ground

Table 10-6. RS-232 Loop Back Tool

PIN	Connect To	PIN
2		3
4		5
20		22

DIM Installation Overview

For specific DIM installation details, refer to the appropriate Veeder-Root DIM Installation Manual.

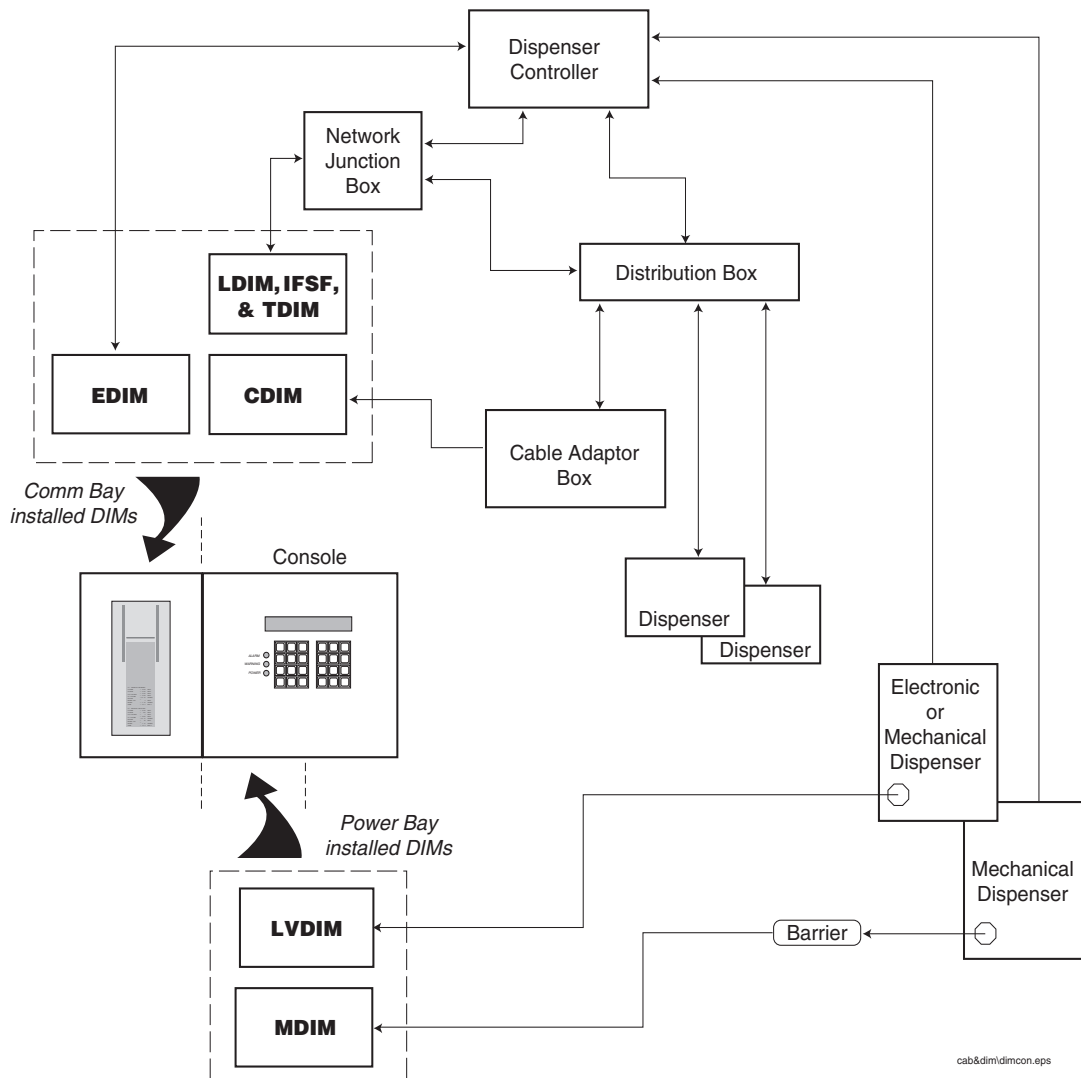


Figure 10-1. Simplified DIM Connections to various Dispensing Systems

DIM Troubleshooting Charts

The charts below contains basic DIM problem basic troubleshooting steps for both disabled DIM and DIM communication alarms:

- Disabled DIM Alarm – for all DIM types (Table 10-7)
- EDIM/LDIM Communication Alarm (Table 10-8)
- CDIM Communication Alarm (Table 10-9)

In each chart, follow the action steps in the left column, and depending on the result in the right two columns (YES or NO), go to the next action step indicated. The grayed-in steps contain either end results (E) or steps for further action (A).

Table 10-7. Disabled DIM Alarm (All Types)

This alarm means that the DIM module has stopped communicating with central processing unit of the console. There are limited number of actions you can take to resolve this problem without having to replace the DIM board.			
STEP	DESCRIPTION	YES	NO
1	[press the ALARM TEST button] Does the alarm go away?	E1	3
2	Are the software revision number and created date displayed in the screen? Note alarm string message: 'E1:', 'M2:'... etc. [MODE] -> DIAGNOSTIC [FUNCTION]-> SYSTEM DIAGNOSTIC [STEP]-> DIM DIAGNOSTIC DATA [ENTER] -> DIM software revision screen. [TANK/SENSOR]-> until screen is displayed for the DIM with the alarm by matching 'E1', 'M1' you noted.	3	A1
3	Does the alarm return after 2 minutes? Turn the console power 'off' and then back 'on'.	A1 (CDIM/EDIM/LDIM) 4 (TDIM)	E1
4 (TDIM only)	Are Channel 1 settings of Telnet Setup menu correct?	A1	E2
A1	Replace the DIM.		
E1	The DIM is working properly.		
E2	Program Channel 1 settings		

Table 10-8. EDIM/LDIM Communication Alarm

This alarm indicates that the DIM module has stopped communicating with external equipment to which it is connected by the RS-232 cable. To trouble shoot this problem you will verify that the DIM is operating properly and that all connections to external equipment are correct.			
STEP	DESCRIPTION	YES	NO
1	[press the ALARM TEST button] Does the alarm go away?	E1	2
2	Is there a DISABLED DIM ALARM also posted for this DIM?	A4	3
3	Is this the correct type of DIM for the external equipment it is connected to? Verify the DIM part number shipped with the DIM part number listed in the Installation Manual. Or do the following: Note alarm string message: 'E1','E2'... or 'M1','M2'... etc. [MODE] -> DIAGNOSTIC [FUNCTION]-> SYSTEM DIAGNOSTIC [STEP]-> DIM DIAGNOSTIC DATA [ENTER] -> DIM software revision screen. [TANK/SENSOR]-> until screen is displayed for the DIM with the alarm by matching 'E1', 'M1' you noted. Note the software revision number to verify what is required for your application.	4	A5
4	Is the cable connected to both the DIM and the correct port on the external equipment? (Double check the correct port is being used on the external equipment.)	5	A1
5	Are any of the LED's flashing on the DIM board?	6	7
6	Is the setup string entered for this DIM correct according to the Installation Manual? Note alarm string message: 'E1','E2'... or 'M1','M2'... etc. [MODE] -> SETUP MODE [FUNCTION]-> RECONCILIATION SETUP [STEP]-> DISP. MODULE SETUP STRING [TANK/SENSOR]-> until screen is displayed for the DIM with the alarm by matching 'E1', 'M1'	7	A2
7	Does the DIM loop-back tool put both LED's ON steady?	8	A6
8	Does the cable meet Installation Manual specifications? Is it wired according to specification, and pass the ohm tests?	E2	A3
A1	Connect the cable to both the DIM and External Equipment. Restart the troubleshooting procedures after 2 minutes, or immediately after a console power cycle.		
A2	Enter the correct parameter string according the instructions in the Installation Manual. Restart the troubleshooting procedures after 2 minutes, or immediately after a console power cycle.		
A3	Install factory authorized cables. Restart the troubleshooting procedures after 2 minutes, or immediately after a console power cycle.		
A4	Use the DISABLED DIM ALARM troubleshooting table first.		
A5	Obtain the correct DIM and/or Installation Kit.		
E1	The DIM board is operational. It is normal for COMMUNICATION ALARMS to occur if the cable was disconnected for longer than 1 minute, or if the external equipment was turned off for longer than one minute.		
E2	All the questions you have answered indicated that the system should be operational. There may be problems with the external equipment such as software compatibility.		

Table 10-9. CDIM Communication Alarm

This alarm indicates that the DIM module has stopped receiving communication from cable adapter box (CAB). To trouble shoot this problem you will verify that the DIM is operating properly and that all the connections to external equipment are correct.			
STEP	DESCRIPTION	YES	NO
1	[press the ALARM TEST button] Does the alarm go away?	E1	2
2	Is there a DISABLED DIM ALARM also posted for this DIM?	E2	3
3	Is this the correct type of DIM for the external equipment it is connected to? Verify the DIM part number shipped with the DIM part number listed in the Installation Manual. Or do the following: Note alarm string message: 'E1','E2'... or 'M1','M2'... etc. [MODE] -> DIAGNOSTIC [FUNCTION]-> SYSTEM DIAGNOSTIC [STEP]-> DIM DIAGNOSTIC DATA [ENTER] -> DIM software revision screen. [TANK/SENSOR]-> until screen is displayed for the DIM with the alarm by matching 'E1', 'M1' you noted. Note the software revision number to verify what is required for your application.	4	A5
4	Is the DIM connected to the correct Cable Adapter Box required for this system?	5	A3
5	Is the CAB properly cabled to the external equipment, as defined by the Installation Manual, with the CAB bypass switch in 'RUN' mode?	6	A4
6	Is the LED on the CAB flashing (fast flicker)?	7	9
7	Is the LED on the DIM that corresponds to the port connected to the CAB flashing in a similar manner as the CAB?	8	A5
8	Is the setup string entered for this DIM correct according to the Installation Manual? Note alarm string message: 'E1','E2'... or 'M1','M2'... etc. [MODE] -> SETUP MODE [FUNCTION]-> RECONCILIATION SETUP [STEP]-> DISP. MODULE SETUP STRING [TANK/SENSOR]-> until screen is displayed for the DIM with the alarm by matching 'E1', 'M1'	9	A1
9	Move the RJ45 connection at the DIM to one of the other three ports. Is the LED on the CAB flashing?	A5	A6
A1	Enter the correct parameter string according the instructions in the Installation Manual. Restart the troubleshooting procedures after 2 minutes, or immediately after a power cycle.		
A2	Use the DISABLED DIM ALARM Trouble shooting table first.		
A3	Obtain the correct CDIM and/or Installation Kit.		
A4	Ensure that the entire installation is complete before you begin troubleshooting.		
A5	Replace the DIM.		
A6	Replace the DIM card and installation kit. It is not possible to determine which device is the problem from the responses.		
E1	The CDIM board is operational. It is normal for COMMUNICATION ALARMS to occur if the cable was disconnected for longer than 1 minute, or if the external equipment was turned off for longer than one minute.		
E2	All the questions you have answered indicate that the system should be operational. There may be problems with the external equipment such as software incompatibility.		

11 CSLD Troubleshooting

CSLD collects information during each idle time to form a highly accurate leak detection database. Since the database is being constantly updated, leak test results are always current. Periodic leak tests are performed using the best data from up to the previous 28 days, and test results are continuously updated as new data is gathered. Invalid data is discarded and only the best data is used to ensure accurate leak test results and fewer false alarms. Test results are provided automatically every 24 hours at 8:00 a.m.

CSLD Tank Limitations

All applications of CSLD should conform to the following installation guidelines.

MAXIMUM TANK CAPACITY

Single tank - 30,000 gallons

Manifolded tanks - 30,000 gallons per manifolded set (3 tanks maximum per set).

MONTHLY THROUGHPUT GUIDELINES

Table 11-1. Tank Capacity / Monthly Throughput Limitations*

Product	Tank Capacity				
	<10,000	12,000	15,000	20,000	30,000
Gasoline	200,000	200,000	200,000	150,000	100,000
Diesel	200,000	200,000	200,000	200,000	200,000

*Total capacity of manifolded tanks establishes the throughput restrictions for that product. Installations exceeding these limitations may not pass monthly tests.

CSLD Block Diagrams

Figure 11-1 illustrates the CSLD decision process in block diagram form and Figure 11-2 diagrams the timing of events during a CSLD test.

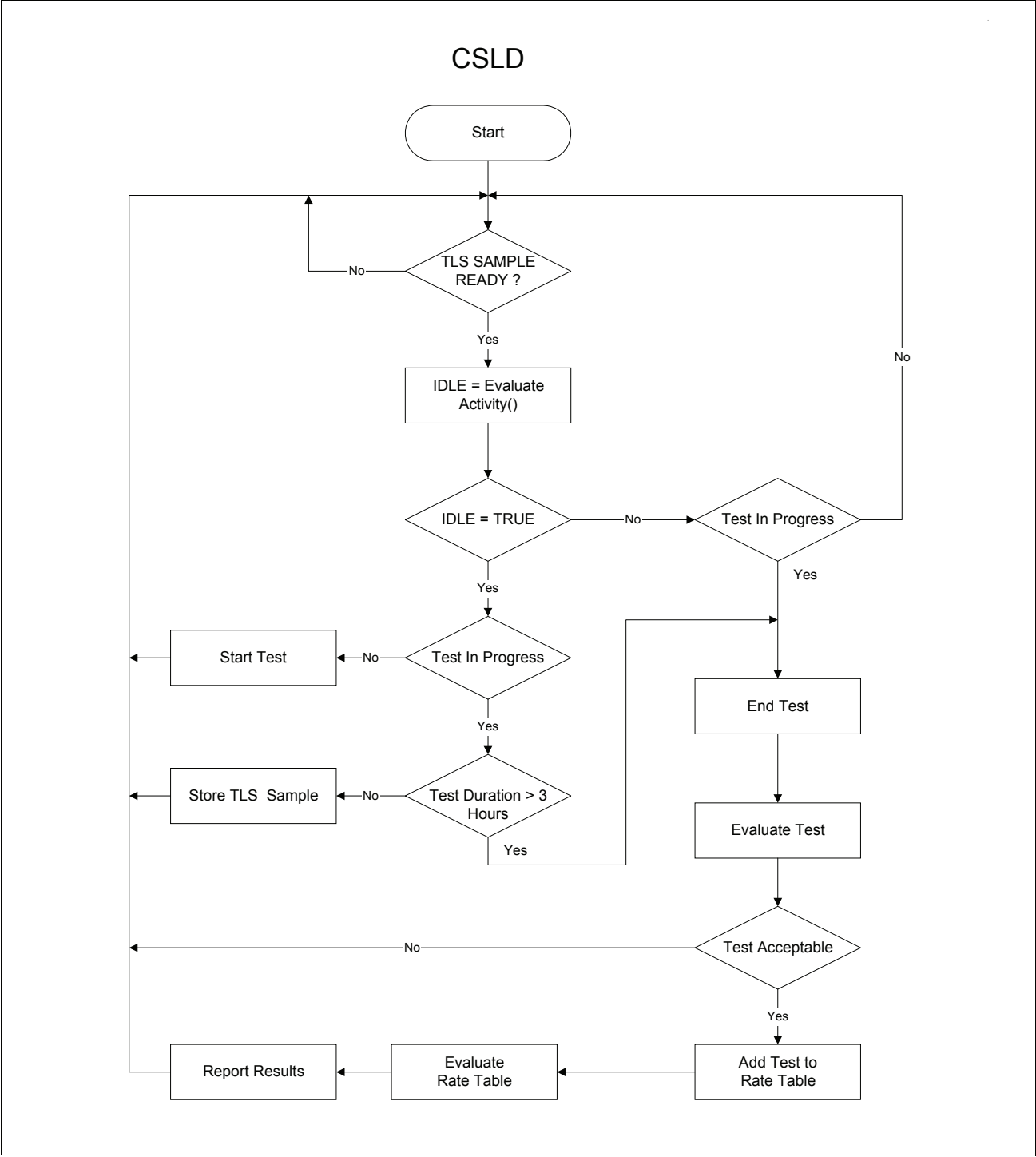


Figure 11-1. CSLD Decision Process Block Diagram

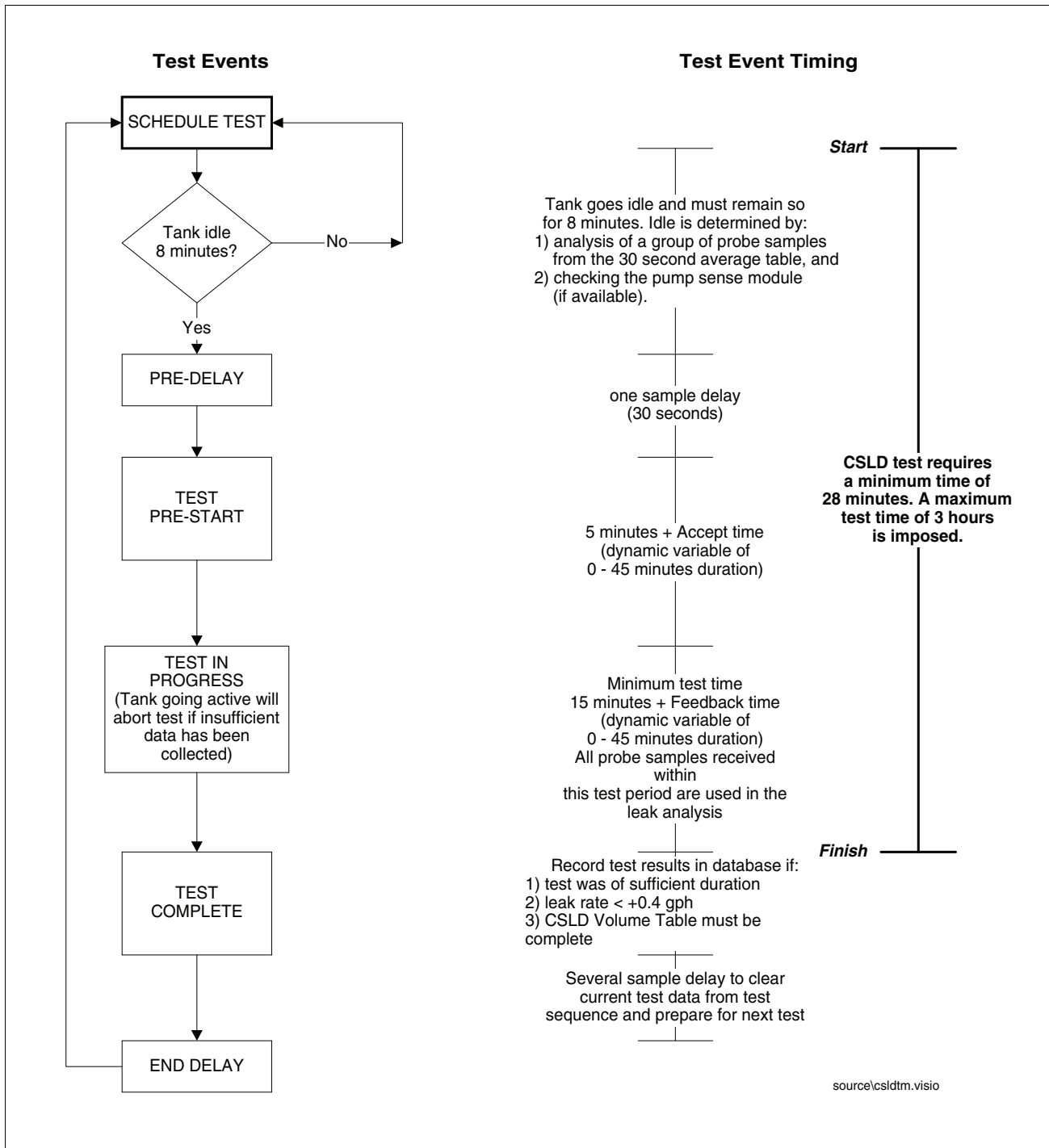


Figure 11-2. CSLD Leak Test Timing Sequence

CSLD Diagnostic Aids

Due to the complexity of CSLD, most information required to troubleshoot the product is accessible only using RS-232 commands via direct or modem connection. If you do not have a computer or data terminal to collect this data you will not be able to resolve CSLD alarms.

In order to troubleshoot CSLD problems you must retrieve the following reports via the RS-232 port or modem:

1. IA5100 - CSLD Rate Table (see Figure 11-3)

This table contains the last 28 days of leak tests, or a maximum of 80 of the most recent tests.

2. IA5200 - CSLD Rate Test (see Figure 11-4)

This report contains the CSLD summary of the evaluation of the raw test data collected in the Rate Table.

3. IA5300 - CSLD Volume Table (see Figure 11-5)

This report contains volume samples collected once every hour. CSLD uses this data to determine the amount of dispensing that has occurred during the last 24 hours.

4. IA5400 - CSLD Moving Average Table (see Figure 11-6)

This report contains averaged probe data collected every 30 seconds. CSLD uses this data to determine if the tank is idle or active, and to perform the leak test.

IA5100												
MAR 14, 1996 8:12 AM												
CSLD DIAGNOSTICS: RATE TABLE												
T 1: SUPER												
	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG EVAP
9602202227	0	-0.016	39.2	38.3	36.3	0.02	191	4281	174.5	2.7	168	0.000
9602210128	0	0.016	39.3	38.2	35.9	0.02	169	4281	174.5	5.7	168	0.000
9602210428	0	-0.022	39.4	38.2	35.6	0.03	162	4281	57.5	8.7	168	0.000
9602210636	1	0.106	39.5	38.3	35.8	0.02	213	4207	19.5	10.8	172	0.000
9602210718	1	0.118	39.5	38.4	35.9	0.00	215	4175	19.5	11.5	173	0.000
9602212259	3	0.007	40.2	39.0	37.1	0.02	460	3557	174.5	27.2	204	0.000
----- Partial set of entries shown -----												
TIME	Test start time. (YYMMDDHHMM)											
ST	Test qualification status at last evaluation.											
	0 Test valid											
	1 Test rejected - duration too short.											
	2 Test rejected - start time too close to a delivery.											
	3 Test rejected - excessive dispensing prior to test.											
	4 Test rejected - excessive temperature change during test.											
	6 Test rejected - leak rate outlier.											
LRT	Leak rate in gph (negative number = a loss, no sign = a gain)											
AVTMP	Average fuel temperature											
TPTMP	Temperature of top thermistor in the tank.											
BDTMP	Temperature of thermistor on the board.											
TMRT	Rate of temperature change during the test.											
DSPNS	Factor related to the amount of dispensing prior to the test.											
VOL	Volume at the start of the test.											
INTVL	Test Duration in minutes.											
DEL	Time since the last delivery in hours.											
ULLG	Amount of surface area of the tank that is not covered by fluid.											
EVAP	If the Reid Vapor Pressure table has been entered, the evaporation rate will be here.											

Figure 11-3. CSLD Rate Table Example

IA5200													
MAR 14, 1996 8:12 AM													
CSLD DIAGNOSTICS: RATE TEST													
TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	EVAP	RJT
1	9603140346	-0.031	33.7	1	0.002	3525	74	15	38.3	28.9	31.63	0.000	0
2	9603140342	0.000	32.2	1	0.004	3184	74	15	38.3	28.9	29.85	0.000	0
3	9603140151	0.051	26.8	1	0.039	6165	49	16	10.1	8.8	43.67	0.000	0
4	9603140646	-0.000	53.0	1	-0.003	1762	80	26	45.0	44.8	20.22	0.000	0
DATE	The date of the last rate table evaluation (YYDDMMHHMM)												
LRATE	Compensated leak rate in gph (negative number = a loss, no sign = a gain)												
INTVL	Total test duration, sum of all acceptable tests, in hours.												
ST	Status: 0 NO TEST - no evaluation. 1 PASS 2 FAIL 3 NOT USED. 4 INVALID - obsolete. 5 NO DATA:COUNT - not enough tests available to evaluate. There must be at least 2 acceptable tests. 6 NO DATA:INTERVAL - not enough total test time to evaluate (< 6 hours). 7 NO DATA:RANGE - tests did not range over a sufficient time period. test time < 10 hours AND tests date range < 5 DAYS. 8 WARNING INCREASE - excessive positive leak rate. 9 WARNING NEGATIVE_HOLD - 2 day waiting period before reporting a failure.												
AVLRTE	Uncompensated Leak Rate, in gph (negative number = a loss, no sign = a gain)												
VOL	Average volume of all acceptable tests.												
C1	Total number of tests in the rate table.												
C3	Number of acceptable tests.												
FDBK	Feedback control variable, range 0 to 45 minutes.												
ACPT	Accept control variable, range 0 to 45 minutes.												
THPUT	Estimated monthly throughput in thousands of gallons.												
EVAP	If the Reid Vapor Pressure table has been entered, the evaporation rate will be here.												
RJT	Of the last 20 tests completed, this is the number of tests rejected due to excessive positive leak rate (>0.4 gph).												

