In-Station Diagnostics (ISD)

Install, Setup, & Operation Manual

For VST ECS Membrane Processors and Veeder-Root Polisher

VEEDER-ROOT

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Please refer to the California Air Resources Board Vapor Recover Certification Phase II EVR Executive Order web site (*www.arb.ca.gov/vapor/eo-evrphaseII.htm*) for the latest manual revisions pertaining to VR 204 (VST Phase II EVR System Including ISD System).

WARRANTY

Please see next page, iii.

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Warranty

ISD

WARRANTY POLICY

For ISD components (Vapor Flow Sensor, Vapor Pressure Sensor, and *NVMEM board*), the following warranty applies:

We warrant that this product shall be free from defects in material and workmanship and will comply with the performance standards of California EPA CP-201 section 10 as amended July 22, 2004 for a period of one (1) year from the date of ISD start-up or twenty-four (24) months from the date of invoice, whichever occurs first. During the warranty period, we and or our representative will repair or replace the product, if determined by us to be defective, at the location where the product is in use, at no charge to the purchaser.

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1 Introduction

Site Requirements 1
Supported Vapor Recovery Systems 2
Contractor Certification Requirements 2
Related Manuals 2
Safety Precautions 3
Example Site Diagrams 3

2 Installation

Vapor Flow Meter 5
Vapor Pressure Sensor 5
Installing TLS Console Modules - General Notes 5
Circuit Directory 6
Smart Sensor Interface Module 7
NVMEM203 Board 7
Site Shut Down Requirements 7
Dispenser Interface Module (DIM) 7
Probe Interface Module 7
I/O Combination or 4-Relay Module 7
Multi-port Card for Vapor Processor Communication 8
TLS Console with V-R Vapor Polisher 8
TLS Console with VST ECS Membrane Processor 8

3 Setup

Introduction 10
Alarm Setups 10
Smart Sensor Setup 11
ATM Pressure Sensor Setup 12
EVR/ISD Setup 13
Output Relay Setup - VST ECS Membrane Processor 17
PMC Setup for VST ECS Membrane Processor 18
Alarm Setup 19
Introduction 19
Alarm Setup for Sites with Line Leak Detection 20
Alarm Setup for Sites without Line Leak Detection 22

4 ISD Operability Test Procedure

Vapor Pressure Sensor Verification Test 24
Principle and Summary of Test Procedure 24
Biases and Interferences 24
Range and Accuracy 25
Equipment 25
Calibration Requirements 25
Determining UST Pressure 25
Determining Ambient Pressure 26
Alternate Procedures 26
Vapor Flow Meter Operability Test 29
EQUIPMENT 29
PRE-TEST PROCEDURES 32
TEST PROCEDURES 33
POST-TEST PROCEDURES 34
Site Shutdown Test 34
Veeder-Root Vapor Polisher Operability Test 34

5 Operation

Alarms 35
Overview of TLS console Interface.....35
Warning Posting 35
Alarm Posting 36
Site Reenable.....36
Alarm Logs 37
Alarm Sequence.....38
ISD Alarm Summary 38
Other Alarms 40
Reports 41
Viewing ISD Reports 42
Viewing ISD Reports via RS-232 Connection 46
Connecting Laptop to Console 46
Connecting Laptop to Console 47
Sending Console Commands.....49

6 Maintenance

TLS Console 57
Air Flow Meter 57
Vapor Pressure Sensor 57

7 Diagnostic Menus

Smart Sensor Diagnostic Menu 58
ISD Diagnostic Menu 59
VST ECS Membrane Processor Diagnostic Menu 61
Veeder-Root Vapor Polisher Diagnostics 61
Automatic Control.....61
Manual control.....61
Veeder-Root Vapor Polisher PMC Diagnostic Menu 62