Figure 11-4. CSLD Rate Test Example

```

IA5300
MAR 14, 1996  8:14 AM

CSLD DIAGNOSTICS: VOLUME TABLE
T 1: SUPER
LAST HOUR = 229664
Most recent → 3410.4  3515.2  3577.8  3581.2  3581.2  3581.3  3581.3  3581.3
                3582.8  2466.7  2466.7  2470.0  2496.6  2522.4  2553.1  2591.0
                2648.5  2702.3  2725.7  2754.5  2823.0  2873.8  2921.8  2991.5 ← Oldest

T 2: SPECIAL
LAST HOUR = 229664
                2996.8  3043.5  3107.4  3127.7  3127.7  3127.8  3127.7  3127.8
                3127.3  1090.8  1105.0  1131.4  1170.1  1198.9  1224.3  1329.6
                1420.9  1535.5  1603.5  1613.2  1680.6  1739.8  1808.6  1842.4

T 3: REGULAR
LAST HOUR = 229664
                7755.0  7960.6  8006.9  8037.9  8049.1  8049.2  8049.3  8049.0
                8021.1  4691.9  4716.8  4804.2  4849.0  4966.7  5240.7  5495.2
                5668.8  5770.5  5959.2  6067.6  6222.8  6352.4  6495.8  6688.3

T 4: DIESEL
LAST HOUR = 229664
                3133.9  3157.1  3157.1  3157.1  3157.1  3157.1  3157.0  3156.8
                3156.7  941.4   941.3   941.3   941.3   941.3   941.3   941.3
                941.3   941.2  1004.7  1004.6  1019.4  1047.6  1064.4  1101.2

The volume table is a 24 hour history of the tank volume recorded every hour.
This list starts with the most recent volume and moves to the oldest volume
from left to right and top to bottom.

```

Figure 11-5. CSLD Volume Table Example

IA5402							
MAR 12, 1996 10:52 AM							
CSLD DIAGNOSTICS: MOVING AVERAGE TABLE							
T 2: SUPER							
	TIME	SMPLS	TCVOL	HEIGHT	AVGTEMP	TOPTEMP	BDTEMP
	960312103008	28	2118.16	29.547	45.52	44.01	39.31
	960312103038	28	2118.16	29.547	45.52	44.01	39.31
	960312103108	28	2118.14	29.547	45.52	44.01	39.31
	960312103138	27	2118.16	29.547	45.53	44.02	39.32
	960312103208	24	2118.17	29.547	45.53	44.02	39.32
	960312103238	28	2118.19	29.547	45.52	44.02	39.32
	960312103308	28	2118.13	29.547	45.52	44.02	39.32
	960312103338	28	2118.13	29.547	45.52	44.02	39.33
	960312103408	28	2118.16	29.547	45.52	44.03	39.33
	960312103438	28	2118.13	29.547	45.52	44.03	39.33
	960312103508	28	2118.17	29.547	45.52	44.03	39.33
	960312103538	27	2118.16	29.547	45.52	44.04	39.34
	960312103608	22	2118.21	29.547	45.52	44.04	39.34
	960312103638	19	2118.16	29.547	45.52	44.04	39.34
	960312103708	28	2118.23	29.548	45.52	44.05	39.34
	960312103738	28	2118.19	29.547	45.52	44.05	39.34
	960312103808	29	2118.17	29.547	45.52	44.06	39.35
	960312103838	21	2118.13	29.547	45.52	44.06	39.35
	960312103908	29	2118.21	29.547	45.52	44.06	39.35
	960312103938	28	2118.12	29.546	45.53	44.06	39.36
	960312104008	28	2118.11	29.546	45.53	44.06	39.36
	960312104038	28	2118.21	29.547	45.53	44.06	39.37
	960312104108	29	2118.14	29.547	45.53	44.06	39.37
	960312104138	27	2118.05	29.546	45.53	44.06	39.38
	960312104208	29	2115.86	29.524	45.53	44.06	39.38
	960312104238	28	2112.55	29.490	45.53	44.05	39.39
	960312104308	28	2109.43	29.459	45.53	44.05	39.39
	960312104338	28	2106.14	29.426	45.53	44.05	39.40
	960312104408	28	2102.58	29.390	45.53	44.05	39.40
	960312104438	27	2099.08	29.354	45.53	44.05	39.40
	960312104508	28	2095.64	29.320	45.53	44.05	39.41
	960312104538	29	2092.37	29.287	45.53	44.04	39.41
	960312104608	22	2091.61	29.279	45.53	44.04	39.41
	960312104638	28	2091.66	29.279	45.53	44.04	39.42
	960312104708	27	2091.64	29.279	45.53	44.04	39.42
	960312104738	28	2091.66	29.280	45.53	44.05	39.43
	960312104808	28	2091.65	29.279	45.53	44.05	39.43
	960312104838	28	2091.60	29.279	45.53	44.05	39.43
	960312104908	28	2091.61	29.279	45.53	44.05	39.44
	960312105008	23	2091.60	29.279	45.53	44.04	39.44
	960312105038	29	2091.67	29.280	45.53	44.04	39.44
	960312105108	29	2091.70	29.280	45.53	44.04	39.45
	960312105138	21	2091.63	29.279	45.53	44.04	39.45
	960312105208	28	2091.74	29.280	45.53	44.04	39.45
	960312105238	29	2091.63	29.279	45.53	44.04	39.45
	960312105308	29	2091.64	29.279	45.53	44.04	39.46
	MOVING AVERAGE:	2091.64					
* following ACTIVE = Pump sense available	DISPENSE STATE: ACTIVE * 330.710632						

* following ACTIVE = Pump sense available

Figure 11-6. CSLD Moving Average Table Example

Tank Setup Check Before Troubleshooting

All in-tank setup data must be correct for CSLD to work properly. Setup data, such as manifolded status, pump sense tank assignment, and temperature coefficient of thermal expansion entries, should be verified before attempting troubleshooting procedures.

CSLD Alarms

Each of the three CSLD alarms, CSLD Rate Incr Warn, No CSLD Idle Time, and Periodic Test Fail is discussed below. In addition, there is one CSLD status message, No Results Available, which is also discussed.

ALARM: CSLD RATE INCR WARN

A CSLD Rate Increase Warning indicates fluid is entering the tank during the leak test. This warning indicates a higher than acceptable positive increase in product calculated from the CSLD Rate Table. The threshold amounts are listed below.

Single tank configuration:

PD - 95% = +0.17 gph

PD - 99% = +0.16 gph

Manifolded Tank configuration:

PD - 95% = +0.16 gph

PD - 99% = +0.15 gph

You can also print out the CSLD DIAGNOSTICS from the DIAGNOSTIC Mode to see the actual calculated value (see Figure 6-7).

SOME POSSIBLE Causes of positive rate increases

1. Incorrect temperature coefficient entered during setup. Verify that the temperature coefficient of thermal expansion is set correctly according to the TLS Setup Manual specifications listing for various product grades.
2. Manifold Tank Siphon Bar Leakage

Rate increases can occur in siphon manifolded tanks due to a leaking siphon system. Since the siphon piping is normally full of fuel this can become a source of rate increases. If the siphon does not hold, product will drain back slowly into the tanks during idle periods. The fuel from the siphon piping will increase the volume in the tank which will cause a CSLD rate increase warning. Test and repair the siphon system per the manufacturer's recommendations.
3. Leaks In Submersible Pumps
 - Around the packer O-ring.
 - At the threads of the two-inch pipe coming from the turbine motor.
 - The gasket between the turbine motor and mounting flange.
 - At any seal which would allow the column of fuel being held in the pump by the check valve to leak back slowly into the tank.
4. Manifolded tanks are programmed incorrectly in In-Tank setup.

Tanks in a manifolded set must be programmed as a set, and you must select **CSLD** as the Leak Test Frequency for each of the tanks.
5. Defective Line Check Valves

Fluid from the line piping leaking back into the tank through a defective Line Check Valve may cause a rate increase. Verify that the line piping holds pressure after pumping stops.
6. Thermal Expansion In The Lines

When the product temperature in the tank is lower than the ground temperature, product in the line will expand after dispensing. After pumping ceases the line check valve or pump check valve will maintain pressure in the line. As the ground warms the product in the line expands. This expansion causes a corresponding pressure increase in the line therefore the pressure relief valve opens. The relief valve, relieves this increased pressure by allowing fuel to flow back into the tank. The flow from the line back into the tank can be a source of rate increase warnings. Typically thermal expansion's impact on CSLD is short lived. However, in extreme cases thermal expansion can be a source of CSLD rate increase warnings. If thermal expansion is suspected as the source of CSLD rate increase warnings you should inspect the site layout to determine if it is susceptible to ex-

treme thermal expansion due to site specific conditions (i.e. shallow line depth combined with extreme temperatures, etc.).

7. Stage II Vapor Recovery System Related Problems

- Condensed vapors and liquid drawn into the vapor recovery system can leak back into the tank causing increases.
- Check with the manufacturer of the vapor recovery system about possible solutions such as the addition of a vapor pot to collect these condensed vapors.
- Have the Stage II vapor recovery system inspected and tested.
- Verify that liquid product in the vapor lines cannot drain directly back into the tank. A liquid trap can be installed. The product that collects in the trap can be siphoned back to the tank via the pump siphon system. This will prevent the introduction of liquid into the tank during idle periods.

8. Water Leaking into the Tank

- Water can leak into the tank and cause rate increase warnings.
- Check the water level in the tank.
- Monitor the tank for increasing water levels.
- Check the alarm history for prior water level alarms.

9. Air eliminator tube missing from Red Jacket pump

- Install air eliminator tube.

10. Clogged FE Petro siphon jet assembly

- Clean assembly.

ALARM: NO CSLD IDLE TIME

The system has not detected an idle period in the last 24 hours. All tanks must have at the very least some short idle periods each day. CSLD needs to find an idle time to clear this alarm. This alarm will automatically clear when the system detects that at least one idle period has occurred (this does not require that a CSLD record get stored in the rate table).

Frequent or continuous NO CSLD IDLE TIME messages are an indication of a problem. Possible reasons for this message:

1. Very large leaks may look like a product dispense. If this occurs the system will post a NO CSLD IDLE TIME alarm since it appears that product is being continually dispensed from the tank. Stop all activities and run a Static Leak Test.
2. Very high activity. Tank capacity or throughput specifications are exceeding CSLD specifications.
3. Line leak detection is running the product pump during normally idle periods. Veeder-Root line leak equipment is designed to coordinate line testing and CSLD to prevent this disturbance however in some cases conflicts may arise.
4. The site may be having problems determining an idle period due to site specific equipment disturbing the tank level (e.g. vapor recovery equipment).
5. The pump is running continuously. Check for a defective product dispenser or pump relay that is keeping the pump turned On.
6. A defective probe will sometimes make the tank level appear as though it is changing continuously when it is actually stable. This can be determined by examining the CSLD Moving Average Table (IA5400 Command). This table displays the tank data at 30 second intervals. Increases and decreases of typically around 1 or 2

gallons when the tank is idle are indications that the probe may be the problem. Also verify the amount of samples the TLS is receiving from the probe -there should be at least 7 and as many as 31.

7. Noisy probe wiring. Check connections.
8. Air eliminator tube missing from Red Jacket pump
 - Install air eliminator tube.
9. Clogged FE Petro siphon jet assembly
 - Clean assembly.

ALARM: PERIODIC TEST FAIL

This message is posted when CSLD data indicates a high probability that a tank is leaking. The threshold for this determination is shown below,

Single Tanks:

PD - 95% = +0.17 gph

PD - 99% = +0.16 gph

Manifolded Tanks:

PD - 95% = +0.16 gph

PD - 99% = +0.15 gph

Review the rate table leak rates (LRATE). If the rates are not consistent (-0.83, +0.06,-0.90, -0.62, etc.) most likely the tank is not leaking.

Possible reasons for this message:

1. Tank is leaking.
2. CSLD is not recognizing the start of a busy period soon enough. These conditions are caused by small and/or slow dispenses, as in the case of operation with blenders. The solution would be to install a Pump Sense Module.
3. An external device is periodically turning On the pump power. This usually results in large negative leak rates. A Pump Sense Module will solve this problem.
4. Coefficient of expansion programmed incorrectly.
5. Tank is manifolded but programmed incorrectly.
6. Excessive compensation. Check in the IA500 report for excessive compensation by comparing the compensated value (LRATE) to the uncompensated value (AVLRTE). The most likely cause of excessive compensation is bad probe temperature readings.
7. Stuck floats. Install a collar on the probe shaft to prevent floats from entering riser.
8. Floats damaged or installed incorrectly.
9. A stuck relay is causing the pump to run continuously. This causes the fluid to heat up around the pump producing temperature compensation errors.
10. Excessive evaporation due to an air leak into the tank may be the cause of a periodic leak test failure. Check vapor recovery system, pressure vent cap, all tank sump areas and riser caps, delivery sump plunger valve, etc.

STATUS MESSAGE: NO RESULTS AVAILABLE

This message may print when the CSLD Test Results are printed or accessed via the RS-232 command. This message indicates that CSLD has not collected sufficient test data to determine whether or not the tank is leaking, and is normal until 7 -10 days AFTER a CSLD startup. The program must be allowed to build a suitable database to calculate reliable results. At highly active sites some tanks may provide results before others. The busier tanks will take longer to produce the initial results.

Possible reasons for this message:

1. Not enough time after startup to generate results.
2. Console is being shut Off on a regular basis.
3. Tank too busy.
4. Defective probe.
5. Noisy probe wiring.
6. Not enough idle time (see message above).
7. Tests are being rejected because the test results indicate a rate increase $>+0.4$ gph.

Static Leak Test

If after troubleshooting the Periodic Test Fail Alarm an equipment problem has not been identified, perform a static leak test. Be sure that the product pump cannot come on during the test and that the level in the tank is within the normal operating range (i.e., the results of the static test may not be meaningful if the tank is nearly empty). If the static test verifies the CSLD result follow the procedures as established by the site owner. If the static test passes, contact Technical Support for assistance.

When to Manually Clear the CSLD Rate Table

You should manually clear the CSLD Rate Table if data, known to be inaccurate, had been stored in the table and the source of the inaccurate data was subsequently removed (e.g., after making tank plumbing repairs).

The CSLD Rate Table can be cleared in the DIAG MODE at the console front panel or via the RS-232 command shown below.

IMPORTANT! DO NOT CLEAR THE CSLD RATE TABLE UNLESS IT IS ABSOLUTELY NECESSARY. DATA CLEARED FROM THIS TABLE CAN NOT BE RECOVERED!

Function Code: 054
Function Type: Delete CSLD Rate Table
Command Format:
Display: <SOH>S054TT149
Computer: <SOH>s054TT149

NOTE:

1. TT - Tank number (command valid for single tank only).
2. 149 - Verification code.

Typical Response Message Display:

<SOH>
S05402149
JAN 1, 1997 8:03 AM

T2:PRODUCT 2 CSLD RECORDS DELETED
<ETX>

typical Response Message Computer:

<SOH>s054TTYMMDDHHMM&&CCCC<EXT>

NOTE:

1. YMMDDHHmm - Current time of day
2. TT - Tank number
3. && - Data termination flag
4. CCCC - Message checksum.

Contacting Tech Support

If the CSLD problem cannot be resolved, retrieve the following data via the RS-232 port or SiteFax modem and contact Technical Support:

1. <Ctrl-A> IA5100 CSLD RATE TABLE
2. <Ctrl-A> IA5200 CSLD RATE TEST
3. <Ctrl-A> IA5300 CSLD VOLUME TABLE
4. <Ctrl-A> IA5400 CSLD MOVING AVERAGE TABLE
5. <Ctrl-A> I10100 SYSTEM STATUS REPORT
6. <Ctrl-A> I10200 SYSTEM CONFIGURATION REPORT
7. <Ctrl-A> I11100 PRIORITY ALARM HISTORY
8. <Ctrl-A> I11200 NON-PRIORITY ALARM HISTORY
9. <Ctrl-A> I20100 INVENTORY REPORT
- 10.<Ctrl-A> I20200 DELIVERY REPORT
- 11.<Ctrl-A> I20600 TANK ALARM HISTORY REPORT
- 12.<Ctrl-A> I25100 CSLD RESULTS
- 13.<Ctrl-A> I60900 SET TANK THERMAL EXPANSION COEFFICIENT
- 14.<Ctrl-A> I61200 SET TANK MANIFOLDED PARTNERS
- 15.<Ctrl-A> I61400 COMMAND CLIMATE FACTOR

Is tank assigned to a pump sense input or assigned to a line leak device?

If assigned to a pump sense collect the following reports:

1. <Ctrl-A> I77100 PUMP SENSE CONFIGURATION REPORT
2. <Ctrl-A> I77200 PUMP SENSOR TANK ASSIGNMENT REPORT
3. <Ctrl-A> I77300 PUMP SENSOR DISPENSE MODE REPORT
4. <Ctrl-A> IB7100 PUMP SENSOR DIAGNOSTIC REPORT

OR - if assigned to PLLD collect the following report:

1. <Ctrl-A> I78000 PRESSURE LINE LEAK GENERAL SETUP INQUIRY

OR - if assigned to WPLLD collect the following report:

1. <Ctrl-A> I7A000 WPLLD LINE LEAK GENERAL SETUP

OR - if assigned to VLLD collect the following reports:

1. <Ctrl-A> I75200 SET VOLUMETRIC LINE LEAK TANK NUMBER
2. <Ctrl-A> I75D00 SET VOLUMETRIC LINE LEAK DISPENSE MODE

Actual CSLD Test Problems Analyzed**CSLD PROBLEM 1 - TANK 1 CSLD FAIL**

Report I25101 confirmed the failure. Reports IA5201, and IA5100 were then collected for analysis.

I25101

CSLD TEST RESULTS

TANK	PRODUCT	RESULT
1	SUPER	PER: JUL 26, 1996 FAIL

DIAGNOSTICS

JUL 26, 1996 10:44 AM

IA5101

CSLD DIAGNOSTICS: RATE TABLE

T1: SUPER

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DISPNS	VOL	INTVL	DEL	ULLG	EVAP
9606280418	1	0.105	66.1	75.3	84.8	-0.05	750	2837	35.5	51.9	263	0.000	
9606290312	3	0.059	69.3	76.4	86.3	-0.09	488	3542	127.5	5.0	227	0.000	
9606281743	1	0.095	68.8	77.0	86.8	-0.08	731	2802	36.0	19.5	265	0.000	
9606300041	3	-0.212	74.0	78.6	87.7	-0.15	432	4432	49.5	5.5	179	0.000	
9606300246	1	0.098	73.8	78.7	87.8	-0.13	441	4381	33.0	7.6	182	0.000	
9606300353	3	0.097	73.6	78.8	87.8	-0.12	438	4366	52.5	8.7	183	0.000	
9606300519	1	0.079	73.5	78.8	87.8	-0.11	434	4352	36.0	10.1	184	0.000	
9606300657	3	0.055	73.4	78.9	87.8	-0.11	4180	4316	53.5	11.8	186	0.000	
9607010127	3	0.070	72.4	79.9	89.5	-0.10	633	3464	39.5	30.3	231	0.000	
9607010240	3	0.047	72.3	79.9	89.6	-0.10	600	3458	44.0	31.5	231	0.000	
9607020111	1	0.050	71.4	79.5	90.2	-0.05	490	4492	32.0	16.5	176	0.000	
9607020303	1	0.067	71.3	79.6	90.2	-0.05	474	4467	26.0	18.4	178	0.000	
9607021054	1	0.092	70.7	80.2	89.7	-0.05	519	4196	25.5	26.2	193	0.000	
9607021900	1	0.105	70.9	80.5	89.8	-0.07	568	3837	35.0	34.3	212	0.000	
9607030105	3	0.069	71.0	80.7	89.8	-0.08	616	3580	41.5	40.4	225	0.000	
9607030222	3	0.002	70.9	80.7	89.7	-0.06	532	3571	113.0	41.7	226	0.000	
9607040407	1	-0.175	69.5	78.0	88.6	0.08	377	4297	34.0	0.9	187	0.000	
9607041719	3	0.092	69.7	79.8	88.0	-0.05	679	3574	42.0	14.1	226	0.000	
9607042049	3	0.052	69.8	79.8	88.3	-0.02	674	3448	43.5	17.6	232	0.000	
9607042330	3	0.010	69.8	79.8	88.3	-0.04	566	3423	113.5	20.3	233	0.000	

9607050208	3	0.042	69.7	79.8	88.3	-0.05	558	3403	39.5	23.0	234	0.000	Start of bad data
9607050323	3	0.002	69.7	79.7	88.2	-0.03	484	3398	99.5	24.2	235	0.000	
9607052355	3	0.062	72.6	79.8	88.6	-0.06	534	4442	78.5	11.8	179	0.000	
9607060152	3	0.040	72.5	79.9	88.7	-0.05	492	4416	146.0	13.8	180	0.000	
9607061838	3	0.095	72.0	80.8	89.1	-0.07	560	3832	37.0	30.5	212	0.000	
9607062238	1	-0.195	72.2	72.6	89.0	0.09	121	5631	28.5	0.0	97	0.000	
9607070235	1	0.022	72.5	74.8	89.4	0.01	208	5511	35.0	4.0	108	0.000	
9607070414	3	-0.454	72.6	75.3	89.4	0.00	209	5502	42.5	5.6	108	0.000	
9607080224	3	-0.004	72.5	80.9	90.7	-0.05	614	4585	104.0	27.8	171	0.000	
9607080756	3	0.042	72.5	81.2	90.5	-0.05	650	4427	41.5	33.3	180	0.000	
9607080923	0	-0.257	71.9	72.0	87.0	0.07	17	6027	147.0	34.8	0	0.000	End of bad data
9607081224	0	-0.341	72.1	73.1	88.5	0.07	14	6026	146.5	3.0	0	0.000	
9607081524	0	-0.557	72.4	74.0	89.0	0.12	13	6025	146.5	6.0	0	0.000	
9607081825	0	-0.356	72.7	75.1	89.4	0.07	10	6024	146.0	9.0	0	0.000	
9607082126	0	-0.306	72.9	76.1	89.7	0.06	7	6023	145.5	12.0	0	0.000	
9607090027	0	-0.296	73.1	76.7	89.8	0.05	6	6022	145.0	15.0	0	0.000	
9607090329	0	-0.359	73.2	77.3	89.7	0.09	5	6021	144.0	18.0	0	0.000	
9607090630	0	-0.429	73.6	78.4	89.4	0.09	4	6020	143.0	21.0	0	0.000	
9607090931	6	-0.737	73.9	79.5	89.2	0.16	5	6018	142.5	24.0	0	0.000	
9607091233	0	-0.448	74.3	80.4	89.0	0.10	6	6017	141.5	27.0	0	0.000	
9607091534	0	-0.187	74.5	80.8	88.9	0.05	5	6016	141.0	30.0	0	0.000	
9607091835	0	-0.393	74.7	81.1	88.8	0.08	5	6015	140.0	33.1	0	0.000	
9607092137	0	-0.080	75.1	81.5	88.7	0.02	5	6013	139.0	36.1	0	0.000	
9607100038	0	-0.034	75.1	81.5	88.5	-0.00	4	6013	138.5	39.1	0	0.000	
9607100339	0	-0.223	75.1	81.4	88.2	0.02	4	6013	137.5	42.1	0	0.000	
9607100640	0	0.054	75.2	81.5	87.8	0.00	3	6013	137.0	45.1	0	0.000	
9607100942	0	-0.178	75.2	81.5	87.4	0.05	2	6013	136.0	48.1	0	0.000	
9607101243	0	-0.555	75.5	81.5	87.2	0.13	3	6012	135.5	51.1	0	0.000	
9607101544	0	-0.093	75.9	81.6	87.2	0.04	3	6010	135.0	54.1	0	0.000	
9607101845	0	-0.018	76.0	81.4	87.4	0.02	3	6010	134.5	57.1	0	0.000	
9607102146	0	-0.248	76.1	81.4	87.5	0.04	3	6009	134.0	60.1	0	0.000	
9607110047	6	0.270	76.1	81.3	87.5	-0.06	2	6009	133.5	63.2	0	0.000	
9607110348	0	-0.115	76.0	81.2	87.4	0.04	2	6009	133.0	66.2	0	0.000	
9607110649	0	0.113	76.1	81.1	87.1	-0.04	2	6009	44.5	69.2	0	0.000	
9607120336	3	-0.149	71.5	80.3	87.4	-0.05	1440	3214	75.5	15.9	244	0.000	
9607130348	3	-0.211	70.8	79.3	86.5	-0.02	587	3965	99.0	4.8	205	0.000	
9607132344	3	0.054	70.9	79.9	87.5	-0.05	638	3110	51.5	24.7	249	0.000	
9607140246	2	0.133	70.1	75.1	86.5	0.04	182	5030	128.5	0.1	144	0.000	
9607150252	3	0.054	70.7	79.4	86.0	-0.03	638	4088	45.0	24.2	199	0.000	
9607170151	1	0.019	72.8	79.6	86.3	-0.07	795	3756	29.0	36.7	216	0.000	
9607170329	3	0.061	72.8	86.4	87.5	-0.07	732	3736	40.5	38.3	217	0.000	
9607170752	1	0.055	72.8	79.8	86.5	-0.07	697	3593	18.5	42.7	224	0.000	
9607172000	1	0.059	72.5	80.2	86.1	-0.05	614	3045	30.5	54.8	252	0.000	
9607180638	1	0.029	72.8	80.4	84.7	-0.04	607	2665	18.0	65.5	271	0.000	
9607190226	1	0.073	72.4	79.5	84.2	-0.02	700	3614	28.0	14.0	223	0.000	
9607200059	3	0.024	73.1	79.5	84.8	-0.09	980	2230	38.0	36.6	294	0.000	
9607200246	3	0.006	73.0	79.5	84.7	-0.08	882	2203	93.0	38.4	295	0.000	
9607210433	3	0.033	71.6	78.6	84.6	-0.01	510	4222	48.0	17.4	191	0.000	
9607210613	1	0.027	71.6	78.6	84.5	-0.02	493	4218	32.0	19.1	191	0.000	
9607220129	1	0.074	72.4	78.9	83.3	-0.08	637	3403	16.0	38.3	234	0.000	
9607220323	3	-0.011	72.3	78.9	83.1	-0.04	563	3380	54.5	40.2	235	0.000	
9607220828	1	0.107	72.4	78.8	82.6	-0.07	604	3219	16.0	45.3	243	0.000	
9607232310	1	0.045	72.7	78.4	83.9	-0.06	644	3525	21.0	32.6	228	0.000	
9607240105	1	0.066	72.7	78.4	84.0	-0.06	620	3471	21.5	34.5	230	0.000	
9607250248	1	0.094	72.0	78.5	85.1	-0.05	654	3301	20.5	18.4	239	0.000	
9607250641	1	0.003	72.1	78.6	84.9	-0.04	620	3219	17.5	22.3	243	0.000	

9607260126	3	0.009	72.3	78.9	85.3	-0.07	793	2153	78.5	41.0	298	0.000
9607260336	3	-0.024	72.2	78.9	85.2	-0.06	732	2145	63.0	43.2	298	0.000

IA5201

CSLD DIAGNOSTICS: RATE TEST

TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	DFMUL	RJT
1	9607260947	-0.308	49.8	2	-0.259	6016	79	22	43.9	43.4	5.24	-0.40	0

ANALYSIS OF RATE TABLE (IA51)

LRT

Looking in the leak rate column (LRT) the test results start off looking reasonable, if anything they tend to be positive. Leak rates suddenly change on the 8th and are consistently negative. There is another transition on the 13th where the leak rates return to the pattern observed prior to the 8th - slightly positive.