Appendix A: Site EVR/ISD Equipment Location Worksheet

Appendix B: ISD Operability Test Procedure Data Forms

Figures

Figure 1. Example Site Diagram - TLS Console Controlled Vapor Processor 4
Figure 2. TLS console Interface Module Bays 6
Figure 3. V-R Vapor Polisher Connections to TLS Console 8
Figure 4. VST ECS Membrane Processor Connections to TLS Console 9
Figure 5. Smart Sensor Setup 11
Figure 6. Smart Sensor Setup Printout Example 11
Figure 7. EVR/ISD Setup 1 13
Figure 8. EVR/ISD Setup 2 14
Figure 9. EVR/ISD Setup 3 15
Figure 10. Example VST ECS Printout 16
Figure 11. Output Relay Setup for VST ECS Membrane Processor 17
Figure 12. Output Relay Setup Printout Examples for TLS Console Controlled Processor 17
Figure 13. PMC Setup - VST ECS Membrane Processor 18
Figure 14. Site Tank Control Examples 19
Figure 15. Assigning ISD Shut Down Alarms in Line Leak Disable Setup 20

Figure 16. Example Line leak Disable Setup Printout 21
Figure 17. Assigning ISD Shut Down Alarms in Output Relay Setup 22
Figure 18. Example printout - ISD Alarms Assignments - Output Relay Setup.....23
Figure 19. Typical modified vapor adaptor dust cap (bottom view) 27
Figure 20. Typical field installation of UST Pressure Measurement Assembly 27
Figure 21. Vapor pressure sensor valve positions 28
Figure 22. Accessing the vapor pressure sensor reading 29
Figure 23. VST Surrogate Spout Assembly 30
Figure 24. Vapor Flow Meter Test Assembly 31
Figure 25. TLS console alarm interface 35
Figure 26. Example Warning posting 36
Figure 27. Example Alarm posting 36
Figure 28. ISD Alarm Override Procedure 37
Figure 29. Printing ISD Reports on Console Printer 42
Figure 30. ISD Status Report Example - TLS console printout 43
Figure 31. ISD Daily Report Example - TLS console printout 44
Figure 32. ISD Monthly Report Example - TLS console printout 45
Figure 33. Connecting laptop to TLS console for serial communication 46
Figure 34. Connection Description window 47
Figure 35. Connect To window 47
Figure 36. Console comm port settings prinout example 48
Figure 37. HyperTerminal main window 49
Figure 38. ISD Daily Report Details - Serial to PC Format 51
Figure 39. ISD Monthly Status Report - Serial to PC Format 52
Figure 40. ISD Alarm Status Report - Serial to PC Format 53
Figure 41. VST Vapor Processor Runtime Diagnostics Report - Serial to PC Format 54
Figure 42. V-R Vapor Polisher Runtime Diagnostics Report - Serial to PC Format 54
Figure 43. Vapor Valve Status Report - Serial to PC Format 55
Figure 44. Smart Sensor Sub Alarm History Report - Serial to PC Format 56
Figure 45. PMC Daily Vapor Polisher Diagnostic Report - Serial to PC Format 56
Figure 46. Smart Sensor Diagnostic Menu 58
Figure 47. ISD Diagnostic Menu 59
Figure 48. VST ECS Membrane Processor Diagnostic Menu 61
Figure 49. PMC Diagnostic Menus 62

Tables

Table 1. Vapor Recovery System 2
Table 2. Related Manuals 2
Table 3. ISD Alarm Summary 38
Table 4. Other Alarms 40
Table 5. Serial Commands for ISD Alarm, Monthly, and Daily Reports 50
Table 6. Vapor Processor Runtime Diagnostic Report Event Codes 55
Table 7. Clear Test Repair Menu 60

1 Introduction

In-Station Diagnostic (ISD) equipment is designed to monitor the collection and containment of vapors by vapor recovery equipment. The ISD software monitors the vapor recovery equipment using the Veeder-Root (V-R) TLS console platform, sensor inputs, and dispenser fuel events. ISD provides test reports, generates alarms following test/equipment failures, and finally, shuts down the site upon the occurrence of designated alarms.

This manual provides instructions to install, setup, and operate the special components of the Veeder-Root ISD system that are not covered in existing documentation shipped with other non-ISD specific V-R equipment (e.g., Mag probes, line leak detection, etc.). The ISD feature is an option for the TLS console platform, and as such, many of the installation/setup/operation instructions for non-ISD specific tasks (e.g., line leak detection) are covered in TLS-3XX supplied literature.

WARNING! Revision or reprogramming of the TLS may require notification of the local Certified Unified Program Agency (CUPA).