ST

the status table indicates that the tests between the 8th and 13th are the only ones contributing to the overall leak rate. This is indicated by a status code of 0. The reason CSLD is favoring these tests will be explained below.

DATE

The DATE field indicated that tests are being performed on a regular basis, several tests a day.

CSLD will complete a test after 3 hours and start a new test if the tank remains idle. The tests between the 8th and the 13th are being performed continuously, one test every 3 hours. This is inconsistent with the tests outside this date range.

INTVL

This is the length of a test in minutes. With the exception of the period between the 8th and 13th, test lengths are much less than 140 minutes. this indicates the site is a 24-hour site because tests are halted by dispensing, not the 3-hour CSLD limit. Test intervals are less than 3 hours because CSLD eliminates the first part of a test. The amount of time eliminated varies with the feedback variables.

Together, the interval and date information indicates that the tank was IDLE during the 8th and 13th period.

In reference to all the test in the rate table, these tests also have the longest interval time, one of the reasons CSLD is favoring these tests. All the tests with status code 1 were rejected due to short intervals.

DSPNS

The dispense factor is an indication of the amount of dispensing that occurred during the last 24 hours. It is not as simple as the amount of gallons dispensed during the last 24 hours because the hourly volumes are weighted in such a way that the most recent dispensing value contributes more to the dispense factor than dispensing volume that has occurred 23 hours ago. But it can be used as a relative indication of tank activity. The dispense factor for the above data set shows a typical value of 600. But the dispense factor during the 8th and 13th period drops rapidly to single digit values. This is another indication that there was no dispensing during this period.

CSLD prefers tests with low dispense factors, another reason why CSLD is favoring these tests. All the tests rejected with error code 3 were rejected because of high dispense factors.

VOL

The volume parameter indicates the volume at the start of the test. The volume during the trouble period started at 6027 and slowly dropped to 6009 gallons. Note that none of the volumes exceeded 6027.

EVAP

If the Reid Vapor Pressure table has been entered, the evaporation rate is displayed here.

DEL

The time since last delivery is in hour units. There was no indication of a delivery during the problem period. All tests rejected with error code 2 started within 2 hours of a delivery.

ULLG

The ullage factor is the surface area of the walls of the tank that is NOT covered in fluid. It is used for leak rate compensation. This parameter normally provides little diagnostic value, but it actually solves the problem. An ullage factor of zero indicates the tank is completely full, i.e., fluid height is equal to or greater than the tank's diameter.

ANALYSIS OF RATE TEST (IA52)

The average leak rate (AVLRTE) is -0.259. The average leak rate is uncompensated so excessive compensation is not an issue. This leak rate is not excessively high so blender/pump sense issues are probably not involved.

The tank label is SUPER so most likely it is not manifolded.

The DATE is recent so results are up to date.

The maximum number of tests is 80 and because C1 = 79 there are more than enough tests.

SOLUTION

The float was stuck in the riser. A collar was installed on the probe to prevent recurrences of this problem.

CSLD PROBLEM 2 - MANIFOLDED TANKS 1 AND 2 ARE FAILING

Reports I201, I51, IA52, and I752 were collected for analysis.

DIAGNOSTICS

I20100

STATION HEADER INFO

MAY 21, 2000 10:29 AM

TANK	PRODUCT	VOLUME	TLC	VOLUME	ULLAGE	HEIGHT	WATER	TEMP
1	REGULAR	2311		2303	3705	39.21	0.0	65.2
2	REGULAR SLAVE	3276		3266	4746	41.07	1.6	64.1
3	MIDGRADE	4378		4365	5774	42.81	0.0	64.4
4	PREMIUM	2547		2548	7605	28.68	1.3	59.7

IA5200

JUN 11, 2000 12:00 PM

CSLD DIAGNOSTICS: RATE TEST

TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	EVAP	RJT
1	9608220320	-0.834	28.4	2	-0.809	7909	58	30	20.3	21.7	32.37	0.000	0
2	9608220320	-0.834	28.4	2	-0.809	7909	58	30	20.3	21.7	29.56	0.000	0
3	9608220445	-0.008	25.8	1	0.005	4400	67	18	30.	21.7	21.23	0.000	0
4	9608220402	0.005	22.3	1	0.005	1893	80	13	45.0	44.8	24.45	0.000	0

I75200

JUN 11, 2000 10:30 AM

LINE LEAK TANK ASSIGNMENT

LINE	LABEL	TAN
1	PREMIUM	4
2	MIDGRADE	3
3	REGULAR	1

Line 1 should be labelled Regular and assigned to tank 1
Correct as is
Line 3 should be labelled Premium and assigned to tank 4

I510

AUG 22, 1996 11:58 AM

CSLD DIAGNOSTICS: RATE TABLE

T1: REGULAR

Large and inconsistent negative leak rates.

TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DISPNS	VOL	INTVL	DEL	ULLG	EVAP
9607250359	1	-0.802	72.3	73.7	76.0	-0.09	594	5214	20.0	36.3	602	0.000
9607260145	3	-0.186	73.5	74.3	76.2	-0.15	451	9019	25.0	0.6	443	0.000
9607260309	0	-0.661	73.3	74.3	76.2	-0.12	438	9005	28.5	2.0	444	0.000
9607270309	0	-0.666	72.4	73.5	76.2	-0.04	602	11409	29.5	3.4	331	0.000
9607270411	0	-0.409	72.4	73.6	76.2	-0.04	552	11407	55.5	4.4	331	0.000
9607280030	0	-1.027	72.2	73.9	76.2	-0.05	503	9725	39.5	24.8	413	0.000
9607280318	0	-1.064	72.1	73.9	76.2	-0.05	448	9688	74.5	27.6	414	0.000
9607280511	0	-0.634	72.1	73.8	76.2	-0.04	410	9671	57.0	29.5	415	0.000
9607290118	1	-0.544	71.9	73.9	76.3	-0.07	478	8065	25.0	49.6	483	0.000
9607290408	0	-0.932	71.8	73.8	76.3	-0.05	434	8032	33.0	52.4	485	0.000
9607300100	0	-1.121	71.7	73.6	76.2	-0.07	601	5827	84.5	73.3	577	0.000
9607300258	0	-0.873	71.5	73.6	76.2	-0.07	551	5815	119.0	75.3	577	0.000
9607310325	2	-0.621	70.3	72.7	76.0	0.02	468	10592	29.5	1.8	373	0.000
9607310427	0	-0.388	70.4	72.8	76.0	0.01	431	10589	43.0	2.8	373	0.000
9608010046	6	-0.081	70.3	71.8	75.6	0.00	509	11824	138.5	2.1	309	0.000
9608010451	1	-0.521	70.3	72.4	75.5	0.00	481	11804	22.5	6.2	310	0.000
9608020130	3	-0.839	70.6	73.1	75.4	-0.04	689	9208	107.5	26.9	436	0.000
9608020349	0	-0.597	70.5	73.1	75.3	-0.04	663	9202	48.5	29.2	436	0.000
9608020510	1	-1.061	70.5	73.1	75.3	-0.03	639	9191	17.0	30.5	437	0.000
9608030035	1	-0.775	70.8	72.9	75.1	-0.06	783	6543	15.0	49.9	546	0.000
9608030351	3	-0.951	70.7	72.9	75.1	-0.06	680	6448	68.0	53.2	551	0.000
9608040234	3	-0.839	72.8	73.7	75.1	-0.08	988	8570	55.5	12.4	463	0.000
9608040425	1	-0.046	72.7	73.9	75.1	-0.05	944	8567	16.0	14.3	462	0.000
9608040649	1	-0.144	72.6	73.7	75.1	-0.07	842	8514	21.0	16.6	465	0.000
9608050051	0	-0.228	72.3	73.4	75.2	-0.07	531	6661	81.5	34.7	541	0.000
9608050309	1	0.030	72.2	73.6	75.2	-0.09	509	6659	20.0	37.0	541	0.000
9608060123	0	-0.344	71.9	73.3	75.3	-0.10	617	4366	107.5	59.2	639	0.000
9608070046	3	-0.942	77.8	77.3	76.4	-0.20	684	9861	48.0	7.2	404	0.000
9608070312	1	-0.955	77.4	77.0	76.5	-0.17	647	9823	26.0	9.6	406	0.000
9608080356	0	-0.960	75.5	75.9	76.9	-0.10	654	7168	76.5	34.4	520	0.000
9608090121	0	-1.035	74.6	75.4	77.2	-0.11	614	4957	47.0	55.6	613	0.000
9608090315	1	-1.435	74.5	75.4	77.2	-0.10	599	4930	22.5	57.7	614	0.000
9608090410	0	-1.226	74.4	75.4	77.3	-0.09	577	4923	31.0	58.6	614	0.000
9608100145	1	-0.738	73.3	75.0	77.4	-0.06	713	7261	24.0	19.6	517	0.000
9608110220	1	0.132	72.5	74.0	77.4	0.00	420	11645	22.0	1.4	317	0.000
9608110445	0	-0.218	72.6	74.7	77.5	-0.01	372	11634	53.0	3.8	318	0.000
9608110616	0	-0.628	72.6	74.7	77.5	-0.01	362	11624	42.5	5.3	319	0.000
9608120303	2	-0.779	72.7	73.3	77.3	-0.02	302	12240	31.5	0.7	282	0.000
9608120409	2	-0.574	72.7	73.5	77.3	-0.03	293	12233	43.5	1.8	283	0.000
9608130138	0	-0.874	72.8	74.8	77.2	-0.04	580	10045	88.0	23.3	398	0.000
9608130342	1	-0.777	72.7	74.9	77.2	-0.04	560	10035	21.5	25.4	398	0.000
9608130520	1	-1.054	72.7	74.9	77.2	-0.04	547	10016	21.5	27.0	399	0.000
9608140210	0	-1.442	72.7	74.9	77.1	-0.05	565	8025	36.5	47.8	486	0.000
9608140328	0	-1.245	72.6	74.9	77.1	-0.05	523	8010	47.0	49.1	486	0.000
9608150117	3	-0.758	72.6	74.7	77.0	-0.08	690	5501	100.5	70.9	590	0.000
9608160325	2	-0.843	72.1	74.1	76.9	0.00	415	10443	53.0	1.7	380	0.000
9608160455	0	-0.594	72.1	74.3	77.0	0.00	398	10438	30.5	3.2	380	0.000
9608170055	0	-0.427	72.2	74.7	77.0	-0.06	630	8255	29.5	23.3	475	0.000
9608170403	0	-0.704	72.2	74.7	77.0	-0.04	551	8193	112.0	26.4	478	0.000
9608180200	0	-1.037	72.2	74.6	76.9	-0.06	504	6338	78.5	48.3	555	0.000

9608180357	0	-0.853	72.1	74.6	76.9	-0.05	486	6329	46.5	50.3	555	0.000
9608180523	0	-1.071	72.0	74.6	76.9	-0.05	452	6316	72.0	51.7	556	0.000
9608190359	2	-1.182	72.0	74.1	76.8	0.00	358	9680	62.0	1.7	414	0.000
9608200135	1	-0.385	72.2	74.6	76.8	-0.05	618	7471	22.5	23.3	508	0.000
9608220158	0	-1.139	71.6	74.5	76.7	-0.09	564	3210	41.5	71.6	694	0.000
9608220320	0	-1.284	71.5	74.5	76.7	-0.08	520	3194	40.0	73.0	695	0.000

CSLD DIAGNOSTICS: RATE TABLE

T2: REGULAR SLAVE

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DISPNS	VOL	INTVL	DEL	ULLG	EVAP
RATE TABLE EMPTY	The slave tank in manifolded sets <u>will</u> have empty rate tables!												

Analysis of Rate Table (IA51)

Rate table shows large negative rates and the rates are inconsistent. This is an indication that CSLD is not detecting dispensing soon enough. If the leak test had stopped after dispensing began, the result would have been a negative rate.

The solution for this type of problem is pump sensing. BUT this site has pump sensing with line leak devices. The problem in this example was that the pump wiring to the line leak devices was correct, but the line leak tank assignments were incorrect.

Solution

Reassign Tanks 4 and 1 to their installed line leak devices (in this example, Line 1 [Reg] to Tank 1, Line 2 is correctly assigned to Tank 3, but Line 3 [Premium] should be assigned to Tank 4).

CSLD PROBLEM 3 - INCREASE RATE WARNING FOR MANIFOLDED TANKS 2 AND 3

Reports IA52 and IA53 were collected for analysis.

Diagnostics

IA5200
MAR 12, 1996 1:54 PM

CSLD DIAGNOSTICS: RATE TEST

TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	DFMUL	RJT
1	9603121226	-0.033	28.6	1	-0.009	3877	80	20	45.0	44.8	1.42	-0.08	0
2	9603120523	0.138	36.8	1	0.165	8647	53	31	14.6	15.0	3.26	0.16	5
3	9603120523	0.138	36.8	1	0.165	8647	53	31	14.6	15.0	3.26	0.16	5

Indicates number of tests rejected because leak rates > +0.4 gph.

CSLD DIAGNOSTICS: RATE TABLE

T 2:REGULAR

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	EVAP
9602130541	1	0.181	42.2	41.7	40.1	-0.01	265	10628	20.5	23.9	304	0.000	
9602140033	3	0.320	42.1	41.6	40.3	-0.00	457	9331	59.5	42.7	366	0.000	
9602140318	1	0.285	42.1	41.6	40.4	-0.00	420	9304	21.5	45.5	366	0.000	
9602140406	0	0.178	42.1	41.6	40.4	-0.00	386	9292	100.0	46.3	366	0.000	
9602150326	0	0.144	42.1	41.6	40.9	-0.00	382	7994	76.0	69.6	415	0.000	

Large positive rates.

9602160140	0	0.354	42.0	41.6	41.2	0.00	440	6451	86.5	91.8	469	0.000
9602160333	0	0.281	42.0	41.6	41.2	0.00	422	6446	30.0	93.7	469	0.000
9602160506	1	0.260	42.0	41.7	41.2	0.00	404	6434	9.0	95.3	469	0.000
9602160541	0	0.084	42.0	41.7	41.2	0.00	388	6428	44.5	95.9	469	0.000
9602170444	0	0.353	42.1	41.5	41.4	0.00	416	4840	77.0	118.9	526	0.000
9602190128	0	0.307	42.8	42.6	41.8	-0.01	287	11416	101.0	33.9	267	0.000
9602190335	0	0.072	42.8	42.6	41.8	-0.01	259	11411	123.0	36.0	267	0.000
9602200211	0	0.046	42.7	42.4	41.9	-0.00	357	10165	125.0	58.6	328	0.000
9602210256	0	0.169	42.7	42.3	41.9	-0.00	366	8726	132.0	83.3	383	0.000
9602210534	0	0.260	42.7	42.3	41.8	-0.00	351	8721	53.0	86.0	383	0.000
9602220139	3	0.153	42.6	42.2	41.9	-0.00	499	7285	63.0	106.1	444	0.000
9602220308	3	0.180	42.6	42.2	41.9	-0.00	479	7280	43.5	107.6	444	0.000

CSLD DIAGNOSTICS: RATE TABLE

T 3:REGULAR

TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	THPT
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RATE TABLE EMPTY

IA5300

IA5300

MAR 12, 1996 1:54 PM

T2 is not tracking T3 which indicates siphon is broken.

CSLD DIAGNOSTICS: VOLUME TABLE

T 2:REGULAR

LAST HOUR = 229621

3768.9	3844.8	3893.5	3938.7	3979.9	4002.5	4002.5	4003.3	Volume is not moving.
4003.4	4003.4	4003.3	4003.5	4003.1	4003.0	4003.5	4001.6	
4003.8	4024.6	4061.8	4109.2	4162.8	4253.6	4344.8	4346.6	

T 3:REGULAR

LAST HOUR = 229621

3473.6	3457.0	3487.6	3511.8	3537.1	3573.3	3609.7	3644.7	Volume is moving.
3649.7	3653.7	3655.9	3664.3	3670.7	3688.0	3746.6	3756.3	
3796.1	3831.2	3850.6	3914.6	3941.3	3923.1	3908.1	3999.2	

Analysis

The hourly volume table shows that the manifolded tanks are not always tracking. Compare the periods underlined in the volume table below (Tank 2 volume only moved 1.3 gals while Tank 3 volume moves 222.8 gals). This large difference indicates that the siphon is breaking. Fluid leaking into the tank from the siphon is causing the increase rate warning.

Solution

Repair siphon.

CSLD PROBLEM 4 - NO CSLD IDLE TIME

Report IA5402 was collected for analysis during an idle period (no dispensing/deliveries).

Diagnostics

IA5402

JUN 24, 1996 2:30 PM

CSLD DIAGNOSTICS: MOVING AVERAGE TABLE

T 2: MIDGRADE

Excessive differences may indicate a defective probe.

TIME	SMPLS	TLCVOL	HEIGHT	AVGTEMP	TOPTEMP	BDTEMP
960624140631	31	6521.67	53.299	78.76	81.10	86.64
960624140701	31	6521.77	53.298	78.72	80.99	86.54
960624140731	31	6521.85	53.297	78.67	80.88	86.44
960624140801	31	6522.22	53.298	78.61	80.75	86.34
960624140831	31	6522.67	53.298	78.53	80.62	86.23
960624140901	31	6523.02	53.298	78.46	80.49	86.11
960624140931	31	6523.44	53.299	78.38	80.35	85.94
960624141001	31	6523.48	53.297	78.30	80.17	85.81
960624141031	31	6523.90	53.297	78.22	80.04	85.67
960624141101	31	6524.77	53.301	78.15	79.93	85.84
960624141131	31	6524.58	53.298	78.11	79.84	85.41
960624141201	31	6525.14	53.301	78.09	79.77	85.28
960624141231	31	6524.94	53.299	78.08	79.71	85.15
960624141301	31	6524.97	53.299	78.06	79.66	85.03
960624141331	30	6525.22	53.300	78.04	79.62	84.91
960624141401	32	6525.17	53.299	78.02	79.57	84.79
960624141431	30	6525.26	53.299	77.98	79.51	84.68
960624141501	32	6525.63	53.299	77.93	79.24	84.52
960624141531	31	6526.39	53.302	77.68	79.33	84.40
960624141601	31	6526.71	53.303	77.80	79.26	84.29
960624141631	31	6526.88	53.302	77.74	79.20	84.17
960624141701	31	6527.34	53.304	77.72	79.17	84.07
960624141731	31	6527.60	53.306	77.73	79.17	83.97
960624141801	31	6527.49	53.308	77.81	79.27	83.89
960624141831	30	6527.37	53.311	77.93	79.43	83.85
960624141901	32	6526.21	53.307	78.05	79.62	83.82
960624141931	31	6526.36	53.311	78.16	79.78	83.81
960624142001	31	6525.02	53.305	78.23	79.94	83.81
960624142031	31	6525.20	53.307	78.26	80.00	83.81
960624142101	31	6524.84	53.304	78.25	80.01	83.80
960624142131	30	6523.02	53.304	78.25	80.00	83.80
960624142201	32	6526.39	53.314	78.23	80.04	83.79
960624142231	31	6526.65	53.319	78.35	80.19	83.81
960624142301	31	6525.05	53.315	78.57	80.45	83.86
960624142331	30	6523.43	53.319	78.84	80.78	83.94
960624142401	29	6521.88	53.310	79.11	81.12	84.05
960624142431	31	6519.58	53.303	79.34	81.44	84.17
960624142501	31	6519.59	53.308	79.53	81.69	84.35
960624142531	30	6518.62	53.304	79.60	81.84	84.47
960624142601	32	6518.72	53.305	79.59	81.90	84.58
960624142631	30	6519.02	53.305	79.53	81.89	84.67
960624142701	31	6519.54	53.305	79.43	81.78	84.73
960624142731	31	6520.18	53.307	79.35	81.70	84.78
960624142801	31	6520.59	53.308	79.31	81.66	84.83
960624142831	31	6519.95	53.305	79.33	81.68	84.88
960624142901	30	6519.45	53.304	79.41	81.79	84.95

MOVING AVERAGE: 6523.52

DISPENSE STATE: ACTIVE * 177.531143

Analysis

The moving average table shows erratic probe readings. Fluid is rising and falling by several gallons.

Solution

Replace probe.

CSLD PROBLEM 5 - TANK 1 IS FAILING

Reports I251, I201, IA52, IA51, and I609 were collected for analysis.

Diagnostics

I25100

JUN 26, 1996 2:37

STATION

HEADER

INFO

PHONE

CSLD TEST RESULTS

TANK	PRODUCT	RESULT
1	UNLEADED	PER: JUN 24, 1996 FAIL
2	UNLEADED PLUS	PER: JUN 26, 1996 PASS
3	SUPER UNLEADED	PER: JUN 26, 1996 PASS
4	KEROSENE	PER: JUN 26, 1996 PASS
5	DIESEL	PER: JUN 26, 1996 PASS

I20100

STATION HEADER INFO

JUN 26, 1996 2:36 PM

TANK	PRODUCT	VOLUME	TLC	VOLUME	ULLAGE	HEIGHT	WATER	TEMP
1	UNLEADED	8627		8617	3000	63.42	0.0	76.9
2	UNLEADED PLUS	9286		9278	2341	67.92	0.0	72.2
3	SUPER UNLEADED	8315		8309	3312	61.38	0.0	70.6
4	KEROSENE	5399		5395	598	60.21	0.0	70.9
5	DIESEL	2989		2987	2940	46.27	0.0	70.1

IA5200

JUN 26, 1996 2:37 PM

CSLD DIAGNOSTICS: RATE TEST

TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	EVAP	RJT
1	9606240446	-0.270	10.3	2	-0.217	6406	21	20	0.0	0.0	44.32	0.000	1

2	9606260806	-0.159	25.1	1	-0.140	8959	67	16	30.4	32.6	77.32	0.000	0
3	9606260928	-0.039	31.3	1	-0.026	9277	80	18	45.0	44.8	87.45	0.000	0
4	9606261351	0.020	102.1	1	0.031	5404	63	41	25.9	24.3	43.32	0.000	0
5	9606261122	-0.010	41.4	1	0.001	3495	80	21	45.0	44.8	27.45	0.000	0

IA5100

CSLD DIAGNOSTICS: RATE TABLE (excerpt)

Inconsistent rates - not temperature compensating correctly.