Site Requirements

Below are the requirements for all vapor recovery systems except where noted.

- V-R TLS-350R/EMC w/BIR, TLS-350 Plus/EMC Enhanced, TLS-350/EMC and Red Jacket ProMax consoles with ECPUII - install as per TLS-3XX Site Prep manual, setup following instructions in TLS-3XX System Setup Manual.
- A flash memory board (NVMEM203) for ISD software storage - installed on the ECPU2 board in place of the console's 1/2 Meg RAM board - install as per TLS-350 Series Board and Software Replacement Manual, no setup required.
- An available RS-232 module is required for RS-232 access to ISD reports - install as per instructions shipped with module, connect to the port using instructions in this manual.
- An output relay is required (either 4-Output Relay module, I/O Combination module) to shut down each Submersible Turbine Pump (STP) upon activation of certain ISD alarms (these alarms can also be assigned in Line Leak Disable setup to shut down the STP if Line Leak detection feature is installed) - install as per instructions shipped with module or line leak system, setup ISD shut down alarms either using output relays or line leak system following instructions in this manual. Two output relays on either of these two modules are also required for vapor processor motor control - install as per instructions in this manual.
- Dispenser Interface module (DIM) for the type of dispensers installed - install as per installation manual shipped with device, setup following instructions in DIM manual and TLS-3XX Setup Manual. Note: the DIM supplies flow meter event inputs needed for ISD analysis.
- One V-R Mag probe in each of the gasoline tanks being monitored - install as per installation manual shipped with device, setup following instructions in TLS-3XX Setup Manual.
- Smart Sensor module is required to monitor Air Flow Meters and Vapor Pressure Sensor (up to 8 devices per module, or 7 if customer is using SmartSensor module / embedded pressure). Install and connect following instructions in the Air Flow Meter and Vapor Pressure Sensor installation Guides.
- Air Flow Meters (one for each dispenser) - install as per ISD Flow Meter installation manual shipped with meter, setup following instructions in this manual. Also referred to as Vapor Flow Meters within this manual.
- Vapor Pressure Sensor (one per site) - install as per ISD Pressure Sensor installation manual shipped with sensor, setup following instructions in this manual.
- When monitoring a VST ECS membrane processor a Multi-port controller module is required.

Supported Vapor Recovery Systems

Table 1 lists V-R supported vapor recovery system.

Table 1. Vapor Recovery System

Name	CARB Executive Order
VST Phase II EVR System including ISD	VR-204

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 canistor vapor polisher installation; tank and line preparation; and line leak detector installation.

TLS-350 Technician (Level 2/3 or 4) Certification: Contractors holding valid TLS-350 Technician Certifications are approved to perform installation checkout, startup, programming and operations training, troubleshooting and servicing for all Veeder-Root TLS-300 or TLS-350 Series Tank Monitoring Systems, including Line Leak Detection and associated accessories.

In-Station Diagnostics (ISD-PMC) Technician Certification: ISD PMC Contractors holding a valid ISD/PMC Certification are approved to perform (ISD/PMC) installation checkout, startup, programming, and operations training. This training also includes troubleshooting and service techniques for the Veeder-Root In-Station Diagnostics system. A current Veeder-Root Technician Certification is a prerequisite for the ISD/PMC course.

Veeder-Root ISD/PMC Including Carbon Canister Vapor Polisher Contractor Certification: This Certification includes Executive Orders 203, 204 and the Veeder-Root Vapor Polisher. This certification is required for setup and service of the Veeder-Root Vapor Polisher.

Warranty Registrations may only be submitted by selected Distributors.

Related Manuals

The manuals in Table 2 below are shipped with the equipment on the V-R Tech Docs CD-ROM and will be needed to install related equipment.

Table 2. Related Manuals

V-R Manual	Part Number
TLS-3XX Site Prep Manual	576013-879
ISD Balance Flow Meter Installation Guide	VR-204 IOM/ Section 18
Pressure Sensor Installation Guide	VR-204 IOM/ Section 17
TLS-3XX Series Consoles System Setup Manual	576013-623
TLS-3XX Series Consoles Operator's Manual	576013-610
Serial Comm Modules Installation Guide	577013-528
ISD Troubleshooting Manual	577013-819
TLS-350 Series Board and Software Replacement Manual	576013-637

Table 2. Related Manuals

V-R Manual	Part Number
TLS-350R Point-of-Sale (POS) Application Guide	577013-401

Safety Precautions

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

	ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.		**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.
	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.		

⚠ WARNING

The console contains high voltages which can be lethal. It is also connected to low power devices that must be kept intrinsically safe.

Turn power Off at the circuit breaker. Do not connect the console AC power supply until all devices are installed.

Touching a live circuit can cause electrical shock that may result in serious injury or death.

Example Site Diagrams

Figure 1 shows an example site with a VST ECS membrane vapor processor.

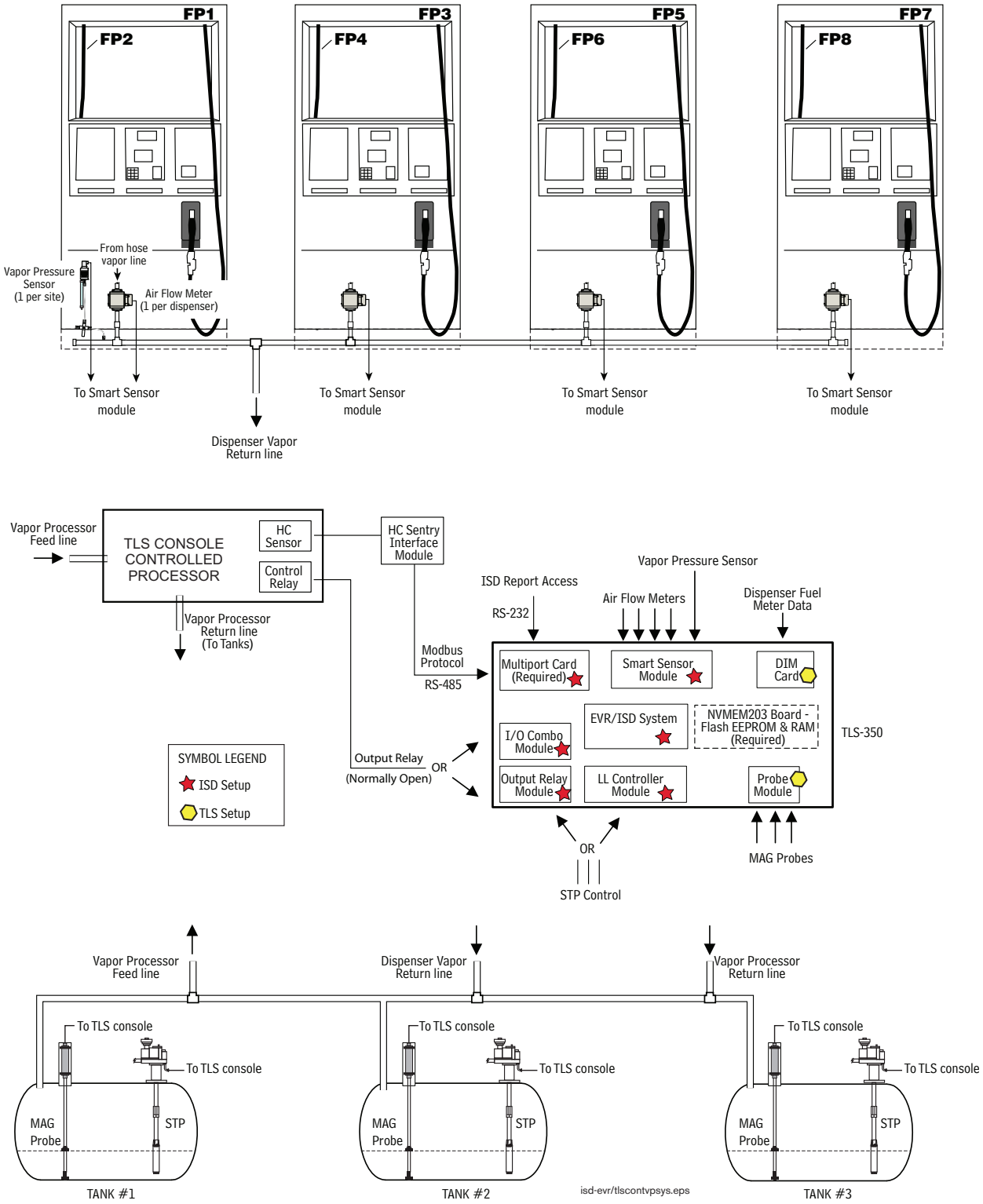


Figure 1. Example Site Diagram - TLS Console Controlled Vapor Processor

2 Installation

This section discusses the installation and wiring of the hardware required to enable the TLS console to perform ISD monitoring of the site's gasoline vapor recovery equipment (non-gas tanks are not monitored):