T1: UNLEADED

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DISPNS	VOL	INTVL	DEL	ULLG	EVAP
9605270507	0	-0.140	65.9	70.0	73.7	0.00	1271	8521	31.5	24.7	322	0.000	
9605290214	0	-0.343	66.0	70.1	72.9	-0.10	1945	4983	17.0	38.9	471	0.000	
9605290334	0	-0.172	65.9	70.0	72.8	-0.09	1820	4937	44.0	40.3	473	0.000	
9605290444	0	-0.135	65.8	70.0	72.6	-0.11	1770	4911	40.5	41.4	474	0.000	
9606020430	0	0.050	70.6	72.2	76.0	-0.07	1660	7254	20.0	16.1	378	0.000	
9606020510	0	-0.301	70.5	72.2	76.1	-0.12	1591	7247	31.5	16.8	378	0.000	
9606020637	0	-0.193	70.4	72.1	75.8	-0.10	1539	7215	18.0	18.3	380	0.000	
9606030317	0	-0.408	69.2	71.8	73.1	-0.13	1584	4802	16.5	38.9	479	0.000	
9606030346	0	-0.336	69.1	71.8	73.1	-0.14	1517	4799	21.5	39.4	479	0.000	
9606030441	0	-0.249	69.0	71.7	73.1	-0.09	1474	4779	27.5	40.3	480	0.000	
9606100451	0	-0.114	68.0	71.2	72.5	-0.12	1411	4303	28.5	41.1	500	0.000	
9606110421	0	-0.136	67.8	70.6	72.8	-0.05	1956	7132	28.5	22.5	383	0.000	
9606110505	0	-0.049	67.8	70.6	72.9	-0.05	1907	7105	23.0	23.2	384	0.000	
9606120357	0	0.148	68.8	70.8	72.7	-0.05	1253	6644	17.0	4.7	403	0.000	
9606120601	0	0.133	68.7	70.6	72.2	-0.06	1247	6535	18.5	6.7	408	0.000	
9606130439	0	-0.293	73.0	73.4	75.2	-0.14	745	8532	44.0	5.8	321	0.000	
9606130608	0	0.324	72.9	73.3	74.8	-0.12	763	8464	16.0	7.3	324	0.000	
9606170258	0	-0.254	73.1	75.4	80.0	-0.12	1511	4677	21.5	38.7	484	0.000	
9606170334	0	-0.424	73.0	75.5	80.2	-0.16	1373	4672	112.0	39.3	484	0.000	
9606180420	6	-1.046	78.9	79.2	82.8	-0.26	1222	6206	49.0	10.3	421	0.000	
9606240446	0	-0.350	75.2	79.0	84.5	-0.20	1659	3399	41.0	33.0	539	0.000	

IA5100

CSLD DIAGNOSTICS: RATE TABLE (excerpt)

T2: UNLEADED PLUS

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DISPNS	VOL	INTVL	DEL	ULLG	EVAP
9606100818	1	-0.134	67.2	69.2	71.5	-0.04	116	10194	21.5	2.3	231	0.000	
9606110159	3	-0.081	67.4	70.1	72.3	-0.02	492	9489	69.5	19.9	273	0.000	
9606110346	3	-0.081	67.3	70.2	72.3	-0.01	460	9479	90.0	21.7	274	0.000	
9606120140	3	-0.075	67.5	70.3	71.8	-0.03	484	8763	70.0	43.6	310	0.000	
9606120329	3	-0.083	67.5	70.4	71.9	-0.02	445	8759	75.0	45.4	310	0.000	
9606120614	3	-0.044	67.4	70.5	71.8	-0.02	395	8747	57.5	48.1	311	0.000	
9606130250	0	-0.103	68.9	70.6	73.6	-0.04	245	9650	146.5	3.8	264	0.000	
9606140214	3	-0.111	68.6	71.2	75.3	-0.02	404	8974	145.5	27.1	300	0.000	
9606140515	0	-0.117	68.5	71.4	75.8	-0.02	369	8974	66.5	30.1	300	0.000	
9606150445	1	-0.051	68.5	71.6	76.7	-0.03	543	8049	27.5	53.6	343	0.000	
9606150557	3	-0.108	68.5	71.8	76.7	-0.02	506	8035	120.0	54.8	344	0.000	
9606160322	3	-0.251	70.7	73.0	78.6	-0.04	415	9276	113.5	14.8	284	0.000	
9606160601	3	-0.233	70.5	73.1	79.0	-0.04	399	9271	52.0	17.4	285	0.000	
9606170504	1	-0.142	70.2	73.4	78.9	-0.04	326	8731	29.0	40.4	312	0.000	
9606180317	3	-0.131	70.0	73.8	79.6	-0.02	395	8055	76.0	62.6	343	0.000	
9606190158	3	-0.146	69.9	73.9	78.7	-0.03	434	7315	138.5	85.3	375	0.000	
9606190524	3	-0.136	69.8	74.1	79.4	-0.03	398	7310	52.5	88.7	375	0.000	
9606191045	1	-0.062	69.7	74.1	77.5	-0.05	354	7207	28.0	94.1	380	0.000	

9606200101	3	-0.183	70.4	74.1	79.3	-0.07	412	7715	48.5	12.6	358	0.000
9606200241	3	-0.187	70.3	74.2	79.5	-0.05	382	7711	53.5	14.3	358	0.000
9606200429	0	-0.175	70.3	74.3	79.6	-0.04	354	7708	70.5	16.0	358	0.000

I60900

JUN 26, 1996 2:39 PM

TANK PRODUCT LABEL

1	UNLEADED	0.000070
2	UNLEADED PLUS	0.000070
3	SUPER UNLEADED	0.000070
4	KEROSENE	0.000050
5	DIESEL	0.000045
6		0.000000
7		0.000000
8		0.000000

Wrong values.**Analysis of Rate Table (IA5100)**

The test results show that tank 2 is also close to failing. Examining the leak rates for both tanks shows negative rates. the TMRT parameter is showing a negative temperature rate. This means that the fuel is contracting during the test.

ANALYSIS OF THERMAL EXPANSION COEFFICIENT REPORT (I60900)

Checking the thermal temperature coefficient of expansion value for the tanks reveals that these values were programmed incorrectly (1 extra zero was entered for each value e.g., 0.000070 instead of 0.00070). CSLD was not able to correct for temperature change when computing the leak rate.

Solution

Correctly reprogram the coefficient of thermal expansion for each tank.

CSLD PROBLEM 6 - CSLD PERIODIC FAILURE TANK 1**Diagnostics**

200

Station Header 1

Station Header 2

Station Header 3

Station Header 4

JUN 17, 1998 8:31 AM

TANK	PRODUCT	GALLONS	INCHES	WATER	DEG F	ULLAGE
1	<u>UNLEADED SOUTH</u>	5288	<u>48.27</u>	0.8	63.4	4528
2	<u>UNLEADED NORTH</u>	5332	<u>48.59</u>	0.0	63.8	4484
3	POWER PREMIUM	7168	62.35	0.0	66.4	2648
4	POWER PLUS	6150	54.60	0.0	65.2	3666

Identical names suggest tanks are manifolded.

When tank levels are close tanks may be manifolded.

I25100
JUN 17, 1998 8:32 AM

Station Header 1
Station Header 2
Station Header 3
Station Header 4

CSLD TEST RESULTS

TANK	PRODUCT	RESULT
1	UNLEADED SOUTH	PER: JUN 17, 1998 <u>FAIL</u>
2	UNLEADED NORTH	PER: JUN 17, 1998 <u>PASS</u>
3	POWER PREMIUM	PER: JUN 17, 1998 PASS
4	POWER PLUS	PER: JUN 17, 1998 PASS

Tanks programmed as manifolded would have a common result.

IA5200
JUN 17, 1998 8:32 AM

CSLD DIAGNOSTICS: RATE TEST

TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	DFMUL	RJT
1	9806170430	-0.492	14.7	2	-0.504	6123	26	20	0.0	0.0	7.13	0.61	0
2	9806170254	0.025	14.8	1	0.015	6238	22	19	0.0	0.0	6.89	0.67	<u>9</u>
3	9806170557	0.033	22.3	1	0.025	6289	75	19	39.4	29.8	4.01	0.14	0
4	9806170527	0.033	26.6	1	0.018	6010	44	21	4.5	4.2	6.74	0.08	1

Positive tests rejected, these occurred when T1 was filing this tank.

I61200
JUN 17, 1998 8:33 AM

TANK MANIFOLDED PARTNERS

TANK	PRODUCT LABEL	MANIFOLDED TANKS
1	UNLEADED SOUTH	<u>NONE</u>
2	UNLEADED NORTH	<u>NONE</u>
3	POWER PREMIUM	NONE
4	POWER PLUS	NONE

Tanks not programmed as manifolded.

IA5100
JUN 17, 1998 8:32 AM

Inconsistent large leak rates. T1 is filling T2 while test is running.

CSLD DIAGNOSTICS: RATE TABLE

T 1:UNLEADED SOUTH

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	THPT
9806060245	3	-0.307	63.0	66.4	69.8	-0.08	1562	4297	57.5	31.7	419	6.7	
9806060527	0	-0.452	62.9	66.3	69.5	0.12	1457	4263	16.0	34.4	420	6.4	
9806070032	2	0.073	60.5	64.8	69.5	0.03	649	6411	34.5	1.1	325	7.4	
9806070211	0	-0.185	60.5	65.0	69.4	0.02	601	6379	111.5	2.8	327	7.0	
9806070414	0	-0.459	60.5	65.2	69.3	0.11	601	6378	24.0	4.8	327	7.0	
9806080228	2	0.081	59.9	60.2	69.7	0.07	225	8870	54.5	0.7	190	6.9	
9806100232	3	-0.978	60.8	64.4	69.9	0.04	1680	3968	17.5	48.7	434	7.2	
9806100303	3	-1.977	60.8	64.4	69.9	-0.05	1612	3966	28.5	49.2	434	7.2	
9806110337	0	-0.706	63.0	64.9	70.2	-0.03	916	6092	27.0	13.2	339	7.1	

CSLD DIAGNOSTICS: RATE TABLE

T 2:UNLEADED NORTH

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	THPT
9806060147	6	-0.747	63.4	67.8	71.8	-0.02	1620	4335	47.5	30.7	417	7.0	
9806060245	0	-0.008	63.4	67.7	71.7	-0.02	1555	4333	58.0	31.7	417	6.7	
9806060527	0	-0.420	63.3	67.4	71.2	-0.01	1452	4299	16.5	34.4	419	6.4	
9806070032	2	-0.061	60.9	66.0	71.3	0.07	647	6442	35.5	0.7	324	6.9	
9806070211	0	0.109	61.0	66.1	71.2	0.04	599	6406	112.0	2.4	325	6.6	
9806070414	0	0.021	61.1	66.1	71.1	-0.00	599	6403	25.0	4.4	326	6.5	
9806080248	2	0.046	62.1	62.6	71.2	0.01	187	8886	35.5	0.6	188	6.4	
9806080434	0	-0.303	62.1	63.1	71.2	-0.02	202	8854	29.5	2.4	191	6.3	
9806090040	0	-0.323	62.0	66.1	71.4	-0.01	1470	6594	23.0	22.5	317	6.7	
9806090425	0	-0.427	62.0	66.2	71.2	-0.02	1329	6571	20.5	26.2	318	6.5	

IA5400
JUN 17, 1998 8:33 AM

This tank is filling T2.

CSLD DIAGNOSTICS: MOVING AVERAGE TABLE

T 1:UNLEADED SOUTH

	TIME	SMPLS	TLCVOL	HEIGHT	AVGTEMP	TOPTEMP	BDTEMP
980617081037	23	5322.01	48.612	63.50	66.17	71.45	
980617081107	23	5321.05	48.605	63.51	66.18	71.45	
980617081137	22	5320.19	48.599	63.51	66.19	71.45	
980617081207	23	5319.40	48.593	63.51	66.19	71.45	
980617081237	23	5318.47	48.587	63.51	66.18	71.45	
980617081307	24	5317.38	48.579	63.52	66.18	71.45	

980617081337	25	5316.16	48.570	63.51	66.19	71.45
980617081407	16	5315.18	48.562	63.51	66.19	71.45
980617081437	20	5313.85	48.552	63.50	66.19	71.45
980617081507	16	5312.97	48.546	63.50	66.19	71.45
980617081537	15	5311.84	48.538	63.50	66.18	71.44
980617081607	10	5310.87	48.531	63.50	66.17	71.44
980617081637	15	5309.86	48.523	63.51	66.15	71.44
980617081707	23	5308.98	48.517	63.51	66.15	71.44
980617081737	24	5307.90	48.509	63.51	66.15	71.44
980617081807	23	5306.60	48.500	63.51	66.16	71.44
980617081837	24	5305.09	48.489	63.51	66.17	71.44
980617081907	22	5303.46	48.477	63.51	66.19	71.44
980617081937	19	5301.98	48.466	63.51	66.19	71.44
980617082007	13	5300.33	48.454	63.51	66.19	71.44
980617082037	19	5298.60	48.441	63.50	66.19	71.43
980617082107	23	5297.30	48.431	63.50	66.20	71.44
980617082137	23	5295.99	48.422	63.51	66.21	71.44
980617082207	22	5294.84	48.414	63.51	66.20	71.44
980617082237	24	5293.70	48.406	63.52	66.19	71.44
980617082307	13	5292.71	48.399	63.53	66.19	71.44
980617082337	23	5291.84	48.392	63.53	66.19	71.44
980617082407	22	5291.12	48.387	63.53	66.19	71.44
980617082437	23	5290.39	48.381	63.52	66.18	71.44
980617082507	24	5289.71	48.376	63.53	66.18	71.44
980617082537	22	5288.92	48.370	63.52	66.20	71.44
980617082607	12	5287.66	48.361	63.52	66.19	71.44
980617082637	24	5286.69	48.354	63.52	66.19	71.44
980617082707	23	5285.51	48.346	63.52	66.19	71.44
980617082737	24	5284.08	48.335	63.52	66.19	71.43
980617082807	23	5282.60	48.324	63.52	66.19	71.43
980617082837	24	5281.25	48.314	63.51	66.20	71.43
980617082907	13	5280.05	48.305	63.51	66.20	71.43
980617082937	13	5278.94	48.297	63.51	66.20	71.43
980617083007	23	5277.81	48.289	63.50	66.21	71.43
980617083037	23	5276.85	48.282	63.51	66.21	71.43
980617083107	24	5275.94	48.275	63.51	66.21	71.43
980617083137	23	5275.23	48.270	63.52	66.21	71.43
980617083207	21	5274.56	48.266	63.54	66.20	71.43
980617083237	15	5273.92	48.262	63.55	66.20	71.43
980617083307	23	5273.35	48.258	63.55	66.20	71.43

MOVING AVERAGE: 5284.02

DISPENSE STATE: ACTIVE * 762.432312

T 2: UNLEADED NORTH

TIME	SMPLS	TLCVOL	HEIGHT	AVGTEMP	TOPTEMP	BDTEMP
980617081037	24	5358.36	48.889	63.88	67.13	72.66
980617081107	23	5359.32	48.896	63.89	67.15	72.66
980617081137	22	5360.10	48.901	63.88	67.15	72.66
980617081207	23	5357.81	48.885	63.88	67.15	72.67
980617081237	23	5353.93	48.856	63.87	67.16	72.67
980617081307	24	5350.46	48.830	63.87	67.17	72.67
980617081337	23	5349.34	48.822	63.87	67.17	72.67
980617081407	16	5347.34	48.808	63.87	67.15	72.67
980617081437	20	5348.24	48.814	63.88	67.15	72.67

T2's volume increases as T1 fills it.

980617081507	16	5349.11	48.821	63.89	67.15	72.67
980617081537	15	5348.68	48.818	63.88	67.14	72.67
980617081607	10	5347.10	48.806	63.88	67.13	72.67
980617081637	15	5347.82	48.811	63.88	67.12	72.67
980617081707	23	5345.59	48.795	63.87	67.13	72.67
980617081737	24	5340.45	48.757	63.86	67.14	72.67
980617081807	23	5332.53	48.699	63.85	67.14	72.67
980617081837	23	5327.48	48.662	63.85	67.13	72.67
980617081907	22	5323.96	48.636	63.85	67.13	72.67
980617081937	18	5321.93	48.621	63.85	67.13	72.67
980617082007	14	5323.43	48.632	63.85	67.12	72.67
980617082037	19	5325.39	48.647	63.86	67.13	72.66
980617082107	23	5326.68	48.656	63.86	67.14	72.66
980617082137	22	5327.94	48.666	63.87	67.14	72.67
980617082207	23	5329.04	48.674	63.87	67.14	72.67
980617082237	24	5330.24	48.682	63.86	67.14	72.68
980617082307	12	5331.09	48.688	63.86	67.13	72.68
980617082337	24	5332.11	48.696	63.86	67.12	72.68
980617082407	22	5332.77	48.701	63.86	67.12	72.68
980617082507	23	5329.52	48.677	63.85	67.15	72.68
980617082537	22	5324.32	48.639	63.85	67.16	72.68
980617082607	12	5321.19	48.616	63.86	67.16	72.68
980617082637	24	5319.28	48.602	63.87	67.16	72.68
980617082707	23	5315.00	48.571	63.86	67.16	72.68
980617082737	24	5309.65	48.531	63.86	67.15	72.68
980617082807	23	5309.97	48.534	63.87	67.15	72.68
980617082837	23	5311.16	48.543	63.87	67.14	72.69
980617082907	13	5311.96	48.549	63.87	67.14	72.69
980617082937	12	5313.25	48.558	63.87	67.14	72.68
980617083007	24	5314.42	48.567	63.87	67.13	72.68
980617083037	23	5315.37	48.574	63.87	67.14	72.68
980617083107	24	5316.16	48.579	63.87	67.14	72.69
980617083137	22	5316.99	48.585	63.86	67.14	72.69
980617083207	21	5317.58	48.590	63.86	67.14	72.69
980617083237	15	5316.19	48.580	63.87	67.14	72.69
980617083307	23	5312.81	48.555	63.86	67.13	72.69
980617083337	20	5311.06	48.542	63.86	67.13	72.69
MOVING AVERAGE:		5311.55				

DISPENSE STATE: ACTIVE 957.217224

Analysis

Tanks 1 and 2 are siphon manifolded, but they are incorrectly programmed in the console as single tanks.

Solution

Reprogram tanks 1 and 2 as manifolded and delete the rate table.

CSLD PROBLEM 7 - NO CSLD RESULTS**Diagnostics**

I20100
MAY 14, 1998 11:44 AM

Station id 1
Station id 2
Station id 3
Station id 4

IN-TANK INVENTORY

TANK	PRODUCT	VOLUME	TLC	VOLUME	ULLAGE	HEIGHT	WATER	TEMP
1	REGULAR UNLEADED	6912		0	3115	62.50	0.00	73.39
2	PLUS UNLEADED	1845		0	8182	22.99	0.00	74.96
3	PREMIUM UNLEADED	3761		0	6266	38.52	0.00	73.95

IA5200
MAY 14, 1998 11:45 AM

No tests.

CSLD DIAGNOSTICS: RATE TEST

TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	DFMUL	RJT
1	7001010000	0.000	0.0	5	0.000	0	0	0	0.0	0.0	0.00	0.80	0
2	7001010000	0.000	0.0	5	0.000	0	0	0	0.0	0.0	0.00	0.80	0
3	7001010000	0.000	0.0	5	0.000	0	0	0	0.0	0.0	0.00	0.80	0

IA5300
MAY 14, 1998 11:45 AM

CSLD DIAGNOSTICS: VOLUME TABLE

T 1:REGULAR UNLEADED

LAST HOUR = 248651

6876.8	6949.6	6985.7	7110.7	7191.0	7282.3	7354.8	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table not full.

T 2:PLUS UNLEADED

LAST HOUR = 248651

1825.8	1846.9	1868.8	1900.3	1936.7	1936.7	1947.3	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

T 3:PREMIUM UNLEADED

LAST HOUR = 248651

3737.9	3773.5	3797.8	3817.8	3883.3	3904.5	3904.7	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Analysis

The volume table IA53 gets cleared when a gap in time between probe samples is detected. The site operators were turning the console's power Off every evening. This caused a gap between probe readings which cleared the volume table. CSLD does not perform any tests until the volume table is full (24 hours).

Solution

Keep power turned On to the console.

CSLD PROBLEM 8 - CSLD FAILURE TANK 1

Diagnostics

I25100

JUN 11, 1998 12:45 PM

Site Id 1

Site Id 2

Site Id 3

Site Id 4

CSLD TEST RESULTS

TANK	PRODUCT	RESULT
1	REGULAR	PER: JUN 11, 1998 FAIL
2	PLUS	PER: JUN 11, 1998 PASS
3	PREMIUM	PER: JUN 11, 1998 PASS

200

Site Id 1

Site Id 2

Site Id 3

Site Id 4

JUN 11, 1998 12:45 PM

TANK	PRODUCT	GALLONS	INCHES	WATER	DEG F	ULLAGE
1	REGULAR	6439	57.38	1.0	52.3	3289

2	PLUS	6362	56.81	0.0	68.1	3366
3	PREMIUM	7916	69.05	0.0	67.3	1812

IA5200

JUN 11, 1998 12:45 PM

CSLD DIAGNOSTICS: RATE TEST

Comparing compensated LRATE to uncompensated AVLRATE shows excessive compensation.

TK	DATE	LRATE	INTVL	ST	AVLRATE	VOL	C1	C3	FDBK	ACPT	THPUT	DFMUL	RJT
1	9806110308	<u>-0.309</u>	13.0	2	<u>0.040</u>	6676	56	22	18.0	12.3	8.22	0.40	0
2	9806110404	-0.011	25.0	1	0.025	7865	80	16	45.0	44.0	2.28	0.02	0
3	9806110021	-0.011	26.6	1	0.012	7087	80	16	45.0	44.2	2.01	-0.00	0

I60900

JUN 11, 1998 12:46 PM

TANK THERMAL COEFFICIENT

OK

TANK	PRODUCT	LABEL	
1	REGULAR		0.000700
2	PLUS		0.000700
3	PREMIUM		0.000700
4			0.000000

IA5101

JUN 11, 1998 12:46 PM

Abnormal temperatures.

Large jump in temp following delivery.

CSLD DIAGNOSTICS: RATE TABLE

T 1:REGULAR

	TIME	ST	LRT	AVTMP	TEMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	THPT
9805230026	3	0.050	69.2	14.7	71.3	-0.02	2052	2976	24.5	34.7	452	8.2	
9805230102	3	0.011	69.2	14.7	71.3	-0.03	1991	2972	30.0	35.3	452	8.0	
9805230148	3	0.016	69.1	14.7	71.2	-0.02	1915	2964	38.5	36.0	452	7.9	
9805230239	3	0.006	69.1	14.7	71.2	-0.02	1841	2953	69.5	36.9	453	7.6	
9805230441	3	0.021	69.0	14.7	71.2	-0.02	1729	2910	29.5	38.9	455	7.4	
9805230557	3	0.017	<u>69.0</u>	14.7	71.2	-0.00	1687	2856	29.5	40.2	457	7.3	
9805240018	0	-0.018	<u>55.4</u>	14.7	72.0	-0.03	561	7499	33.5	4.6	255	8.1	
9805240144	0	-0.041	55.3	14.7	72.0	-0.03	565	7470	23.5	6.0	256	7.9	
9805240224	1	-0.069	55.2	14.7	71.9	-0.04	565	7454	19.0	6.6	257	7.9	

9805240303	0	0.057	55.1	14.7	71.9	-0.05	584	7426	45.0	7.3	259	7.8
9805240454	0	-0.138	54.9	14.7	71.8	-0.00	594	7366	21.5	9.1	262	7.7
9805240552	0	-0.084	54.8	14.7	71.8	-0.01	593	7337	40.0	10.1	263	7.5
9805250213	3	-0.048	51.2	14.7	72.0	-0.03	1599	5019	32.5	30.5	366	7.8
9805250340	0	-0.026	51.3	14.7	71.9	-0.04	1481	4988	24.0	31.9	367	7.8
9805250526	1	0.178	<u>51.8</u>	14.7	71.7	-0.08	1468	4911	18.0	33.7	370	7.7
9805250617	0	0.343	<u>70.5</u>	14.7	71.5	-0.13	1424	4821	26.0	34.5	371	7.7
9805250655	1	0.296	70.4	14.7	71.4	-0.12	1446	4812	18.5	35.2	372	7.6
9805260040	1	0.183	55.6	14.7	71.8	-0.08	650	7598	17.5	5.2	250	7.9
9805260118	1	0.124	55.5	14.7	71.7	-0.07	629	7580	16.5	5.8	251	7.9
9805260227	6	0.242	55.3	14.7	71.6	-0.08	604	7540	98.5	7.0	253	7.7
9805260417	0	0.277	55.1	14.7	71.5	-0.08	604	7540	98.5	7.0	253	7.7
9805270015	0	0.051	46.7	14.7	71.5	-0.08	604	7540	98.5	7.0	253	7.7
9805270109	0	0.053	46.7	14.7	71.1	-0.05	1174	5704	65.0	29.7	338	7.5
9805270303	0	0.019	46.8	14.7	70.9	-0.05	1164	5656	34.0	31.6	340	7.5
9806020056	2	-0.004	55.7	14.7	70.5	-0.00	375	8102	28.0	1.4	222	7.9
9806020136	0	0.045	55.7	14.7	70.6	-0.00	370	8090	46.0	2.1	223	7.9
9806020234	0	0.050	55.6	14.7	70.5	-0.01	359	8086	63.5	3.1	223	7.9
9806020442	0	0.022	55.6	14.7	70.5	-0.00	351	8061	43.0	5.2	225	7.8
9806030030	3	0.026	46.5	14.7	71.0	-0.01	1487	5697	108.5	25.0	338	7.9
9806030231	1	0.028	46.6	14.7	71.0	-0.02	1487	5688	18.5	27.0	339	7.9
9806030308	0	0.014	<u>46.7</u>	14.7	70.9	-0.02	1454	5660	44.5	27.6	340	7.9
9806040208	3	0.039	<u>67.7</u>	14.7	70.3	-0.05	2093	2291	23.5	50.7	485	8.1
9806040317	3	0.016	67.7	14.7	70.1	-0.05	2012	2267	37.5	51.8	486	8.1
9806040426	3	0.014	67.7	14.7	70.0	-0.04	1856	2245	61.5	52.9	487	8.0
9806050031	0	-0.008	42.0	14.7	70.9	-0.05	1002	6740	34.5	9.5	294	8.2
9806050118	0	0.015	42.1	14.7	70.8	-0.05	1002	6726	24.0	10.3	295	8.2
9806050154	0	0.007	42.1	14.7	70.8	-0.04	983	6719	21.0	10.9	295	8.1

Big swing in temperature even though there has been no delivery.