- Vapor Flow Meter
- Vapor Pressure Sensor
- Smart Sensor Interface Module (8 input and 7 input w/embedded pressure versions)
- NVMEM203 board - required
- 4-Relay Output Module or I/O Combination Module
- Line Leak Detection
- Dispenser Interface Module
- Probe Interface Module
- Multi-port Card (for VST ECS Membrane Processor only)

All field wiring, its type, its length, etc., used for TLS console sensors must conform to the requirements outlined in the Veeder-Root TLS-3XX Site Prep manual (P/N 576013-879).

Vapor Flow Meter

Install one Vapor Flow Meter in the vapor return piping of each gasoline dispenser following the instructions in the ISD Balance Flow Meter Installation guide (VR-204 IOM / Section 18). Program the meter following instructions in this manual.

Vapor Pressure Sensor

Install one Vapor Pressure Sensor in the vapor return piping of the gasoline dispenser closest to the tanks following the instructions in the Pressure Sensor Installation guide VR-204 IOM / Section 17). Program the meter following instructions in this manual.

Installing TLS Console Modules - General Notes

TLS consoles have three bays in which interface modules can be installed; Comm bay (left door) and Power and Intrinsically-Safe bays (right door). Smart Sensor modules are installed in the Intrinsically-Safe (I.S.) bay only (Figure 2).

Most consoles will be shipped with modules installed as ordered. If additional features are added at a later date, modules will be field installed.

In all cases, the position of the modules, their respective connectors and the devices wired to the connectors must be recorded to prevent improper replacement during installation or service. A circuit directory for Power and I.S. bay Interface Modules is adhered to the back of the right-hand door for this purpose.

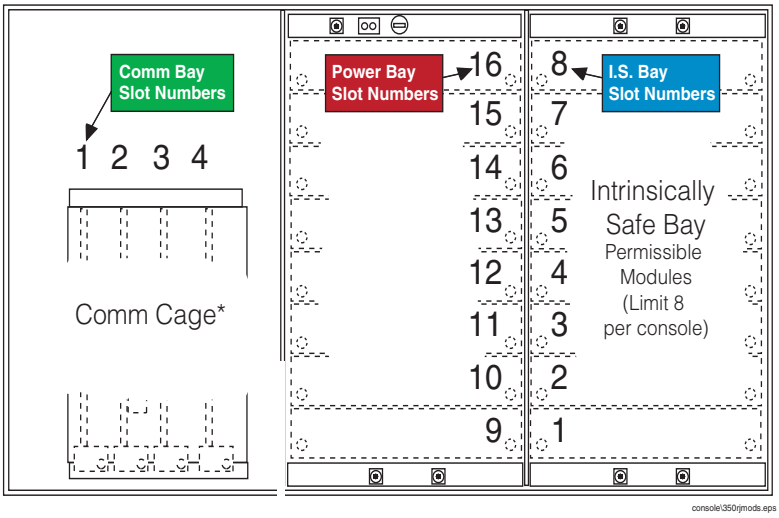


Figure 2. TLS console Interface Module Bays

CAUTION! During programming, module positions and the devices wired to each module are identified and stored in memory. If a connector is removed and reinstalled on a different module after programming, or if an entire module with its connector is removed and reinstalled in a different module slot, the system will not properly recognize the data being received.

Module Position

1. Record on the circuit directory the type of module in each slot location.
2. If a system contains multiple modules of a single type (i.e., two Smart Sensor Modules), they may be swapped between their respective slot locations, however, the connectors must remain with their original locations, not with the original modules.

Connector Position

1. Identify all connectors according to their slot location using the self-adhesive numbering labels furnished with each module. Accurately record on the circuit directory the location of each device wired to the connector as you attach wires to the module.
2. Once a device has been wired to certain terminals on a connector and the system has been programmed, the wires from that device may not be relocated to other terminals without reprogramming the system.

Grounding Probe and Sensor Shields

Connect probe and sensor cable shields to ground at the console only. Do not ground both ends of the shield.

CIRCUIT DIRECTORY

A circuit directory is adhered to the inside of the right-hand door. It should be filled out by the installer as the module's connectors are being wired.

The following information should be recorded for each slot:

- Module Type: record what type of module has been installed in the slot, e.g., Smart Sensor Module.
- Position Record: record the physical location and/or type of device wired to each terminal of the module connector in the slot, e.g., AFM1.

Smart Sensor Interface Module

The Smart Sensor Interface Module 8 input or 7 input w/embedded pressure versions monitor Air Flow Meter (AFM) and Vapor Pressure Sensor (VPS) inputs.

Switch off power to the TLS console while you install modules and connect sensor wiring.

Open the right door of the console and slide the necessary Smart Sensor modules into empty I.S. Bay slots. Connect the field wiring from each of the sensors following instructions in the Air Flow Meter and Vapor Pressure Sensor manuals. Setup the Smart Sensor module(s) following instructions in this manual.

NVMEM203 Board

Verify that a NVMEM203 board is installed in the TLS console (ref. Figure 2-7 in the V-R TLS-3XX Series Consoles Troubleshooting Manual P/N 576013-818, Rev Q or later). This board contains flash EEPROM and RAM needed to run ISD software and store ISD reports. No setup is required.

Site Shut Down Requirements

Normal ISD operation requires TLS console control of the STP in each of the gasoline tanks. If the site has Wireless Pressure Line Leak Detection (WPLLD), Pressure Line Leak Detection (PLLD) or Volumetric Line Leak Detection (VLLD) for each tank, you can use the line leak disable setup to control the vapor recovery tanks (diesel tanks do not require shutdown). If the site does not have line leak detection for all vapor recovery tanks, you can use output relay setup to control each tank. In lieu of line leak detection, install the necessary modules (output relay) to control each gasoline tank.

Dispenser Interface Module (DIM)

Verify that a dispenser interface module (DIM) is installed in the TLS console communication bay (ref. Figure 2) and that it is designed to communicate with the type of gasoline dispensers installed at the site. The ISD software requires dispenser fuel flow meter data inputs. Reference TLS-350R Point-of-Sale (POS) Application Guide to select correct DIM card. Refer to the manual shipped with the DIM for installation instructions, refer to the TLS-3XX System Setup manual to program the DIM.

Probe Interface Module

Verify that a Probe Interface Module(s) is installed (Intrinsically-Safe bay) and that a Mag probe is in each gasoline tank and is connected to the module(s). Program the Mag probes following instructions in the TLS-3XX System Setup manual.

I/O Combination or 4-Relay Module

Connect the vapor processor motor control relay to two relays on either the 4-Relay or I/O Combination module as shown in Figure 4.

Multi-port Card for Vapor Processor Communication

A Multi-port card is needed for RS-485 communication with the TLS console and is required with VST ECS membrane processor installations. Verify that a Multi-port card is installed in slot 4 of the card cage in the communications bay of the TLS console (ref. Figure 4). When installing this card, refer to the V-R Serial Comm Modules Installation Guide (577013-528) for instructions. Connect this card to the vapor processor as shown in Figure 4. Program the card as instructed in this manual.

TLS Console with V-R Vapor Polisher

Figure 4 shows the interconnection wiring between a TLS console and a V-R Vapor Polisher.