Template for A12 command

```
IA1200
JUN 11, 1998 12:47 PM
TANK 1  REGULAR          MAG  NUMBER OF SAMPLES = 20
WATER    HEIGHT0  HEIGHT1  HEIGHT2  HEIGHT3  HEIGHT4  HEIGHT5  HEIGHT6
HEIGHT7  HEIGHT8  HEIGHT9  TMP REF  TMP5     TMP4     TMP3     TMP2
TMP1     TMP0     TMP REF
```

Probe Standard Average Buffers

```
IA1200
JUN 11, 1998 12:47 PM
TANK 1  REGULAR          MAG  NUMBER OF SAMPLES = 20
1477.000 19845.199 19845.150 19844.699 19845.350 19847.150 19847.199 19847.301
19847.051 19847.400 19847.350 42377.398 17287.949 42375.449 17287.301 42375.898
17286.199 19271.199 42375.051
TANK 2  PLUS            MAG  NUMBER OF SAMPLES = 20
1371.150 19443.000 19443.000 19443.000 19443.000 19442.850 19443.000 19443.000
19443.000 19442.949 19443.000 42508.199 17503.051 18755.250 19174.350 19427.551
19583.150 20000.600 42506.000
TANK 3  PREMIUM          MAG  NUMBER OF SAMPLES = 20
```

Bad probe thermistor values.

```

1383.000 23473.699 23473.500 23473.699 23473.699 23473.500 23485.051 23484.699
23484.850 23485.150 23484.949 41917.949 17255.750 18685.750 19646.900 19714.150
19804.750 19917.900 41901.301

```

Analysis

From the IA52 command compare LRATE (-0.309) with AVL RTE (0.040). This shows that there is excessive compensation. The most likely cause for excessive compensation is a false probe temperature reading. Examining the IA12 command shows that there are two erroneous thermistor values.

Solution

Replace probe and delete rate table.

CSLD PROBLEM 9 - TANK 1 FAIL

Diagnostics

200

Site ID

Site ID

Site ID

Site ID

MAY 18, 2000 8:23

TANK	PRODUCT	GALLONS	INCHES	WATER	DEG F	ULLAGE
1	UNLEADED	4740	44.69	0.0	61.2	4896
2	PLUS	5740	63.65	0.0	61.9	1952
3	PREMIUM	2712	62.65	0.0	62.0	1010

CSLD TEST RESULTS

TANK	PRODUCT	RESULT
1	UNLEADED	PER: MAY 18, 2000 FAIL
2	PLUS	PER: MAY 18, 2000 PASS
3	PREMIUM	PER: MAY 18, 2000 PASS

76687IA5200_

IA5200

MAY 18, 2000 8:23

Comparing compensated LRATE to uncompensated AVL RTE shows excessive compensation.

CSLD DIAGNOSTICS: RATE TEST

TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	EVAP	RJT
1	0005180427	<u>-0.282</u>	37.0	2	<u>0.017</u>	6709	70	17	33.8	33.8	127.1	0.000	0
2	0005180735	-0.025	32.5	1	0.026	5558	80	19	45.0	44.8	17.6	0.000	0
3	0005180531	-0.061	32.3	1	-0.000	2589	80	17	45.0	44.8	8.6	0.000	0

IA5101

MAY 18, 2000 8:25

CSLD DIAGNOSTICS: RATE TABLE

T 1:UNLEADED

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	EVAP
0004200431	0	-0.085	53.3	52.0	56.5	0.00	2	9682	50.0		48.5	0	0.000
0004202332	3	0.068	55.2	55.5	57.2	-0.03	3073	4904	129.5		14.8	372	0.000
0004210148	3	-0.044	55.1	55.4	57.2	-0.03	2712	4904	174.5		17.8	372	0.000
0004210448	3	-0.174	55.0	55.4	57.1	-0.02	2601	4904	54.0		20.8	372	0.000
0004222339	0	-0.023	52.3	54.1	55.8	0.02	1585	6548	129.5		8.7	301	0.000
0004230155	0	0.012	52.4	53.5	55.6	0.01	1398	6548	174.5		11.7	301	0.000
0004230456	0	0.027	52.4	52.6	55.4	0.01	1234	6548	168.5		14.8	301	0.000
0004232246	3	0.038	53.2	53.0	55.8	-0.00	2597	2936	129.5		31.8	459	0.000
0004240105	3	0.005	53.2	53.1	55.8	-0.00	2292	2936	171.0		34.8	459	0.000
0004240407	3	-0.011	53.2	53.2	55.7	0.00	2109	2936	57.0		37.9	459	0.000
0004242334	0	0.052	56.6	56.0	56.5	-0.06	1649	5721	129.5		6.6	337	0.000
0004250156	0	-0.002	56.4	56.0	56.4	-0.05	1455	5721	168.0		9.6	337	0.000
0004250458	1	-0.047	56.3	56.0	56.2	-0.04	1395	5721	18.5		12.6	337	0.000
0004252306	2	-0.024	55.8	55.9	56.8	-0.02	382	8435	129.5		1.0	199	0.000
0004260131	0	-0.016	55.8	55.9	56.8	-0.01	337	8435	165.5		4.0	199	0.000
0004260432	0	0.050	55.7	55.8	56.8	-0.01	323	8435	50.5		7.0	199	0.000
0004262332	3	-0.036	55.8	56.0	57.5	-0.03	2846	4236	129.5		25.4	401	0.000
0004270158	3	0.024	55.8	55.9	57.5	-0.02	2511	4236	164.0		28.4	401	0.000
0004270459	1	-0.414	55.7	55.9	57.5	-0.02	2409	4236	27.0		31.5	401	0.000
0004272326	3	0.036	58.4	57.6	58.5	-0.08	2029	4975	129.5		6.3	369	0.000
0004280154	3	-0.039	58.2	57.6	58.4	-0.06	1790	4975	162.5		9.3	369	0.000
0004282311	0	0.061	59.1	57.1	59.4	-0.06	1659	6434	129.5		6.4	305	0.000
0004290140	0	-0.002	58.9	57.1	59.4	-0.06	1464	6434	161.0		9.4	305	0.000
0004290441	0	0.021	58.8	57.0	59.4	-0.05	1345	6434	98.0		12.4	305	0.000
0004292345	3	0.074	58.3	56.0	60.1	-0.10	3384	1251	129.5		31.0	551	0.000
0004300216	3	0.028	58.0	58.0	60.1	-0.09	2986	1251	159.0		34.0	551	0.000
0004300518	3	0.007	57.8	57.9	60.1	-0.07	2618	1251	110.5		37.0	551	0.000
0004302242	3	0.050	56.8	57.5	61.1	-0.02	2587	3949	129.5		12.9	413	0.000
0005010116	3	-0.022	56.7	57.9	61.1	-0.02	2283	3950	156.5		15.9	413	0.000
0005010417	3	-0.099	56.7	57.8	61.1	-0.02	2190	3950	39.0		18.9	413	0.000
0005012322	3	0.000	58.1	58.9	61.7	-0.03	2100	5699	129.5		12.1	338	0.000
0005020159	3	0.027	58.0	58.8	61.7	-0.03	2029	6495	129.5		15.1	338	0.000
0005022346	3	0.047	58.0	58.8	62.1	-0.03	2029	6495	129.5		36.5	539	0.000
0005030225	3	-0.014	57.8	58.9	62.0	-0.06	2652	1445	49.0		39.5	539	0.000
0005032325	3	0.061	57.2	57.9	62.8	-0.03	2922	4110	129.5		19.0	406	0.000
0005040206	3	0.034	57.2	58.3	62.9	-0.02	2578	4110	149.5		22.0	406	0.000
0005042339	3	0.032	63.4	<u>-107.4</u>	64.6	-0.11	2029	6495	129.5		7.8	301	0.000
0005050222	3	0.007	63.1	<u>-105.1</u>	64.7	-0.10	1791	6496	147.5		10.8	301	0.000
0005052345	3	0.053	61.8	61.2	65.9	-0.14	3175	1823	129.5		31.8	516	0.000
0005060230	3	0.007	61.4	60.5	65.9	-0.12	2801	1823	145.5		34.8	516	0.000
0005060531	3	-0.025	61.1	60.2	65.9	-0.11	2571	1823	51.5		37.9	516	0.000
0005062349	3	0.006	61.1	51.2	67.2	-0.06	3140	3581	129.5		14.1	429	0.000
0005070236	3	0.012	60.9	51.4	67.2	-0.06	2771	3581	143.5		17.1	429	0.000
0005070537	3	-0.040	60.7	51.0	67.3	-0.04	2547	3581	124.0		20.1	429	0.000
0005072237	0	-0.023	66.8	<u>-107.5</u>	68.8	-0.16	792	7014	129.5		2.5	275	0.000

Intermittent bad values.

0005080126	0	0.020	66.4	<u>-107.4</u>	69.0	-0.13	699	7014	141.5	5.5	276	0.000
0005080427	1	0.129	66.0	<u>-107.3</u>	69.1	-0.11	670	7014	30.5	8.5	276	0.000
0005082328	3	0.097	64.5	<u>-107.3</u>	70.3	-0.16	2854	2747	129.5	27.3	467	0.000
0005090218	3	0.051	64.1	<u>-107.3</u>	70.3	-0.14	2518	2747	140.5	30.3	467	0.000
0005092322	3	0.003	64.6	<u>-83.9</u>	71.2	-0.07	1982	5745	129.5	9.1	334	0.000
0005100213	0	0.036	64.4	41.9	71.2	-0.06	1749	5744	139.5	12.1	334	0.000
0005102331	3	0.039	63.7	30.1	71.2	-0.13	2855	1559	129.5	33.3	531	0.000
0005110222	3	0.036	63.4	35.6	71.0	-0.10	2520	1559	139.0	36.3	531	0.000
0005112319	3	0.048	62.5	<u>-107.1</u>	70.7	-0.04	2878	4154	129.5	15.0	404	0.000
0005120210	3	0.009	62.3	<u>-72.8</u>	70.7	-0.04	2540	4154	139.0	18.0	404	0.000
0005130136	2	0.030	69.8	<u>-107.2</u>	71.1	-0.24	824	6333	138.5	0.2	307	0.000
0005130437	0	0.077	69.1	<u>-107.3</u>	71.3	-0.17	723	6333	114.5	3.2	307	0.000
0005132347	3	0.028	67.1	<u>-107.0</u>	71.6	-0.22	3350	1342	129.5	22.2	545	0.000
0005140237	3	0.008	66.5	<u>-107.2</u>	71.4	-0.17	2956	1342	140.5	25.2	545	0.000
0005140537	3	0.038	66.0	<u>-106.0</u>	71.2	-0.16	2788	1342	140.5	28.3	545	0.000
0005142248	3	-0.013	60.1	<u>-79.5</u>	70.7	0.00	2724	3396	140.5	14.9	438	0.000
0005150138	3	0.007	60.1	<u>-72.9</u>	70.6	-0.00	2724	3396	140.5	17.9	438	0.000
0005150438	3	-0.051	60.1	<u>-72.7</u>	70.4	-0.00	2507	3396	45.0	20.9	438	0.000
0005152328	0	0.054	64.5	<u>-94.8</u>	70.4	-0.07	1260	5499	129.5	5.7	345	0.000
0005160218	0	0.013	64.3	<u>-107.2</u>	70.3	-0.06	1112	5499	140.5	8.7	345	0.000
0005162319	3	0.052	64.1	<u>-106.1</u>	69.7	-0.14	2548	1734	129.5	29.5	521	0.000
0005170209	3	0.020	63.7	<u>-98.6</u>	69.6	-0.12	2444	1734	32.0	32.5	521	0.000
0005170352	2	0.007	60.2	60.5	69.1	0.08	615	9215	68.0	0.2	131	0.000
0005172312	3	0.034	61.5	<u>35.6</u>	68.9	-0.02	2757	5141	129.5	19.3	361	0.000
0005180202	3	-0.010	61.5	<u>-91.1</u>	68.8	-0.02	2433	5141	140.5	22.3	361	0.000

Intermittent bad values.

__I_I_ 76687IA1000_

IA1000

MAY 18, 2000 8:27

TANK 1 UNLEADED MAG NUMBER OF SAMPLES = 9445

1334.000 15481.000 15480.000 15480.000 15480.000 15482.000 15483.000 15485.000
 15489.000 15494.000 15497.000 45689.000 20931.000 23464.000 23409.000 23962.000
24250.000 24810.000 45691.000

TANK 2 PLUS MAG NUMBER OF SAMPLES = 523

1309.000 22143.000 22143.000 22143.000 22143.000 22143.000 22145.000 22144.000
 22145.000 22145.000 22146.000 45504.000 21342.000 22545.000 23465.000 24019.000
 24086.000 24730.000 45503.000

TANK 3 PREMIUM MAG NUMBER OF SAMPLES = 462

1312.000 21871.000 21871.000 21871.000 21871.000 21871.000 21871.000 21871.000
 21872.000 21871.000 21871.000 44889.000 21445.000 22442.000 22975.000 23510.000
 23695.000 24592.000 44892.000

Yet probe's temperature readings look good at this time!

Analysis

From the IA52 command compare LRATE (-0.282) with AVL RTE (0.017). This shows that there is excessive compensation. The most likely cause for excessive compensation is a false probe temperature reading. Examining the IA52 command did not show erroneous thermistor values. However, examining the IA51 command showed that the board temperature value was intermittently bad.

Solution

Replace probe and delete rate table.

CSLD PROBLEM 10 - TANK 8 FAILING**Diagnostics**

I61200

MAY 7, 1999 10:10 AM

TANK MANIFOLDED PARTNERS

TANK	PRODUCT LABEL	MANIFOLDED TANKS
1	DIESEL 1	2, 3, 4, 5
2	DIESEL 2	1, 3, 4, 5
3	DIESEL 3	1, 2, 4, 5
4	DIESEL 4	1, 2, 3, 5
5	DIESEL 5	1, 2, 3, 4
6	AUTO DIESEL	NONE
7	SUPER	NONE
8	REGULAR 1	9
9	REGULAR 2	8
10		NONE
11		NONE
12		NONE

Manifolded set.

IA5200

MAY 7, 1999 10:11 AM

CSLD DIAGNOSTICS: RATE TEST

TK	DATE	LRATE	INTVL	ST	AVLRTE	VOL	C1	C3	FDBK	ACPT	THPUT	DFMUL	RJT
6	9905070326	-0.013	41.1	1	0.000	7740	80	22	45.0	44.8	0.86	-0.36	0
7	9905070456	0.003	22.2	1	0.014	4823	58	23	20.3	16.9	0.87	0.18	1
8	9905070428	0.246	6.8	8	0.241	8708	11	10	0.0	0.0	2.86	0.79	<u>12</u>

Positive rejects.


T 8:REGULAR 1

Positives

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	THPT
9904120309	0	0.395	64.3	67.8	71.5	-0.02	980	8808	36.0	36.8	909	3.0	
9904130447	0	0.213	64.8	68.5	72.3	-0.01	849	5892	23.0	62.7	1038	3.0	
9904280337	0	0.226	67.1	68.9	70.0	-0.02	608	6015	63.5	75.2	1028	3.1	
9904280451	0	0.244	67.1	68.9	70.1	-0.03	578	6013	36.5	76.4	1028	3.1	
9904300319	0	0.198	64.8	68.5	72.3	0.05	1102	10406	26.5	15.5	835	3.1	
9905030233	0	0.130	65.9	69.9	74.2	0.01	1124	12183	22.0	17.1	762	3.1	
9905030302	6	-0.032	65.9	69.9	74.2	0.01	983	12183	117.5	17.8	762	3.1	
9905040303	0	0.324	66.8	70.7	74.7	-0.00	902	9501	29.5	41.7	877	2.8	
9905040453	0	0.178	66.8	70.6	74.6	-0.01	856	9453	46.5	43.3	879	2.8	
9905050339	0	0.186	67.4	71.0	74.8	-0.00	697	11738	90.0	10.	785	2.8	
9905070428	0	0.370	68.2	71.8	75.1	-0.02	719	7068	37.0	59.0	983	2.9	

I61100
MAY 7, 1999 10:13 AM

LEAK TEST METHOD
- - - - -
TEST CSLD : TANK 8
Pd = 95%
CLIMATE FACTOR:MODERATE

TEST ON DATE : TANK 9
JAN 1, 1996
START TIME : DISABLED 
TEST RATE : 0.20 GAL/HR
DURATION : 2 HOURS

S61109
MAY 7, 1999 10:15 AM

LEAK TEST METHOD
- - - - -
TEST CSLD : TANK 9
Pd = 95%
CLIMATE FACTOR:MODERATE

IA5108
MAY 7, 1999 10:16 AM

CSLD DIAGNOSTICS: RATE TABLE

S05408
MAY 7, 1999 10:16 AM

T 8:REGULAR 1 CSLD RECORDS DELETED
T 9:REGULAR 2 CSLD RECORDS DELETED

Analysis
Tanks 8 and 9 were manifolded and programmed as manifolded. However, the leak test frequency selected for Tank 9 was not CSLD. The CSLD program was only using Tank 8's volume to perform the test. When Tank 9 was filling, Tank 8's LRATE was positive.

Solution
Set Tank 9's Leak Test Frequency to CSLD and delete rate table.

CSLD PROBLEM 11 - PERIODIC TEST FAIL TANK 2**Diagnostics**

200

Site ID

Site ID

Site ID

NOV 16, 1999 1:06 PM

TANK	PRODUCT	GALLONS	INCHES	WATER	DEG F	ULLAGE
1	REGULAR	8543	61.99	0.0	77.4	3139
2	PLUS	3705	32.53	0.0	85.2	7977
3	SUPREME	6024	46.50	0.0	80.4	5658

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IA5100

NOV 16, 1999 1:06 PM

CSLD DIAGNOSTICS: RATE TABLE

T 2:PLUS

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	THPT
9910181409	3	-1.252	<u>98.7</u>	<u>97.2</u>	<u>98.9</u>	0.36	734	601	50.0	26.5	717	2.4	
9910181537	6	-0.824	<u>99.2</u>	<u>97.2</u>	<u>98.9</u>	0.39	582	599	142.0	28.0	717	2.4	
9910190355	1	-0.464	<u>91.4</u>	<u>96.5</u>	<u>98.9</u>	0.28	432	2783	14.0	9.1	572	2.4	
9910192324	3	-0.132	<u>96.6</u>	<u>96.9</u>	<u>98.9</u>	-0.21	898	1474	52.5	28.6	646	2.4	
9910200241	3	-0.152	<u>96.0</u>	<u>96.6</u>	<u>98.9</u>	-0.13	753	1445	143.5	31.9	648	2.4	

High 90s inconsistent with other tanks.

CSLD DIAGNOSTICS: RATE TABLE

T 3:SUPREME

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	THPT
9910190459	0	-0.166	<u>85.9</u>	<u>88.1</u>	<u>88.8</u>	0.02	1074	5434	52.5	10.2	456	6.9	
9910200011	0	-0.131	<u>85.7</u>	<u>88.0</u>	<u>88.9</u>	0.03	925	5970	34.5	4.3	434	6.9	
9910200121	0	-0.134	<u>85.8</u>	<u>88.0</u>	<u>88.9</u>	0.03	862	5958	47.0	5.4	434	6.9	
9910200243	0	-0.102	<u>85.8</u>	<u>88.1</u>	<u>88.9</u>	0.03	797	5955	126.0	6.8	434	6.9	

CSLD DIAGNOSTICS: RATE TABLE

T 1:REGULAR

	TIME	ST	LRT	AVTMP	TPTMP	BDTMP	TMRT	DSPNS	VOL	INTVL	DEL	ULLG	THPT
9910200045	0	-0.049	<u>84.9</u>	<u>86.2</u>	<u>88.6</u>	0.04	856	8970	47.0	4.6	301	10.7	
9910200212	0	-0.022	<u>85.0</u>	<u>86.3</u>	<u>88.6</u>	0.02	755	8969	109.5	6.1	301	10.7	
9910200451	0	0.115	<u>85.1</u>	<u>86.5</u>	<u>88.6</u>	0.00	753	8940	26.0	8.7	302	10.7	
9910210348	3	-0.096	<u>86.3</u>	<u>87.0</u>	<u>88.7</u>	0.02	1455	8414	31.0	12.2	327	10.7	
9910210459	0	-0.011	<u>86.3</u>	<u>87.0</u>	<u>88.7</u>	0.02	1394	8410	32.5	13.4	328	10.7	
9910220344	0	-0.087	<u>84.4</u>	<u>85.7</u>	<u>88.5</u>	0.05	661	9773	43.5	6.4	257	10.7	

Mid 80s

Analysis

It can be seen that the temperatures in Tank 2 are abnormally higher than in the other tanks. This problem was traced to a stuck relay. The pump was running continuously and heating up the fuel.

Solution

Replace the stuck relay for pump in Tank 2.

CSLD PROBLEM 12 - PERIODIC TEST FAIL ON TANK 1**Diagnostics**

IA5400

NOV 20, 1998 7:31 AM

CSLD DIAGNOSTICS: MOVING AVERAGE TABLE

T 1:PREM

TIME	SMPLS	TLCVOL	HEIGHT	AVGTEMP	TOPTEMP	BDTEMP
981120072142	30	3456.82	36.518	61.85	60.91	57.32
981120072212	31	3456.80	36.518	61.85	60.90	57.32
981120072242	30	3456.80	36.518	61.85	60.90	57.33
981120072312	30	3456.76	36.518	61.85	60.90	57.33
981120072342	30	3456.78	36.518	61.85	60.90	57.34
981120072412	31	3456.79	36.518	61.85	60.90	57.34
981120072442	30	3456.80	36.518	61.85	60.90	57.34
981120072512	30	3455.51	36.512	61.85	60.90	57.34
981120072542	31	3451.16	36.489	61.85	60.90	57.35
981120072612	30	3446.74	36.466	61.85	60.90	57.35
981120072642	31	3441.81	36.441	61.85	60.90	57.35
981120072712	30	3437.17	36.417	61.85	60.90	57.35
981120072742	30	3435.84	36.410	61.85	60.90	57.34
981120072812	31	3435.37	36.408	61.85	60.90	57.34
981120072842	30	3435.12	36.406	61.85	60.89	57.34
981120072912	31	3434.87	36.405	61.85	60.89	57.33
981120072942	30	3434.70	36.404	61.85	60.89	57.33
981120073012	30	3434.65	36.404	61.85	60.89	57.32
981120073042	31	3434.54	36.403	61.85	60.88	57.32
981120073112	30	3434.45	36.403	61.85	60.88	57.32
981120073142	31	3434.39	36.403	61.85	60.87	57.31
981120073212	29	3434.29	36.402	61.85	60.87	57.31
981120073242	30	3434.18	36.402	61.85	60.86	57.30
981120073312	30	3434.04	36.401	61.85	60.86	57.30
981120073342	30	3433.96	36.400	61.85	60.85	57.30
981120073412	31	3433.91	36.400	61.85	60.85	57.30
981120073442	30	3433.88	36.400	61.85	60.85	57.30
981120073512	31	3433.84	36.400	61.85	60.84	57.30
981120073542	30	3433.85	36.400	61.85	60.84	57.31
981120073642	31	3433.81	36.400	61.85	60.83	57.31
981120073712	30	3433.82	36.400	61.85	60.83	57.32

Dispensing

Slow decrease in vol.