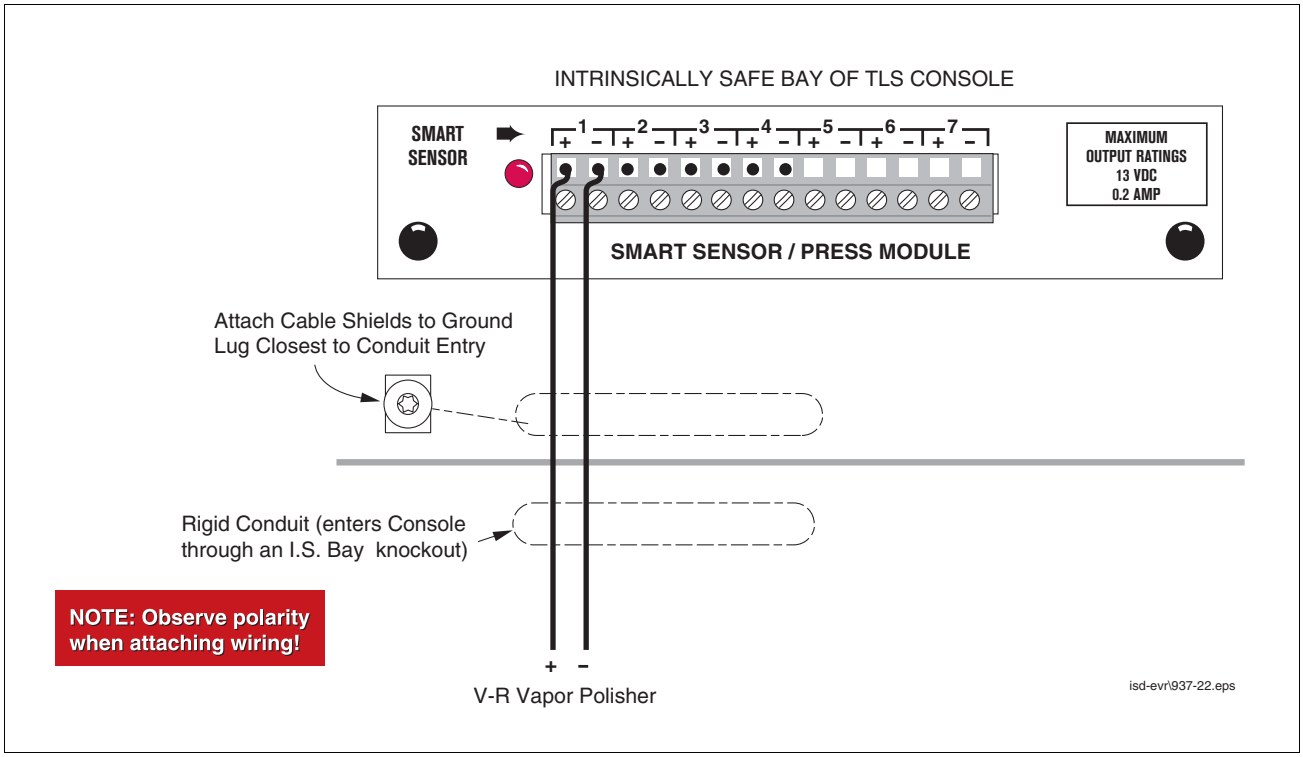


Figure 3. V-R Vapor Polisher Connections to TLS Console

TLS Console with VST ECS Membrane Processor

Figure 4 shows the interconnection wiring between a TLS console and a VST ECS Membrane Processor.