981120073742	31	3433.77	36.399	61.85	60.83	57.32
981120073812	30	3433.69	36.399	61.85	60.83	57.32
981120073842	31	3433.63	36.399	61.85	60.82	57.33
981120073912	30	3433.62	36.399	61.85	60.82	57.33
981120073942	31	3433.56	36.398	61.85	60.83	57.33
981120074012	30	3433.63	36.399	61.85	60.83	57.33
981120074042	30	3433.58	36.398	61.85	60.83	57.33
981120074112	30	3433.60	36.399	61.85	60.83	57.33
981120074142	30	3433.60	36.399	61.85	60.84	57.33
981120074212	31	3433.57	36.398	61.85	60.84	57.33
981120074242	30	3433.55	36.398	61.85	60.84	57.33
981120074312	31	3433.54	36.398	61.85	60.85	57.33
981120074342	30	3433.50	36.398	61.85	60.85	57.34
981120074412	31	3433.43	36.398	61.85	60.85	57.34
981120074442	30	3433.48	36.398	61.85	60.86	57.34
981120074512	31	3433.47	36.398	61.85	60.86	57.34
981120074542	30	3433.44	36.398	61.85	60.86	57.34
981120074612	30	3433.46	36.398	61.85	60.87	57.35
981120074642	31	3433.49	36.398	61.85	60.87	57.35
981120074712	30	3433.50	36.398	61.85	60.87	57.35
981120074742	30	3433.46	36.398	61.85	60.88	57.35
981120074812	31	3433.47	36.398	61.85	60.88	57.35
981120074842	30	3433.41	36.398	61.85	60.88	57.36
981120074912	30	3433.44	36.398	61.85	60.88	57.36
981120074942	31	3433.41	36.398	61.85	60.88	57.36
981120075012	30	3433.36	36.397	61.85	60.88	57.36
981120075042	30	3433.35	36.397	61.85	60.88	57.37
981120075112	30	3433.41	36.398	61.85	60.88	57.37
981120075142	29	3433.41	36.398	61.85	60.88	57.37
981120075212	29	3433.39	36.397	61.85	60.88	57.37
981120075242	32	3433.37	36.397	61.85	60.88	57.38
981120075312	30	3433.41	36.398	61.85	60.88	57.38
981120075342	30	3433.39	36.397	61.85	60.88	57.38
981120075412	31	3433.40	36.398	61.85	60.88	57.38
981120075442	30	3433.37	36.397	61.85	60.88	57.38
981120075512	30	3433.34	36.397	61.85	60.89	57.38
981120075542	31	3433.35	36.397	61.85	60.88	57.39
981120075612	31	3433.38	36.397	61.85	60.88	57.39
981120075642	30	3433.31	36.397	61.85	60.88	57.39
981120075712	30	3433.31	36.397	61.85	60.88	57.40
981120075742	30	3433.29	36.397	61.85	60.88	57.40
981120075812	31	3433.29	36.397	61.85	60.88	57.40
981120075842	30	3433.30	36.397	61.85	60.88	57.41
981120075912	30	3433.27	36.397	61.85	60.88	57.41
981120075942	30	3433.28	36.397	61.85	60.88	57.41
981120080012	30	3433.30	36.397	61.85	60.88	57.41
981120080042	30	3433.26	36.397	61.85	60.88	57.42
981120080112	31	3433.23	36.397	61.85	60.88	57.42
981120080142	30	3433.13	36.396	61.85	60.89	57.42
981120080212	31	3433.14	36.396	61.85	60.89	57.42
981120080242	30	3433.12	36.396	61.85	60.89	57.42

Slow decrease in vol.

981120080312	30	3433.05	36.396	61.85	60.89	57.42
981120080342	31	3433.04	36.396	61.85	60.89	57.42
981120080412	30	3433.10	36.396	61.85	60.89	57.41
981120080442	31	3433.07	36.396	61.85	60.89	57.41
981120080512	30	3433.08	36.396	61.85	60.90	57.40
981120080542	30	3433.08	36.396	61.85	60.90	57.40
981120080612	30	3433.06	36.396	61.85	60.90	57.40
981120080642	31	3433.04	36.396	61.85	60.90	57.39
981120080712	31	3433.06	36.396	61.85	60.90	57.39
981120080742	30	3432.99	36.395	61.85	60.90	57.39
981120080812	30	3432.99	36.395	61.85	60.90	57.39
981120080842	31	3433.00	36.395	61.85	60.90	57.40
981120080912	30	3433.03	36.396	61.85	60.90	57.40
981120080942	31	3433.02	36.396	61.85	60.89	57.40
981120081012	30	3433.04	36.396	61.85	60.89	57.40
MOVING AVERAGE:		3433.07				

DISPENSE STATE: IDLE 0.097659

Analysis

Examining the IA54 table showed that following a dispense the level continued dropping for a long period of time. Inspecting the probe revealed that the floats had been installed upside down.

Solution

Reinstall floats correctly and delete rate table.

12 BIR Troubleshooting

Business Inventory Reconciliation (BIR), an option for TLS-350R Consoles, automatically performs tank-to-meter mapping, tank calibration (AccuChart), and delivery and sales reconciliation to provide the customer with real-time, precise inventory control. This section contains BIR troubleshooting information and examples of actual BIR problems and their solutions.

BIR Troubleshooting Requirements

To troubleshoot BIR, you must have a PC or data terminal to collect important diagnostic reports via RS-232 or modem connection. Veeder Root cannot diagnose some of the more complex BIR problems without access to all of the reports discussed in this section. The majority of the reports needed in this analysis can not be printed on the console's printer.

There are three categories of BIR problems:

- Meter mapping errors,
- Tank calibration (AccuChart) errors, and
- Dispenser Interface Modules (DIM) communication problems

Meter mapping problems, and to some degree tank calibration problems, and BIR variance analysis are contained in this section.

BIR Features

- Inventory reconciliation
- Automatic tank to dispenser meter mapping
- Adjusted delivery reports
- Automatic tank calibration (AccuChart)

BIR Methods

INVENTORY RECONCILIATION

Variance = End Volume - Start Volume + Sales - Deliveries

ADJUSTED DELIVERY REPORTS

Adjusted Delivery = End Volume - Start Volume + Sales

Requirements for BIR with Manifolded Tanks

- Both 3XX software and a Memory Expansion Module are required for siphon or a combination of siphon and line manifolding.

- At least 1XX software for line only manifolding.

ACCUCART RESTRICTIONS WITH MANIFOLDED TANKS

- Only 2 tanks are allowed in a siphon manifolded set.
- Only 4 siphon manifolded sets per system.
- The tank diameters in a siphon manifolded set must be within 6 inches of each other.
- The total siphon manifolded set's capacity must be less than 30,000 gallons.

*If these restrictions are not met BIR will be operational on the siphon manifolded set, but not AccuChart.

Alarms

BIR GENERATES 3 ALARMS

- Close Daily Pending - BIR is waiting for an idle period to close the daily report.
- Close Shift Pending - BIR is waiting for an idle period to close the shift report.
- Prod Threshold Alm - The periodic variance of a product exceeded the BIR calculated threshold.

DISPENSER INTERFACE MODULES (DIMS) GENERATE 3 ALARMS

Because of the many types of DIMs and DIM-to-POS connection possibilities, please refer to the DIM section of this manual to troubleshoot the three DIM alarms:

- Disabled DIM
- Communication Alarm
- BDIM Transaction Alarm

BIR Setup Errors

METER DATA PRESENT ENTRY

If there is meter data present and this entry is incorrectly set to NO, the map will never complete because the auto-meter mapping program will not assign this tank to a meter.

If there is no meter data present and this entry is incorrectly set to YES, a BIR report will be generated for this tank. There will be large reconciliation errors because there is no sales information.

BIR TEMPERATURE COMPENSATION

If the meters are reporting temperature compensated volumes, this entry must be set to YES. Incorrect setting of this entry will result in variance errors.

BIR ALARM THRESHOLD AND OFFSET

If the Periodic Reconciliation Alarm is enabled and the BIR Alarm Threshold and/or Alarm Offset values are entered incorrectly, incorrect reporting of the alarm may occur.

If the variance for the reconciliation period exceeds the maximum limit determined by the Alarm Threshold and Alarm Offset values, the Periodic Reconciliation Alarm will be posted. This maximum limit value is determined by the following formula:

$$\text{Max. variance value} = (\text{Alarm Threshold}\%) \times (\text{total sales}) + \text{Alarm Offset}$$

For example, the Alarm Threshold is set to 1 percent, the Alarm Offset is set to 130 gallons, total sales for the reconciliation period is 100,000 gallons, the maximum variance limit before posting the Periodic Reconciliation Alarm would be:

$$(0.01) \times (100,000) + 130 = 1000 + 130 = 1130 \text{ gallons}$$

BIR Variance Errors

GENERAL

1. The periodic variance is the summation of the daily variances.
2. The polarity of the variance is either positive or negative.
 - A negative variance results when the TLS Console starting and ending volumes indicate more fluid has left the tank than the POS reported sales indicate.
 - A positive variance results when the TLS Console starting and ending volumes indicate less fluid has left the tank than the POS reported sales indicate.
3. An examination of the BIR daily history table will indicate whether a large periodic variance is a summation of smaller daily variances with the same sign or whether there are isolated instances of large daily variances.
4. Typically, variances will be larger on days when there has been a large volume change (large sales or a delivery or both).
5. Typically, variances will be larger on days when the tank fluid level is operating at the extremes (full or almost empty). This is due to calibration errors; accuracy should improve as the tank calibrates.
6. Large negative variances indicate lost sales data. However, don't overlook the possibility that a negative variance could be caused by a tank or line leak!
7. Large positive variances indicate lost delivery data.
8. There are several sources of variance errors: lost or inaccurate VOLUME DATA, lost or inaccurate SALES DATA.

POSSIBLE CAUSES OF LOST OR INACCURATE TLS CONSOLE VOLUME DATA

1. Isolated variances (usually large):
 - Fluid level too low (INVALID FUEL LEVEL - common)
 - Fluid level too high, fluid in the riser, float stuck in the riser (OVERFILL ALARM)
 - Malfunctioning probe (possible PROBE OUT ALARM, stuck float, etc.)
 - Tank calibrating during the day (V106 and V107 only - 3 times)
 - Lost Deliveries (V106 and V107 only - rare).
 - Adding fluid to the tank without tripping a delivery report.
 - Removing fluid from the tank, through a means that by-passes the POS (site maintenance, water removal, etc.)

2. Continuous variances usually of the same sign:
 - Inaccurate tank calibration.
 - Reconciliation temperature compensation incorrectly setup.
 - One or more meters are not being reported.

POSSIBLE CAUSES OF LOST OR INACCURATE SALES DATA

1. Isolated variances (usually large):
 - Malfunctioning DIM (possible DISABLED DIM ALARM).
 - NO POS communication (possible COMMUNICATION ALARM).
 - A period when the TLS Console was not powered.
 - Removing fluid from the tank through a means that by-passes the POS (theft, water removal, etc.).
 - Meter-map state changes to incomplete (V106 and V107 only).
 - Meter totalizer rollover.
 - Meter maintenance.
2. Continuous variances usually of the same sign:
 - DIM programmed incorrectly.
 - Inaccurate meter.
 - Incorrect meter-map (usually on start-up due to pattern matching).
 - Removing fluid from the tank, through a means that by-passes the POS (meter not connected to POS, leaks, etc.).
 - One or more meters are not being reported.

Reports Used to Analyze BIR Variance Problems

I20100 STANDARD INVENTORY REPORT

1. Identifies the site for record keeping and evaluation of environmental extremes.
2. Develop an overview of the site:
 - Only two gasoline grades, e.g., Premium and Regular (could be blenders).
 - Two tanks same product (could be manifolded tanks).
 - Add ullage and inventory to get ballpark capacities.
 - Are there low volume products, such as kerosene, waste oil, etc.
3. Check all parameters (volume, temperature, water, etc.), do they make sense?

I20100

STATION HEADER INFO

JUN 26, 1996 2:36 PM

TANK PRODUCTVOLUMETC VOLUMEULLAGEHEIGHTWATERTEMP

```

1      UNLEADED86278617300063.420.076.9
2      UNLEADED PLUS92869278234167.920.072.2
3      SUPER UNLEADED83158309331261.380.070.6
4      KEROSENE5399539559860.210.070.9
5      DIESEL29892987294046.270.070.1

```

I11100 AND I11200 PRIORITY AND NON-PRIORITY ALARM HISTORY

Look for Communication, DIM, Invalid Fuel Level, and Probe Out alarms that occurred during the problem period.

I11100

DEC 18, 1997, 3:04 PM

PRIORITY ALARM HISTORY

ID	CATEGORY	DESCRIPTION	ALARM TYPE	STATE	DATE	TIME
T3	TANK	REGULAR	LOW PRODUCT ALARM	CLEAR	12-18-97	1:32AM
T3	TANK	REGULAR	LOW PRODUCT ALARM	ALARM	12-17-97	5:56PM
E1	OTHER	B1G	COMMUNICATION ALARM	CLEAR	10-15-97	9:34AM
E1	OTHER	B1G	DISABLED DIM ALARM	CLEAR	1-01-96	8:08AM
E1	OTHER	B1G	DISABLED DIM ALARM	ALARM	1-01-96	8:08AM
E1	OTHER	B1G	COMMUNICATION ALARM	ALARM	1-01-96	8:01AM
T1	TANK	SUPER	PROBE OUT	ALARM	1-01-96	7:01AM

I11200

DEC 18, 1997, 3:05 PM

NON-PRIORITY ALARM HISTORY

ID	CATEGORY	DESCRIPTION	ALARM TYPE	STATE	DATE	TIME
T3	TANK	REGULAR	INVALID FUEL LEVEL	CLEAR	11-08-97	1:01AM
T3	TANK	REGULAR	INVALID FUEL LEVEL	ALARM	11-07-97	6:31PM

I@A400 DAILY RECONCILIATION LIST FOR LAST 31 DAYS (62 ON NEWER VERSIONS)

An alternate command would be IC0700 which gives you the Current or Previous Periodic Report.

1. Determine if the variance problem is associated with a significant number of large variances or the result of small errors of the same polarity.
2. Rule of thumb: a daily variance less than 1% of the day's sales is OK.
3. Large errors (usually isolated)
 - Check sales, if zero or unusually low, look for POS communication problems, DIM problems, or power outages.

- Undetected delivery? TLS Console end volume greater than TLS Console start volume. Deliveries will be lost if TLS Console is not powered, site unmaps (V107), or probe problems.
 - Mismapped meter(s). Sales are reported to the wrong tank. This tank will have a positive variance. The tank the meter is actually mapped to will have a negative variance of approximately equal magnitude.
 - Invalid fuel levels, probe outs, stuck floats, site maintenance.
4. Small errors of the same polarity.
- Check AccuChart.
 - Check temperature compensation setup.

I@A400
 DEC 9, 1997 10:12 AM
 BASIC_RECONCILIATION HISTORY

T 1:BRONZE

REQUEST ST	STRT TIME	END TIME	STRT_VL	END_VL	SALES	DELIV	OFFSET	VARIEN
9711080200	9711080200	9711090200	9256.3	7662.2	0.0	0.0	0.0	-1594.1
9711090200	9711090200	9711100200	7662.2	6093.3	0.0	0.0	0.0	-1568.9
9711100200	9711100200	9711110200	6093.3	4194.3	0.0	0.0	0.0	-1899.0
9711110200	9711110200	9711120200	4194.3	9586.9	0.0	6618.2	0.0	-1225.5
9711120200	9711120200	9711130200	9586.9	8024.1	0.0	0.0	0.0	-1562.8
9711130200	9711130200	9711140200	8024.1	6263.8	1477.5	0.0	0.0	-282.8
9711140200	9711140200	9711150200	6285.1	7967.5	2284.3	3945.9	0.0	20.8
9711150200	9711150200	9711160200	7967.5	6197.8	1788.3	0.0	0.0	18.6
9711160200	9711160200	9711170200	6197.8	4696.4	1514.2	0.0	0.0	12.8
9711170200	9711170200	9711180200	4696.4	10763.6	2176.3	8216.9	0.0	26.5
9711180200	9711180200	9711190200	10763.6	8969.7	1802.6	0.0	0.0	8.8
9711190200	9711190200	9711200200	8969.7	7451.5	1528.4	0.0	0.0	10.2
9711200200	9711200200	9711210200	7451.5	7551.1	1510.3	1599.8	0.0	10.0
9711210200	9711210200	9711220200	7551.1	5861.0	1702.9	0.0	0.0	12.8
9711220200	9711220200	9711230200	5861.0	4345.7	1531.5	0.0	0.0	16.3
9711230200	9711230200	9711240200	4345.7	3072.0	1289.4	0.0	0.0	15.7
9711240200	9711240200	9711250200	3072.0	8845.3	1381.9	7147.6	0.0	7.6
9711250200	9711250200	9711260200	8845.3	7616.4	777.2	0.0	0.0	-451.7
9711260200	9711260200	9711270200	7616.4	6194.1	0.0	0.0	0.0	-1422.3
9711270200	9711270200	9711280200	6194.1	4439.8	0.0	0.0	0.0	-1754.3
9711280200	9711280200	9711290200	4439.8	2527.2	0.0	0.0	0.0	-1912.6
9711290200	9711290200	9711300200	2527.2	7825.3	0.0	7150.2	0.0	-1852.1
9711300200	9711300200	9712010200	7825.3	6243.7	0.0	0.0	0.0	-1581.6
9712010200	9712010200	9712020200	6243.7	4827.5	1347.9	0.0	0.0	-68.3
9712020200	9712020200	9712030200	4827.5	3381.5	1463.5	0.0	0.0	17.5

IA5400 CONSOLE 30 SECOND AVERAGE VOLUME HISTORY

Look for volume stability when the **tank is idle** (variation <0.5 gallon typically).

IA5400
DEC 9, 1997 10:11 AM

CSLD DIAGNOSTICS: MOVING AVERAGE TABLE

T 1:BRONZE	TIME	SMPLS	TCVOL	HEIGHT	AVGTEMP	TOPTMP	BDTEMP
	971209094911	31	7830.4	59.7	45.10	43.47	37.76
	971209094941	32	7830.4	59.7	45.10	43.47	37.76
	971209095011	31	7830.4	59.7	45.10	43.47	37.76
	971209095041	30	7830.3	59.7	45.10	43.46	37.76
	971209095111	31	7830.3	59.7	45.10	43.46	37.76

I61500 METER DATA PRESENT

Pay special attention to any tank in which the flag is set to NO.

I61500

SEP 3, 1996 9:53 AM

TANK	PRODUCT LABEL	METER DATA
1	SUPER	NO
2	UNLEADED STP	YES
3	UNLEADED STORAGE	YES
4	KERO	YES

I90200 SOFTWARE REVISION

If manifolded tanks are present, system software must be the 3XX series.

I90200

DEC 9, 1997 10:08 AM
SOFTWARE REVISION LEVEL
VERSION 114.04
SOFTWARE# 346114-100-E
CREATED - 97.07.09.16.33

S-MODULE# 330160-103-A
SYSTEM FEATURES:
PERIODIC IN-TANK TESTS
ANNUAL IN-TANK TESTS
BIR
FUEL MANAGER

AUTOMATIC METER MAPPING

Auto tank/meter mapping analyzes the metered sales data and the tank volume data. If a transaction volume for a particular meter event uniquely matches a drop in volume in one of the available tanks, a "vote" in favor of mapping that tank to the meter is made.

When a sufficient number of votes indicates that a meter is connected to an available tank, then the meter will be mapped to that tank. Should the automatic meter mapping algorithm recognize a meter-to-tank pattern it will map the tank, even before there are a sufficient number of votes. Automatic meter mapping is recommended over manual meter mapping (see "Manual Meter Mapping" on page 12-10 for exceptions).

In the case of manifolded tanks, the meter is mapped to the primary tank. The primary tank is defined as the lowest numbered tank in the manifolded set.

A tank can be mapped to only one meter for a given Fuel Position (FP). There is an exception beginning with Version 111 or 311 software. If the FP has only 2 meters and the tank product is diesel (identified by the thermal coefficient of expansion being <0.0005 [U.S. units]), auto meter mapping will allow the mapping of both meters to the same tank.

A tank will be unavailable for mapping if any of the following conditions are true:

- In-tank programming parameter Meter Data Present set to NO,
- It is manifolded and the console has 1XX software,
- It is not configured,
- Probe data is not being collected, or
- Probe not magnetostrictive type.

BIR will not produce reports while the meter map is incomplete

The meter map is declared incomplete when:

- Any reported meter has not been mapped to a tank,
- A probeless tank (one connected to the POS, but not monitored by the console) has not been manually mapped (see "Manual Meter Mapping" on page 12-10 for this procedure), or
- A previously "retired" meter is reactivated. If an unmapped meter has not been reported by a POS within 24 hours of the last report, the meter is declared "retired". A retired meter may be a phantom meter incorrectly reported by the POS, or it may be a seldom heard from meter, such as one connected to a kerosene tank. Until the "retired" meter is mapped, every time the meter is activated, and for 24 hours thereafter, BIR is suspended.

TANK/METER CROSS REFERENCES

In addition to the tank/meter map, the following cross references are maintained:

- Real fueling position to logical fueling position cross reference, and
- Real meter to logical meter cross reference.

TANK/METER CROSS REFERENCE DIAGRAM

A POS terminal identifies a specific meter by reporting a Fueling Position (FP) number and a Meter (M) number (see Figure 12-1). The translation or cross referencing of the FP and M numbers reported by the POS terminal is necessary because of console memory limitations.

The POS reports FP numbers in the range 0 - 99 (referred to as Real FP numbers in the diagram). The console is limited to 36 FPs. The POS FP numbers 0 - 99 are cross referenced by the console to 0 - 35 (referred to as Logical FP numbers in the diagram).

The POS reports Meter numbers in the range 0 - 99 (referred to as Real M numbers in the diagram). The console is limited to 6 meters (M) per FP. The POS M numbers 0 - 99 are cross referenced by the console to 0 - 5 (referred to as Logical M numbers in the diagram).

In addition, more than one DIM board is allowed, so it is possible to have two POS terminals reporting the same FP and M numbers. A number identifying each DIM board is added to the Real FP to ensure a unique number (referred to as the DIM FP in the diagram).

POS \implies DIM Event \implies Meter Event

Real FP \implies DIM FP \implies Logical FP

Real M \implies Logical M \implies Logical M

All attempts are made to obtain a one-to-one mapping. If all Real FP numbers are within 0 to 35, the Real FP number will equal the Logical FP number. If all Real Meter numbers are within 0 to 5, the Real Meter number will equal the Logical Meter number.

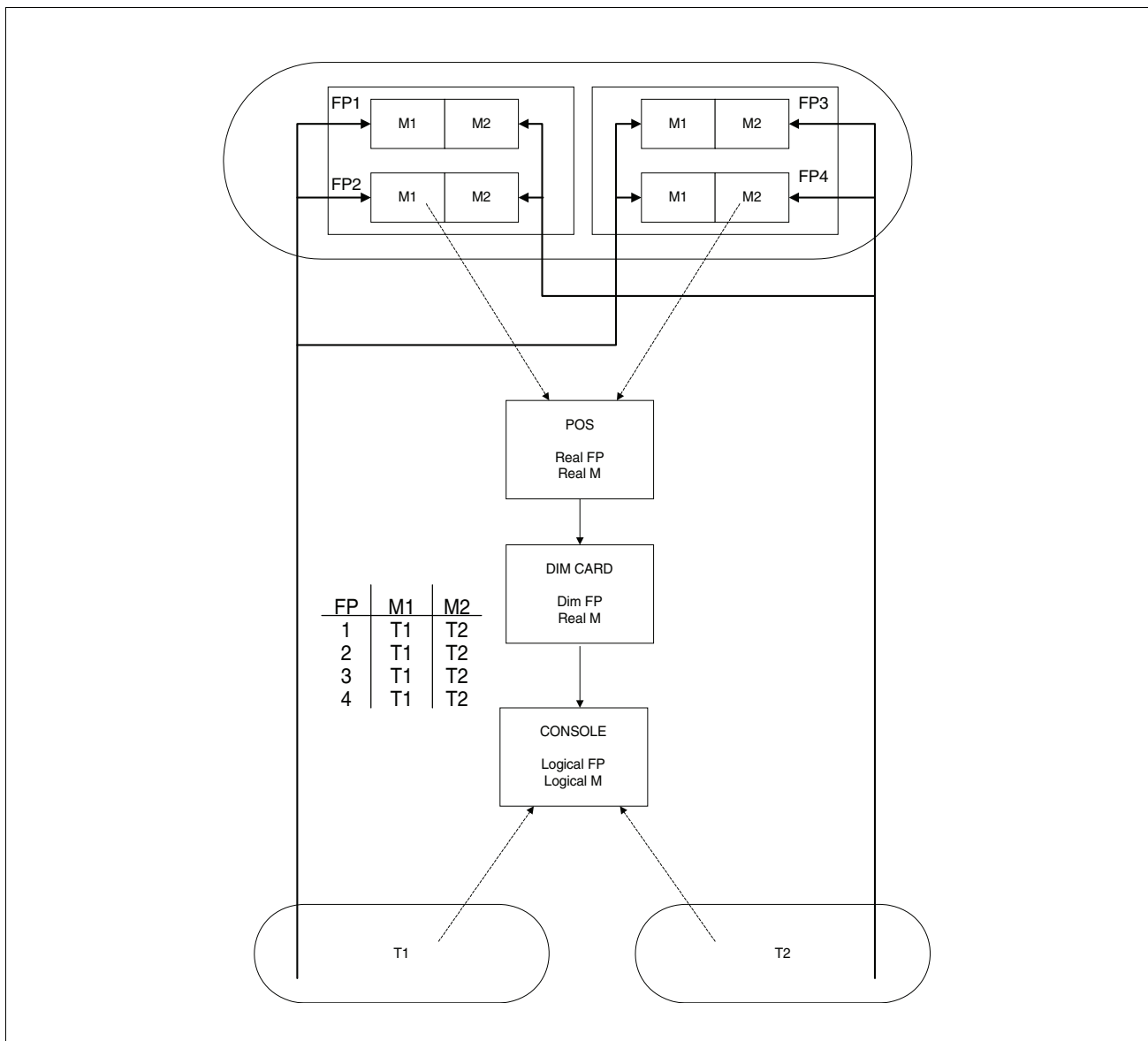


Figure 12-1. Tank/Meter Map Diagram

Manual Meter Mapping

A manual tank/meter map can be entered through the keyboard (SETUP MODE, Reconciliation Setup Function, Modify Tank/Meter Map Step) or through the RS-232 command 7B1. The meter must be identified by bus, slot, real FP, and real M.

A manually entered tank/meter map is locked and cannot be changed by auto-meter mapping. In all displays, printouts, and RS-232 diagnostic reports a locked meter is indicated by an asterisk following the tank number.

In some applications the dispensing data sent from the POS terminal to the TLS Console will contain meter transactions from a tank(s) in which there is no probe. Unable to match the transaction with a corresponding height change, the tank-meter mapping algorithm will declare the map incomplete and BIR will be inhibited. You must manually map a "probeless" meter into the tank/meter map before it will be declared complete and BIR can begin.

A manually mapped meter is considered locked. Auto meter mapping will not change a locked meter.

RS-232 COMMAND 7B1

A manual meter map can be entered through the keyboard (SETUP MODE, RECONCILIATION SETUP Function, MODIFY TANK/METER MAP Step) or through the RS-232 command 7B1.

The 7B1 command requires the meter in question to be fully identified by it's meter number, fueling position, and the bus and slot in which the dispenser interface module (DIM) is located. The bus and slot parameters are required because the Console supports multiple DIM cards. The 7B1 command also requires a tank number to which to map the meter.

A manually mapped meter is considered locked. Auto meter mapping will not change a locked meter.

7B1 REPORT PARAMETERS:

BUS - This is the bus in which the DIM card is placed. There are currently two busses which will support DIM cards:

- Type 2 - Console Power Area slots (MDIMs, LVDIMs)
- Type 3 - Console Comm Cage slots (EDIMs, CDIMs, LDIMs, and IFSF DIMS)

SLOT - This is the slot in which the DIM board is placed. The slots available are dependent on the bus as follows:

- Slots 9 - 16 (Type 2 bus)
- Slots 1 - 6 (Type 3 bus)

FUEL_P - This is the fueling position number reported by the POS terminal. It must be within the range 0 - 99. (The POS FP numbers 0 - 99 are cross referenced by the console to 0 - 35.)

METER - This is the meter number reported by the POS terminal. It must be within the range 0 - 99. (The POS M numbers 0 - 99 are cross referenced by the console to 0 - 5.)

TANK - Any one of the following tank numbers are acceptable:

- -1 (indicates a tank with no probe [99 for keyboard entry])
- 0 (indicates removal of the meter from the map)
- Any tank number that meets the BIR requirements. Note: Meter Data Present = YES.

COMMAND 7B1 INQUIRY EXAMPLES

Inquiry Response If The Map Is Empty.

Command:

I7B100

Response:

I7B100

JAN 1, 2000 8:41 AM

FUELING POSITION - METER - TANK MAP

BUS	SLOT	FUEL_P	METER	TANK
-----	------	--------	-------	------

TANK MAP EMPTY

Inquiry Response With Four Meters Reported

Command:

I7B100

Response:

I7B100

JAN 1, 2000 8:42 AM

FUELING POSITION - METER - TANK MAP

BUS	SLOT	FUEL_P	METER	TANK
-----	------	--------	-------	------

3 1 18 1 1

3	1	18	2	?
---	---	----	---	---

3 1 18 3 x

3	1	18	4	R
---	---	----	---	---

3	1	18	5	2*
---	---	----	---	----

Definitions of symbols in tank column:

FP18/M1	1	Meter is mapped to tank 1.
---------	---	----------------------------

FP18/M2	?	Meter is not mapped.
---------	---	----------------------

FP18/M3	X	Meter is mapped to a probeless tank.
---------	---	--------------------------------------

FP18/M4	R	Meter is retired. This meter position has not been mapped and has not been reported within 24 or more hours. Retiring a meter allows the meter mapping algorithm to declare the tank map complete if all other reported meters have been mapped or retired.
---------	---	---

* Indicates the meter has been manually mapped and cannot be changed by the auto meter mapping procedure.

COMMAND 7B1 SETUP EXAMPLES

An explanation of the RS-232 7B1 command is shown below with the entries defined.

S7B100	B	S	FP	M	T
---------------	---	---	----	---	---

where:

$B = \text{bus (2 or 3)}$

S = slot (bus 2: 9-16, bus 3: 1-6)

FP = fueling position (0-99)*

M = meter (0-9)*

T = tank (-1, 0, or any legitimate tank number)

*Identify unknown Fueling Positions/Meter Numbers as follows:

- The station must be idle throughout this procedure.
- From the console's front panel, clear the meter map (DIAG mode - RECONCILIATION CLEAR MAP function).
- The response from the I7B100 command should be TANK MAP EMPTY.
- Dispense a small amount of product from the meter in question.
- Wait 2 minutes after the completion of the dispensing.
- The response from the I7B100 command should identify the bus, slot, fueling position number, and meter number of the meter in question. The tank parameter will indicate ? because the meter is not mapped.
- If additional meters need to be identified it is not necessary to clear the map; just confirm that 2 minutes after a dispense from the next meter to be identified, a meter was added to the I7B100 command list.

COMMAND SETUP ERROR DETECTION

All parameters are checked before the command is performed. If an error is detected, the command parameters will be repeated with the parameter in error replaced with ??

Example of A Rejected Command with the Fueling Position Out of Range

Command:

S7B100 3 1 108 3 2

Response:

FP must be within 0 - 99

S7B100

JAN 1, 1995 8:43 AM

FUELING POSITION - METER - TANK MAP

BUS	SLOT	FUEL_P	METER	TANK
3	1	<u>??</u>	3	2

?? indicates FP value out of range.

MANUAL METER MAPPING EXAMPLES

Mapping FP18/M1 to tank 1

Command:

S7B100 3 1 18 1 1

Response:

S7B100

JAN 1, 1995 8:42 AM

FUELING POSITION - METER - TANK MAP

BUS	SLOT	FUEL_P	METER	TANK
3	1	18	1	1

Mapping FP18/M3 to a probeless tank**Command:**

S7B100 3 1 18 3 -1

Response:

S7B100

JAN 1, 1995 8:43 AM

FUELING POSITION - METER - TANK MAP

BUS	SLOT	FUEL_P	METER	TANK
3	1	18	3	X

Removing FP18/M4 from the map**Command:**

S7B100 3 1 18 4 0

Response:

S7B100

JAN 1, 1995 8:43 AM

FUELING POSITION - METER - TANK MAP

BUS	SLOT	FUEL_P	METER	TANK
3	1	18	4	-

Automatic Meter-Mapping Errors

Automatic meter-mapping errors usually occur during the first few days and will be corrected automatically.

MAP NEVER COMPLETES

1. Meter data present set to NO for a tank that has meter data.
2. One of the tanks has an invalid fuel height condition.
3. One of the tanks has a probe out alarm.
4. One of the tanks is not configured.
5. A meter with no console height data is reporting sales (probeless tank see below).
6. Manifolder tanks with 1XX software (software must be 3XX with extra RAM).
7. DIM programmed incorrectly.

MAP UNSTABLE

1. Retired Meters - Real Meters (*Seldom Used*)

This situation may occur when the site has a Fueling Position/Meter combination that is seldom used (e.g., a kerosene tank in the summer). If the map is complete and a dispense occurs on this FP/Meter combo, the map will go incomplete. The map will stay incomplete until this FP/Meter combo is mapped, OR retired after 24 hours of non-use.

The preferred method to map a retired or unmapped meter is to map the meter manually through the keyboard (SETUP MODE, RECONCILIATION SETUP Function, MODIFY TANK/METER MAP Step) or the RS-232 serial meter mapping command (7B1).

Alternatively, the auto-meter mapping algorithm will map the meter when the following procedure performed. First wait until the station is idle (no dispensing on any tanks for at least 5 minutes), dispense 6 or more gallons from this FP/Meter combo, wait 5 minutes and dispense 6 more gallons. Wait 5 minutes and verify the map is complete. At this time the dispensed fluid may be returned to the tank.

2. Retired Meters - Phantom Meters

If a POS or a DIM reports a meter that does not exist, the meter mapping algorithm will try to map it. Until the meter is retired the site will be declared unmapped. Possible causes for a phantom meter might be an incompatibility between the POS and DIM (reference Section 10, DIM troubleshooting), or by electrical noise in the cabling.

INCORRECT MAPPING

1. Pattern matching may have predicted a pattern that does not exist. As votes build evidence that the map is wrong, the map may be changed to an unmapped state. Eventually the voting will correct the map. This will only be a start up issue.
2. Incorrect sales data may produce incorrect votes. Conflict between the POS and the DIM or the DIM setup is incorrect are possible causes.
3. Noisy or inaccurate data may produce incorrect votes. Some possible sources of data problems: bad probe, some vapor recovery systems.

Reports Used in Analyzing Meter Map Problems

I@A002 METER MAP DIAGNOSTICS

Typically a site will completely map within a day or two. Low throughput tanks and sites with random mappings that the pattern matching algorithm cannot take advantage of may take longer. If a site is not mapped after two weeks it should be examined.

1. Look for unmapped or retired meters.
 - Are these meters real or phantom meters?
 - Real meters - Is TLS Console data available for them?
 - YES: manually map the meter to the proper tank.
 - NO: manually map the meter to a probeless tank.
2. Phantom meters
Pursue a DIM, POS, or installation problem.
3. Look for voting stability.
Are most of the votes unanimous? NO: Check TLS Console 30 second average history for volume stability. Check for correct DIM setup for POS.

I@A002

MAR 26, 1996 9:27 AM

MAP IS COMPLETE

FP	METER	**TANK_MAP_BALLOT**				
	0	1	2	3	4	5
-----+-----						
0	M0>3:0/0/0	M1>3:1/1/1	M2>3:2/2/2	-:-/-/-	-:-/-/-	-:-/-/-
	9603260815	9603260747	9603252346	*	*	*
-----+-----						
1	M0>2:0/0/0	M1>1:1/1/1	M2>2:2/2/2	-:-/-/-	-:-/-/-	-:-/-/-
	9603260837	9603260815	9603260808	*	*	*
-----+-----						
2	M0>3:0/0/0	M1>1:1/1/1	M2>3:2/2/2	-:-/-/-	-:-/-/-	-:-/-/-
	9603260827	9603260856	9603260839	*	*	*
-----+-----						
3	M0>2:0/0/0	M1>3:1/1/1	M2>3:2/2/2	-:-/-/-	-:-/-/-	-:-/-/-
	9603260916	9603260722	9603260733	*	*	*
-----+-----						
4	M0>2:0/0/0	M1>3:1/1/1	M2>2:2/2/2	-:-/-/-	-:-/-/-	-:-/-/-
	9603260838	9603260915	9603260909	*	*	*
-----+-----						
5	M0>2:0/0/0	M1>3:1/1/1	M2>3:2/2/2	-:-/-/-	-:-/-/-	-:-/-/-
	9603260902	9603260733	9603260916	*	*	*
-----+-----						
6	M0>1:0/0/0	M1>3:1/1/1	M2>1:2/2/2	-:-/-/-	-:-/-/-	-:-/-/-
	9603260908	9603260922	9603251410	*	*	*
-----+-----						
7	M0>3:0/0/0	M1>1:1/1/1	M2>3:2/2/2	-:-/-/-	-:-/-/-	-:-/-/-
	9603260808	9603260856	9603260911	*	*	*
-----+-----						
8	M3>1:3/3/3	-:-/-/-	-:-/-/-	-:-/-/-	-:-/-/-	-:-/-/-
	9603260908	*	*	*	*	*
-----+-----						
9	M3>2:3/3/3	-:-/-/-	-:-/-/-	-:-/-/-	-:-/-/-	-:-/-/-
	9603260856	*	*	*	*	*
-----+-----						

Unmapped	Retired	Probeless				
15 U >0:0/8/8	R >0:8/8/8	X >0:8/8/8	-:-/-/-	-:-/-/-	-:-/-/-	-:-/-/-
9603260902	9603260733	*	*	*	*	*

Legend for report I@A002 above: U = unmapped, R = retired, X = probe

For Example, the FP9 M0 voting ballot is M3>1:3/3/3

Where:

M3	= mapped to tank 4 (3+1*)
3/3/3	= three votes for tank 4
9603260908	= date of last reported event for this meter, not necessarily the last vote (YYMMDDHHMM)

*Tank numbers are zero based (e.g., tank 1 is 0, tank 2 is 1, tank 3 is 2 and tank 4 is 3).

I@A900 BIR MESSAGES

- Examine the time messages:
 - Identify how long the system has been running.
 - Look for excessive time changes, power outages.
- Examine meter map issues:
 - Is the map complete?
 - How long did it take to complete.
 - Is the complete/incomplete status stable? If it was not, was it a startup issue?
 - Are meter/tank mappings changing? Check the meter mapping diagnostic
- Pay attention to time stamps. Problems in this message buffer may not be current. They may have resulted from an earlier problem that has been fixed.

I@A900

SEP 3, 1996 9:53 AM

ASR ERROR EVENT HISTORY BUFFER

TIME	CODE	MESSAGE
960101080012	1008	700101000000 FORWARD
960730080310	1008	960101080309 FORWARD
960730104401	1008	960730080312 FORWARD
960801081827	1011	MAP IS INCOMPLETE
960801081827	1011	MAP IS COMPLETE
960803141857	1011	MAP IS INCOMPLETE
960804170727	1011	MAP IS COMPLETE
960805173827	1011	MAP IS INCOMPLETE

960807132022	1011	MAP IS COMPLETE
960809113157	1011	MAP IS INCOMPLETE
960810184600	1011	MAP IS COMPLETE
960811191224	1011	MAP IS INCOMPLETE
960815150333	1011	MAP IS COMPLETE
960816155152	1011	MAP IS INCOMPLETE
960818143027	1011	MAP IS COMPLETE
960819151050	1011	MAP IS INCOMPLETE
960819161418	1011	MAP IS COMPLETE
960820164436	1011	MAP IS INCOMPLETE
960821151357	1011	MAP IS COMPLETE

Procedure for Identifying AccuChart Problems

WHAT IS THE COMPLAINT?

1. Stick/chart reading does not agree with TLS Console volume. This is because AccuChart takes into account tank variations that the stick/chart method does not.
2. Excessive variance

First determine if AccuChart is the source of the variance error.

If AccuChart is not enabled or the user enable is NO, then BIR is not using AccuChart.

1. The reasons why AccuChart would not be enabled are:
 - Meter Data Present = NO
 - Siphon manifolded with 1XX software.
 - Diameter or Capacity not entered.
 - User multi-point chart bad.
 - Diameter not within 20% of probe length (V108 or V109 software).
 - Not a Mag probe.
 - Tank profile set to LINEAR.
2. The reasons why the user enable flag is NO are:
 - There has never been a calibration (too early in the calibration or low throughput)
 - The AccuChart update scheduling method is set to Never.
 - The AccuChart update scheduling method is set to Complete and AccuChart is still calibrating.
 - The AccuChart update scheduling method is set to Periodic and it has been less than 28 days since AccuChart began calibrating.

If AccuChart is being used by BIR, check the Fitness (value). This is a measure of how well the tank chart matches the data. In general, fitness values >1 (>5 for manifolded tanks) indicates an inaccurate calibration.

Causes for inaccurate calibration.

- User programmed incorrectly the tanks's diameter, full volume, profile, or manifolding.
- Inadequate tank usage during the calibration period.
- Meter mapping problems during the calibrating period.
- Noisy or inaccurate data (probe or dispenser).
- Calibration is incomplete.

Reports Used to Analyze AccuChart Problems

I@B600 ACCUCHART STATUS

1. Check to see if AccuChart is enabled (Enabled = ON).
2. Check User Enable parameter, if OFF, AccuChart is not being used.
3. Check Mode:
 - Calibration: Check duration to determine how long the tank has been calibrating. Depending on throughput, the first COE (capacity, offset, end shape) calibration occurs after two weeks. AccuChart needs 56 days to complete.
 - Monitor Mode: Indicates AccuChart is complete. Check alarm status and MSSE (fitness) value. These are an indication of how well the current data compares to the final AccuChart calibration.
4. Check MINht and MAXht:

These values will indicate the range over which the tank was calibrated. If it is a small range and the calibration is complete or almost complete, the tank was not adequately exercised during the calibration period.
5. Check CAP_O_E COUNT:

Check for no calibrations or less accurate capacity-only calibrations.

 - V108, V109 software - If count is 0, then no calibrations have been performed. If count is less than 4, then less accurate capacity-only calibration.
 - V110 or later software - If count is 3, no calibrations have been performed. Capacity-only calibrations have been eliminated.
6. Reasons for insufficient calibrations:
 - AccuChart not enabled.
 - Low throughput (check daily sales or CSLD A52 diag).
 - Early in the calibration Period.

IB@B601

JUN 26, 1996 2:36 PM

ACCU-CHART DIAGNOSTICS - CALIBRATION STATUS

TANK 1 CAL STATUS

ENABLE = ON MODE = CALIBRATE ALARM = OFF USER ENABLE = OFF

START TIME	DURATION	MSSE	SUMWT	SIGMA	MINht	maxHT
605558407	48.0	0.56	3372	3.98	19.2	53.8

CALIBRATION	CAP	CAP_O_E	DIAM	TILT	SLICE
COUNT		6	0	0	0
SUMWEIGHT	444	2142	0	0	0

IB9400 ACCUCHART CALIBRATION HISTORY

1. Check the startup record: The first record indicates the startup time of AccuChart and the user entered parameters: capacity, diameter, and tank profile (SHAPE F). (Shape F value of 0 = 1 point tank profile was entered, 1 = 4 point tank profile was entered, and 0.5 = 20 point tank profile was entered.) Are the user entered parameters correct?
2. Any subsequent records that are identical to the startup record indicate AccuChart was reset.
3. Look at the final calibration.
 - Determine the type of calibration by looking at the parameters changed.
 - There should be at least one calibration where offset was adjusted.
 - Look at the Fitness value: values <1.0 indicate AccuChart was able to reduce the errors to an acceptable level at the time of calibration. Manifolded tanks will have larger fitness values (>5.0).

IB9400

DEC 9, 1997 10:13 AM

ACCU_CHART CALIBRATION HISTORY

T 1:BRONZE

DATE/TIME	DIAM	LENGTH	OFFSET	TILT	SHAPE F	CAPACITY	FITNESS
97/09/19 10:43	2400	8007	0.0	25.4	1.00	43459	0.00
97/09/30 14:07	2404	7959	13.6	25.4	1.00	43426	0.21
97/10/07 21:52	2401	7970	14.3	25.4	1.00	43350	0.14
97/10/30 19:52	2420	7878	19.9	25.4	1.00	43680	0.24
97/11/05 13:43	2403	7979	11.1	25.4	1.00	43480	0.27

**Startup
record.**

Resetting AccuChart

If it has been determined that the calibration is inaccurate and the cause has been repaired, AccuChart should be reset (ref. AccuChart Diagnostics Function - Figure 6-10 on page 6-10).

Contacting Tech Support

If the BIR problem cannot be resolved, retrieve the following data via the RS-232 port or SiteFax modem and contact Technical Support:

1. <Control-A> I10200 System Configuration Report
2. <Control-A> I11100 Priority Alarm History
3. <Control-A> I11200 Non-priority Alarm History
4. <Control-A> I20100 Inventory Report

5. <Control-A> IC070001 Basic Inventory Reconciliation Periodic "Row" Report (Previous)
6. <Control-A> IC070000 Basic Inventory Reconciliation Periodic "Row" Report (Current)
7. <Control-A> I60A00 Set Tank Linear Calculated Full Volume
8. <Control-A> I61200 Set Tank Manifolded Partners
9. <Control-A> I61500 Set BIR Meter Data Present
- 10.<Control-A> I7B100 Set BIR Meter/Tank Mapping
- 11.<Control-A> I90200 System Revision Level Report
- 12.<Control-A> IA5400 CSLD Diagnostics, Moving Average Table
- 13.<Control-A> IB9400 AccuChart Calibration History
- 14.<Control-A> I@A400 Basic Reconciliation History
- 15.<Control-A> I@A002 Meter Map Diagnostics
- 16.<Control-A> I@A900 ASR Error Event History Buffer
17. <Control-A> I@B600 AccuChart Diagnostics - Calibration Status

BIR Troubleshooting Examples

/*****

Example 1:

In this example the fluid level went below the operating level of the probe. An active INVALID FUEL LEVEL during 11-10-94 through 11-11-94 identified this condition. This is a very common problem.

IC@A400

REQUEST ST	STRT TIME	END TIME	STRT_VL	END_VL	SALES	DELIV	OFFSET	VARIEN
9411090200	9411090200	9411100200	585.1	427.6	155.9	0.0	0.0	-1.5
9411100200	9411100200	9411110200	427.6	275.6	174.3	0.0	0.0	22.3
9411110200	9411110200	9411120200	275.6	1953.0	217.5	1800.1	0.0	94.8
9411120200	9411120200	9411130200	1953.0	1837.1	118.9	0.0	0.0	2.9

NON-PRIORITY ALARM HISTORY

ID	CATEGORY	DESCRIPTION	ALARM TYPE	STATE	DATE	TIME
T 1	TANK	SPECIAL	INVALID FUEL LEVEL	CLEAR	11-11-94	1:03AM
T 3	TANK	REGULAR	DELIVERY NEEDED	CLEAR	11-11-94	10:50AM
T 3	TANK	REGULAR	DELIVERY NEEDED	ALARM	11-10-94	6:03PM
T 1	TANK	SPECIAL	INVALID FUEL LEVEL	ALARM	11-10-94	1:18PM

/*****

Example 2:

In the following example a COMMUNICATION ALARM was active from 94/12/03 through 94/12/08. This error is easy to spot because the sales value is 0 and it occurs in all tanks. Note: the lost sales were recovered on the day the POS was reconnected because cumulative meter data was available.

TANK 1 - BASIC_RECONCILIATION HISTORY

REQUEST ST	STRT TIME	END TIME	STRT_VL	END_VL	SALES	DELIV	OFFSET	VARIEN
9412010200	9412010200	9412020200	274.2	274.2	61.5	0.0	0.0	61.4
9412020200	9412020200	9412030200	274.2	2414.1	187.6	2321.5	0.0	6.0
9412030200	9412030200	9412040200	2414.1	2270.5	0.0	0.0	0.0	-143.6
9412040200	9412040200	9412050200	2270.5	2271.1	0.0	0.0	0.0	0.6
9412050200	9412050200	9412060200	2271.1	2046.1	0.0	0.0	0.0	-225.1
9412060200	9412060200	9412070200	2046.1	1848.4	0.0	0.0	0.0	-197.7
9412070200	9412070200	9412080200	1848.4	1690.6	0.0	0.0	0.0	-157.8
9412080200	9412080200	9412090200	1690.6	1397.9	1017.8	0.0	0.0	725.1
9412090200	9412090200	9412100200	1397.9	1246.7	153.5	0.0	0.0	2.2

TANK 2 - BASIC_RECONCILIATION HISTORY

REQUEST ST	STRT TIME	END TIME	STRT_VL	END_VL	SALES	DELIV	OFFSET	VARIEN
9412010200	9412010200	9412020200	1995.0	1543.6	457.9	0.0	0.0	6.5
9412020200	9412020200	9412030200	1543.6	4096.9	446.8	2991.7	0.0	8.4
9412030200	9412030200	9412040200	4096.9	3924.4	0.0	0.0	0.0	-172.5
9412040200	9412040200	9412050200	3924.4	3885.6	0.0	0.0	0.0	-38.8
9412050200	9412050200	9412060200	3885.6	3576.9	0.0	0.0	0.0	-308.6
9412060200	9412060200	9412070200	3576.9	3337.3	0.0	0.0	0.0	-239.6
9412070200	9412070200	9412080200	3337.3	3094.2	0.0	0.0	0.0	-243.1
9412080200	9412080200	9412090200	3094.2	2734.5	1370.2	0.0	0.0	1010.6
9412090200	9412090200	9412100200	2734.5	2288.6	449.4	0.0	0.0	3.4

Lost Sales

Example 3:

This example demonstrates an incorrect meter-map due to pattern matching. The meters for Tank 15 (a seldom used kerosene tank) are mapped to Tank 1. The errors are roughly similar and opposite in sign. The meter-map shows the inconsistent mapping of the meters which fooled the pattern matcher. This situation took longer to correct because of the limited use of kerosene tank. Further evidence of this situation is available in the ASR ERROR EVENT HISTORY BUFFER, where the re-mapping t0 => t14 is reported (internally tank numbers go from 0 to 15) for Fps 3 and 4.

TANK 1 - BASIC_RECONCILIATION HISTORY

REQUEST ST	STRT TIME	END TIME	STRT_VL	END_VL	SALES	DELIV	OFFSET	VARIEN
9501280200	9501280200	9501290200	3184.7	3167.1	33.1	0.0	0.0	15.5
9501290200	9501290200	9501300200	3167.1	3143.3	42.6	0.0	0.0	18.8
9501300200	9501300200	9501310200	3143.3	2953.0	243.5	0.0	0.0	53.2
9501310200	9501310200	9502010200	2953.0	2823.1	129.7	0.0	0.0	-0.3
9502010200	9502010200	9502020200	2823.1	2753.6	67.2	0.0	0.0	-2.3

TANK 15 - BASIC_RECONCILIATION HISTORY

REQUEST ST	STRT TIME	END TIME	STRT_VL	END_VL	SALES	DELIV	OFFSET	VARIEN
9501280200	9501280200	9501290200	2964.8	2947.9	0.0	0.0	0.0	-16.9
9501290200	9501290200	9501300200	2947.9	2926.9	0.0	0.0	0.0	-21.0
9501300200	9501300200	9501310200	2926.9	2862.4	0.0	0.0	0.0	-64.5
9501310200	9501310200	9502010200	2862.4	2817.7	38.5	0.0	0.0	-6.2
9502010200	9502010200	9502020200	2817.7	2785.9	30.2	0.0	0.0	-1.6

I7B000

JAN 8, 1995 8:54 AM

LOGICAL				REAL				METER					
FP	FP	BUS	SLOT					0	1	2	3	4	5
1	2	3	2	2	14	16	1	U	U				
2	3	3	2	2	14	16	1	U	U				
3	4	3	2	2	14	16	1	U	U				
4	5	3	2	2	14	16	1	U	U				

Pattern Mapping Incorrectly
Mapped These Meters To Tank 1.

I@A900

FEB 2, 1995 8:52 AM

ASR ERROR EVENT HISTORY BUFFER

TIME	CODE	MESSAGE
900101062628	1008	700101000000 FORWARD
950101080014	1008	900101062628 FORWARD
950127080052	1008	950101080051 FORWARD
950127094202	1008	950127080131 FORWARD
950127095140	1011	MAP IS INCOMPLETE
950127133642	1011	MAP IS COMPLETE
950131072012	1013	fp m3 t0 => t14
950131072012	1013	fp m3 t0 => t14

Auto-Meter Mapping Detected
And Corrected The Error.

I7B000

FEB 2, 1995 8:54 AM

LOGICAL				REAL				METER					
FP	FP	BUS	SLOT					0	1	2	3	4	5
1	2	3	2	2	14	16	1	U	U				
2	3	3	2	2	14	16	1	U	U				
3	4	3	2	2	14	16	15	U	U				
4	5	3	2	2	14	16	15	U	U				

Example 4. Customer complaint: missing days in reconciliation.

I@A400

SEP 3, 1996 9:53 AM

BASIC_RECONCILIATION HISTORY

T1: SUPER

REQUEST ST	STRT TIME	END TIME	STRT_VL	END_VVL	SALES	DELIV	OFFSET	VARIEN
9608030000	9608031429	9608040002	10588.0	10415.5	171.3	0.0	0.0	-1.3
9608040000	9608051736	9608060000	12287.4	12159.0	123.8	0.0	0.0	-4.6
---- MISSING DATA ----								
9608060000	9608060000	9608070002	12159.0	14025.2	652.4	2535.7	0.0	-17.1
9608070000	9608091031	9608100011	8381.6	11501.1	4283.8	7625.3	0.0	-221.9
---- MISSING DATA ----								
9608100000	9608111907	9608120000	11222.3	10421.5	796.2	0.0	0.0	-4.7
---- MISSING DATA ----								
9608130000	9608130002	9608140000	11384.5	11231.1	2849.3	2751.2	0.0	-55.3
9608140000	9608140000	9608150000	11231.1	11566.0	2556.1	2940.9	0.0	-49.9

-- TABLE ABBREVIATED FOR THIS EXAMPLE, BUT IT IS INDICATIVE OF AN UNSTABLE MAP --

200

Station ID

XXXdd

yyyddd

SEP 3, 1996 9:53AM

TANK	PRODUCT	GALLONS	INCHES	WATER	DEG F	ULLAGE
1	SUPER	10364	73.64	0.0	76.6	4612
2	UNLEADED STP	8736	64.10	0.8	79.4	6240
3	UNLEADED STORAGE	8375	63.75	0.0	79.0	6601
4	KERO	3434	68.23	1.1	72.3	722

Kerosene is considered an unusual product because of its usually low throughput.

CONFIRM KEROSENE SALES DATA IS BEING REPORTED BY THE POS.

I61500

SEP 3, 1996 9:53 AM

TANK	PRODUCT LABEL	METER DATA PRESENT
1	SUPER	YES
2	UNLEADED STP	YES
3	UNLEADED STORAGE	YES
4	KERO	<u>YES</u>

REPORT @A9 CONFIRMS THAT MAP IS UNSTABLE.

I@A900

SEP 3, 1996 9:53 AM

ASR ERROR EVENT HISTORY BUFFER

TIME	CODE	MESSAGE
960101080012	1008	700101000000 FORWARD
960730080310	1008	960101080309 FORWARD
960730104401	1008	960730080312 FORWARD
960801081827	1011	MAP IS INCOMPLETE
960803141857	1011	MAP IS COMPLETE
960804170727	1011	MAP IS INCOMPLETE
960805173827	1011	MAP IS COMPLETE
960807132022	1011	MAP IS INCOMPLETE
960809113157	1011	MAP IS COMPLETE
960810184600	1011	MAP IS INCOMPLETE
960811191224	1011	MAP IS COMPLETE
960815150333	1011	MAP IS INCOMPLETE
960816155152	1011	MAP IS COMPLETE
960818143027	1011	MAP IS INCOMPLETE
960819151050	1011	MAP IS COMPLETE
960819161418	1011	MAP IS INCOMPLETE
960820164436	1011	MAP IS COMPLETE
960821151357	1011	MAP IS INCOMPLETE
960822151457	1011	MAP IS COMPLETE

I7B100

SEP 3, 1996 9:54 AM

FUELING POSITION - METER - TANK MAP

BUS	SLOT	FUEL_P	METER	TANK
3	2	1	2	2
3	2	1	3	1
3	2	2	2	2
3	2	2	3	1
3	2	3	2	2
3	2	3	3	1

3	2	4	2	2
3	2	4	3	1
3	2	5	2	2
3	2	5	3	1
3	2	6	2	2
3	2	6	3	1
3	2	7	2	2
3	2	7	3	1
3	2	8	2	2
3	2	8	3	1
3	2	9	2	2
3	2	9	3	1
3	2	10	2	2
3	2	10	3	1
3	2	11	2	2
3	2	11	3	1
3	2	12	2	2
3	2	12	3	1
3	2	17	0	R

Retired - there was a sale report for this meter, however, there was not enough information to map it and it was not reported again for a 24-hour period.

S7B100

SEP 3, 1996 9:56 AM

FUELING POSITION - METER - TANK MAP

BUS SLOT FUEL_P METER TANK

3	2	17	0	4
---	---	----	---	---

Here we manually map the meter to the kerosene tank.

I7B100

SEP 3, 1996 9:56 AM

FUELING POSITION - METER - TANK MAP

BUS SLOT FUEL_P METER TANK

3	2	1	2	2
3	2	1	3	1
3	2	2	2	2
3	2	2	3	1
3	2	3	2	2
3	2	3	3	1

3	2	4	2	2	
3	2	4	3	1	
3	2	5	2	2	
3	2	5	3	1	
3	2	6	2	2	
3	2	6	3	1	
3	2	7	2	2	
3	2	7	3	1	
3	2	8	2	2	
3	2	8	3	1	
3	2	9	2	2	
3	2	9	3	1	
3	2	10	2	2	
3	2	10	3	1	
3	2	11	2	2	
3	2	11	3	1	
3	2	12	2	2	
3	2	12	3	1	
3	2	17	0	4*	← Meter is mapped to Tank 4 - (* indicates meter was manually mapped).

Example 5. Customer complaint: No BIR Data

200
100550 EAGLE OIL
156 N. LASALLE
CHICAGO, IL

SEP 11, 1997 10:39 AM

TANK	PRODUCT	GALLONS	INCHES	WATER	DEG F	ULLAGE	
1	BLUE WEST MASTER	4642	45.14	0.0	65.6	4878	
2	BLUE EAST SLAVE	4649	45.20	0.8	65.2	4871	← Note manifolded tanks.
3	SILVER	4495	44.08	0.0	64.8	5025	
4	GOLD	3438	36.33	0.0	68.4	6082	

I61200
SEP 11, 1997 10:39 AM

TANK MANIFOLDED PARTNERS

TANK	PRODUCT LABEL	MANIFOLDED TANKS
1	BLUE WEST MASTER	2
2	BLUE EAST SLAVE	1
3	SILVER	NONE
4	GOLD	NONE

 **Confirm tanks are manifolded.**
I61500

SEP 11, 1997 10:39 AM

TANK	PRODUCT LABEL	METER DATA
1	BLUE WEST MASTER	YES
2	BLUE EAST SLAVE	YES
3	SILVER	YES
4	GOLD	YES

 **Always check for Meter Data Present set to Yes.**
I@A400


SEP 11, 1997 10:41 AM

BASIC_RECONCILIATION HISTORY

T1: BLUE WEST MASTER

T2: BLUE EAST SLAVE

REQUEST ST STRT TIME END TIME STRT_VL END_VL SALES DELIV OFFSET VARIEN


EMPTY
 **Report @A4 confirms complaint - No BIR data**

BASIC_RECONCILIATION HISTORY

T1: BLUE WEST MASTER

T2: BLUE EAST SLAVE

REQUEST ST STRT TIME END TIME STRT_VL END_VL SALES DELIV OFFSET VARIEN

EMPTY


BASIC_RECONCILIATION HISTORY

T3: SILVER

REQUEST ST STRT TIME END TIME STRT_VL END_VL SALES DELIV OFFSET VARIEN

EMPTY ←

BASIC_RECONCILIATION HISTORY

T4: GOLD

REQUEST ST STRT TIME END TIME STRT_VL END_VL SALES DELIV OFFSET VARIEN

EMPTY ←

IGA002**CHECK MAP.**

SEP 11, 1997 10:40 AM

MAP IS INCOMPLETE

FP	METER	**TANK_MAP_BALLOT**				
	0	1	2	3	4	5
0	M3>3:3/3/3 M2>3:2/2/2 U >2:3/2/2 9708081319 9708081326 9708081357			-:-/-/- *	-:-/-/- *	-:-/-/- *
1	M3>3:3/3/3 M2>3:2/2/2 U >3:2/3/2 9708081319 9708081404 9708081357			-:-/-/- *	-:-/-/- *	-:-/-/- *
2	M3>3:3/3/3 M2>3:2/2/2 U >3:3/2/3 9708081358 9708081239 9708081404			-:-/-/- *	-:-/-/- *	-:-/-/- *
3	M3>1:3/3/3 M2>2:2/2/2 U >3:2/2/3 9708081308 9708081357 9708081412			-:-/-/- *	-:-/-/- *	-:-/-/- *
4	M3>1:3/3/3 M2>3:2/2/2 U >1:2/3/3 9708081341 9708081116 9708081324			-:-/-/- *	-:-/-/- *	-:-/-/- *
5	M3>1:3/3/3 M2>3:2/2/2 U >2:3/2/2 9708081307 9708081408 9708081410			-:-/-/- *	-:-/-/- *	-:-/-/- *
6	M3>1:3/3/3 M2>1:2/2/2 U >1:2/2/3 9708081404 9708081009 9708081314			-:-/-/- *	-:-/-/- *	-:-/-/- *
7	M3>2:3/3/3 M2>2:2/2/2 U >2:2/3/2 9708081335 9708081206 9708081116			-:-/-/- *	-:-/-/- *	-:-/-/- *
8	M3>1:3/3/3 M2>2:2/2/2 U >2:2/3/3 9708081231 9708080952 9708081351			-:-/-/- *	-:-/-/- *	-:-/-/- *
9	M3>2:3/3/3 M2>1:2/2/2 U >3:3/2/3 9708081320 9708080915 9708081408			-:-/-/- *	-:-/-/- *	-:-/-/- *
10	M3>1:3/3/3 M2>1:2/2/2 U >1:3/3/3 9708081349 9708081025 9708081408			-:-/-/- *	-:-/-/- *	-:-/-/- *
11	M3>3:3/3/3 M2>2:2/2/2 U >2:2/2/3 9708080818 9708080829 9708080917			-:-/-/- *	-:-/-/- *	-:-/-/- *

Meter 2 for all FPs is unmapped.

Only Tanks 3 and 4 are mapped.
The manifolded tanks (1 & 2) are not mapped. (Note - Tank numbers are zero based in this report, e.g., M3 = mapped to T4.)

I90200

DEC 9, 1997 10:08 AM
 SOFTWARE REVISION LEVEL
 VERSION 114.04
 SOFTWARE# 346114-100-E
 CREATED - 97.07.09.16.33

S-MODULE# 330160-103-A
 SYSTEM FEATURES:
 PERIODIC IN-TANK TESTS
 ANNUAL IN-TANK TESTS
 BIR
 FUEL MANAGER

902 indicates software version is 1XX
 which does not support BIR for manifolded
 tanks. Version 3XX software is required.

Example 6. Customer complaint: Large Variance

The reconciliation shows a variance on the order of 25%.
 This number is too large to be an accuchart error.
 This is true for all tanks.

I@A401

JAN 4, 2000 3:35 PM
 BASIC_RECONCILIATION HISTORY

T 1:UNLEADED

REQUEST ST	STRT TIME	END TIME	STRT_VL	END_VL	SALES	DELIV	OFFSET	VARIEN
9911030200	9911030200	9911040200	4142.1	3719.4	545.5	0.0	0.0	122.8
9911040200	9911040200	9911050200	3719.4	3172.6	690.2	0.0	0.0	143.4
9911050200	9911050200	9911060200	3172.6	5766.4	738.3	3165.6	0.0	166.6
9911060200	9911060200	9911070200	5766.4	5254.9	665.9	0.0	0.0	154.3

The tank calibration records show a consistent ratio of 25% for tanks 1 and 2, and 15% for tank 3. Because the records are consistent this could not be lost sales, something is wrong with the t1s volume or the sales volume.

I@B900

JAN 4, 2000 3:35 PM

TANK CALIBRATION DATA

=====

T 1:UNLEADED

Opening Height	Closing Height	TLS Volume	Dispensed Volume	Tank/Meter Ratio
44.336	44.146	19.79	25.50	<u>0.7761</u>
44.146	44.028	12.26	16.40	0.7478
44.028	43.948	8.40	11.31	0.7428
43.947	43.918	3.04	4.10	0.7427

43.918	43.840	8.15	10.79	0.7550
43.840	43.724	12.06	15.76	0.7650
43.724	43.650	7.72	10.10	0.7647
43.649	43.522	13.25	17.40	0.7617
43.522	43.472	5.17	6.78	0.7631
43.473	43.377	9.96	12.90	0.7724

For all tanks accuchart is not enabled.
Accuchart is not capable of calibrating linear tanks so it does not enable when the tank profile is set to linear.

I@B600

JAN 4, 2000 3:36 PM

ACCU-CHART DIAGNOSTICS - CALIBRATION STATUS

TANK 1 CAL STATUS

 ENABLE = OFF MODE = CALIBRATE ALARM = OFF USER ENABLE = OFF

START TIME	DURATION	MSSE	SUMWT	SIGMA	MINht	MAXht	UPDATES
0	0.0	0.00	0	0.00	0.0	0.0	0

CALIBRATION	CAP	CAP_O_E	DIAM	TILT	SLICE
COUNT		0	0	0	0
SUMWEIGHT	0	0	0	0	0

The only way to determine that the profile is set to linear is to run the 60A command.

I60A00

JAN 4, 2000 3:38 PM

TANK FULL VOLUME

TANK	PRODUCT LABEL	TANK PROFILE	GALLONS
1	UNLEADED	LINEAR	10000
2	PLUS	LINEAR	6000
3	PREMIUM	LINEAR	8000
4		1 PT	0

The 1 Point Full Volume command 604 gives no indication that the profile is linear!

I60400

JAN 4, 2000 4:01 PM

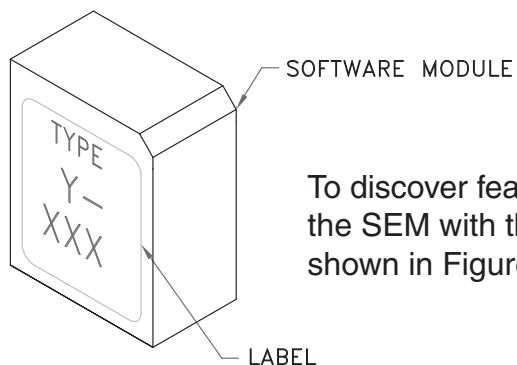
TANK FULL VOLUME

TANK	PRODUCT LABEL	GALLONS
1	UNLEADED	10000
2	PLUS	6000
3	PREMIUM	8000
4		0

Appendix A: TLS-3XX Console SEM Tables

Appendix A contains the TLS-300 and TLS-350 Console SEM codes with which you can verify your console's installed feature set.

TLS-300 SEM Code Legend



To discover features, compare the 3-digit suffix on the SEM with the entries in the TLS-300 SEM table shown in Figure A-1.

THREE DIGIT SUFFIX	EXPLANATION
001	LD – LEAK DETECT (0.1 GPH)
002	CSLD – CONTINUOUS STATISTICAL LEAK DETECTION
004	FUEL – FUEL MANAGEMENT REORDER
020	TLC – TANKER LOADING CONTROL
400	LOW-END VERSION OF TLS-300 CONSOLE ONLY

TLS-300 SEM Table

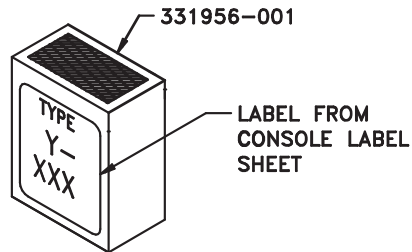
	SOFTWARE MODULE	MARK LABEL Y- XXX	REMARKS	FEATURE SET AVAILABILITY
	330161-000		NO MODULE	
	330161-001	¹⁻ 001	LD	YES
	330161-002		CSLD	
	330161-003	¹⁻ 003	LD CSLD	YES
	330161-004		FUEL	
①	330161-005	¹⁻ 005	LD FUEL	YES
	330161-006		CSLD FUEL	
①	330161-007	¹⁻ 007	LD CSLD FUEL	YES
	330161-020	¹⁻ 020	TLC	YES
	330161-021	¹⁻ 021	TLC LD	YES
	330161-022		TLC CSLD	
	330161-023		TLC LD CSLD	
	330161-024		TLC FUEL	
	330161-025		TLC LD FUEL	
	330161-026		TLC CSLD FUEL	
	330161-027		TLC LD CSLD FUEL	
L	330161-403	¹⁻ 403	LD CSLD	YES

NOTES:

① THESE SEMS ARE USED BY ANDOVER CONTROLS.

Figure A-1. 330161-0XX Series SEMs

TLS-350 SEM Code Legend



(Y = 6TH DIGIT OF SEM P/N)
(XXX = 3 DIGIT SUFFIX OF SEM P/N)

EXPLANATION OF VARIATIONS AND SEM GROUP PART NUMBER	
0XX	WITHOUT BIR
1XX	WITH BIR
XX2	CS – CSLD FOR MANIFOLD TANKS
XX3	FL – FUEL MANAGEMENT REORDER
XX4	ISD – IN-STATION DIAGNOSTICS
X1X	P1C2C – PLLD .1 AND .2 CONTINUOUS
X2X	TLC – TANKER LOADING CONTROL
X5X	WP1D – WPLLD AND PLLD .1 ON-DEMAND
X6X	WP1D2C – WPLLD AND PLLD .1 ON-DEMAND AND .2 CONTINUOUS

TLS-350 SEM Tables

330160-0XX WITHOUT BIR							
SOFTWARE MODULE	FEATURES	SOFTWARE MODULE	FEATURES	SOFTWARE MODULE	FEATURES	SOFTWARE MODULE	FEATURES
		330160-010	P1C2C	330160-020	TLC	330160-030	P1C2C TLC
330160-002	CS	330160-012	P1C2C CS	330160-022	TLC CS	330160-032	P1C2C TLC CS
330160-003	FL	330160-013	P1C2C FL	330160-023	TLC FL	330160-033	P1C2C TLC FL
330160-004	ISD	330160-014	P1C2C ISD	330160-024	TLC ISD	330160-034	P1C2C TLC ISD
330160-005	CS FL	330160-015	P1C2C CS FL	330160-025	TLC CS FL	330160-035	P1C2C TLC CS FL
330160-006	CS ISD	330160-016	P1C2C CS ISD	330160-026	TLC CS ISD	330160-036	P1C2C TLC CS ISD
330160-007	FL ISD	330160-017	P1C2C FL ISD	330160-027	TLC FL ISD	330160-037	P1C2C TLC FL ISD
330160-009	CS FL ISD	330160-019	P1C2C CS FL ISD	330160-029	TLC CS FL ISD	330160-039	P1C2C TLC CS FL ISD
		330160-050	WP1D	330160-070	TLC WP1D		
		330160-052	WP1D CS	330160-072	TLC WP1D CS		
		330160-053	WP1D FL	330160-073	TLC WP1D FL		
		330160-054	WP1D ISD	330160-074	TLC WP1D ISD		
		330160-055	WP1D CS FL	330160-075	TLC WP1D CS FL		
		330160-056	WP1D CS ISD	330160-076	TLC WP1D CS ISD		
		330160-057	WP1D FL ISD	330160-077	TLC WP1D FL ISD		
		330160-059	WP1D CS FL ISD	330160-079	TLC WP1D CS FL ISD		
		330160-060	WP1D2C	330160-080	TLC WP1D2C		
		330160-062	WP1D2C CS	330160-082	TLC WP1D2C CS		
		330160-063	WP1D2C FL	330160-083	TLC WP1D2C FL		
		330160-064	WP1D2C ISD	330160-084	TLC WP1D2C ISD		
		330160-065	WP1D2C CS FL	330160-085	TLC WP1D2C CS FL		
		330160-066	WP1D2C CS ISD	330160-086	TLC WP1D2C CS ISD		
		330160-067	WP1D2C FL ISD	330160-087	TLC WP1D2C FL ISD		
		330160-069	WP1D2C CS FL ISD	330160-089	TLC WP1D2C CS FL ISD		

Figure A-2. 330160-0XX Series SEMs - Without BIR

330160-1XX WITH BIR							
SOFTWARE MODULE	FEATURES	SOFTWARE MODULE	FEATURES	SOFTWARE MODULE	FEATURES	SOFTWARE MODULE	FEATURES
330160-100	WITH BIR, NO VLD	330160-110	P1C2C	330160-120	TLC	330160-130	P1C2C TLC
330160-102	CS	330160-112	P1C2C CS	330160-122	TLC CS	330160-132	P1C2C TLC CS
330160-103	FL	330160-113	P1C2C FL	330160-123	TLC FL	330160-133	P1C2C TLC FL
330160-104	ISD	330160-114	P1C2C ISD	330160-124	TLC ISD	330160-134	P1C2C TLC ISD
330160-105	CS FL	330160-115	P1C2C CS FL	330160-125	TLC CS FL	330160-135	P1C2C TLC CS FL
330160-106	CS ISD	330160-116	P1C2C CS ISD	330160-126	TLC CS ISD	330160-136	P1C2C TLC CS ISD
330160-107	FL ISD	330160-117	P1C2C FL ISD	330160-127	TLC FL ISD	330160-137	P1C2C TLC FL ISD
330160-109	CS FL ISD	330160-119	P1C2C CS FL ISD	330160-129	TLC CS FL ISD	330160-139	P1C2C TLC CS FL ISD
		330160-150	WP1D	330160-170	TLC WP1D		
		330160-152	WP1D CS	330160-172	TLC WP1D CS		
		330160-153	WP1D FL	330160-173	TLC WP1D FL		
		330160-154	WP1D ISD	330160-174	TLC WP1D ISD		
		330160-155	WP1D CS FL	330160-175	TLC WP1D CS FL		
		330160-156	WP1D CS ISD	330160-176	TLC WP1D CS ISD		
		330160-157	WP1D FL ISD	330160-177	TLC WP1D FL ISD		
		330160-159	WP1D CS FL ISD	330160-179	TLC WP1D CS FL ISD		
		330160-160	WP1D2C	330160-180	TLC WP1D2C		
		330160-162	WP1D2C CS	330160-182	TLC WP1D2C CS		
		330160-163	WP1D2C FL	330160-183	TLC WP1D2C FL		
		330160-164	WP1D2C ISD	330160-184	TLC WP1D2C ISD		
		330160-165	WP1D2C CS FL	330160-185	TLC WP1D2C CS FL		
		330160-166	WP1D2C CS ISD	330160-186	TLC WP1D2C CS ISD		
		330160-167	WP1D2C FL ISD	330160-187	TLC WP1D2C FL ISD		
		330160-169	WP1D2C CS FL ISD	330160-189	TLC WP1D2C CS FL ISD		

Figure A-3. 330160-1XX Series SEMs - With BIR