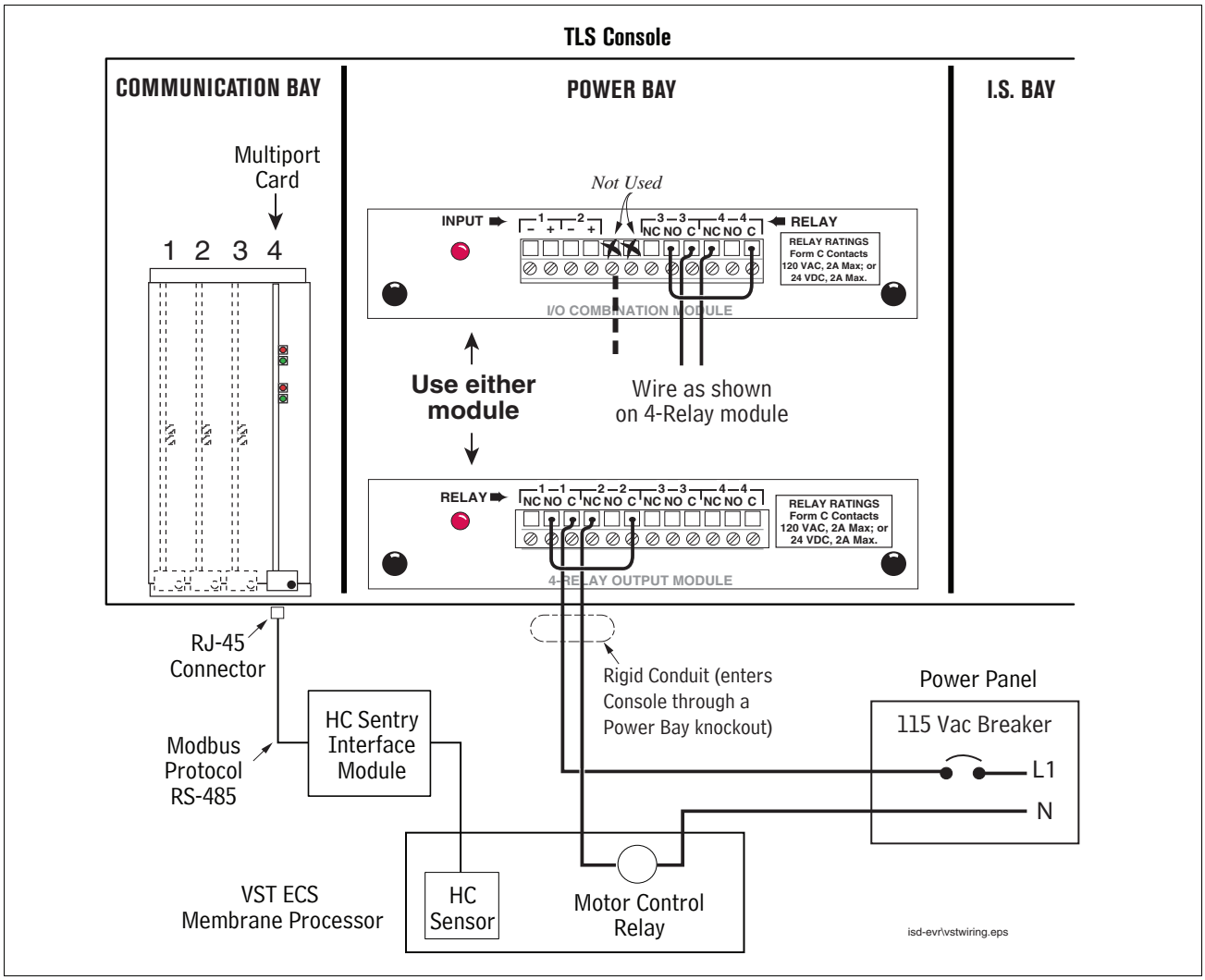


Figure 4. VST ECS Membrane Processor Connections to TLS Console

3 Setup

Introduction

This section describes how to program the ISD system using the TLS console's front panel buttons and display. The procedures in this manual follow standard TLS console setup programming input, i.e., keypad/display interaction. If necessary, refer to Section 2 of the TLS-3XX System Setup manual (P/N 576013-623) to review entering data via the front panel keypads.

All ISD-related equipment must be installed at the site and connected to the TLS console prior to beginning the setups covered in this section. As with all TLS connections, you cannot change sensor wiring or module slots after programming or the system will not recognize the correct data. Reference the section entitled "Connecting Probe/ Sensor Wiring to Consoles" in the TLS-3XX Site Prep and Installation manual (P/N 576013-879) for rewiring precautions.

ALARM SETUPS

One of two TLS setups below must be performed to shut down the tank should certain ISD alarms occur:

- For ISD sites with line leak detection - XLLD Line Disable Setup (go to Figure 15)

  This setup assigns ISD alarms to a line leak detector that will shut down the tank's STP.
- For ISD sites without line leak detection - Output Relay Setup (go to Figure 17)

  This setup assigns ISD alarms to a relay that will shut down the tank's STP.

Smart Sensor Setup

The Smart Sensor Interface Module is installed in the Intrinsically-Safe bay of the TLS console. This module monitors Air Flow Meters and the Vapor Pressure Sensor. Figure 5 diagrams the Smart Sensor setup procedure. Figure 6 shows a printout of the Smart Sensor setup.

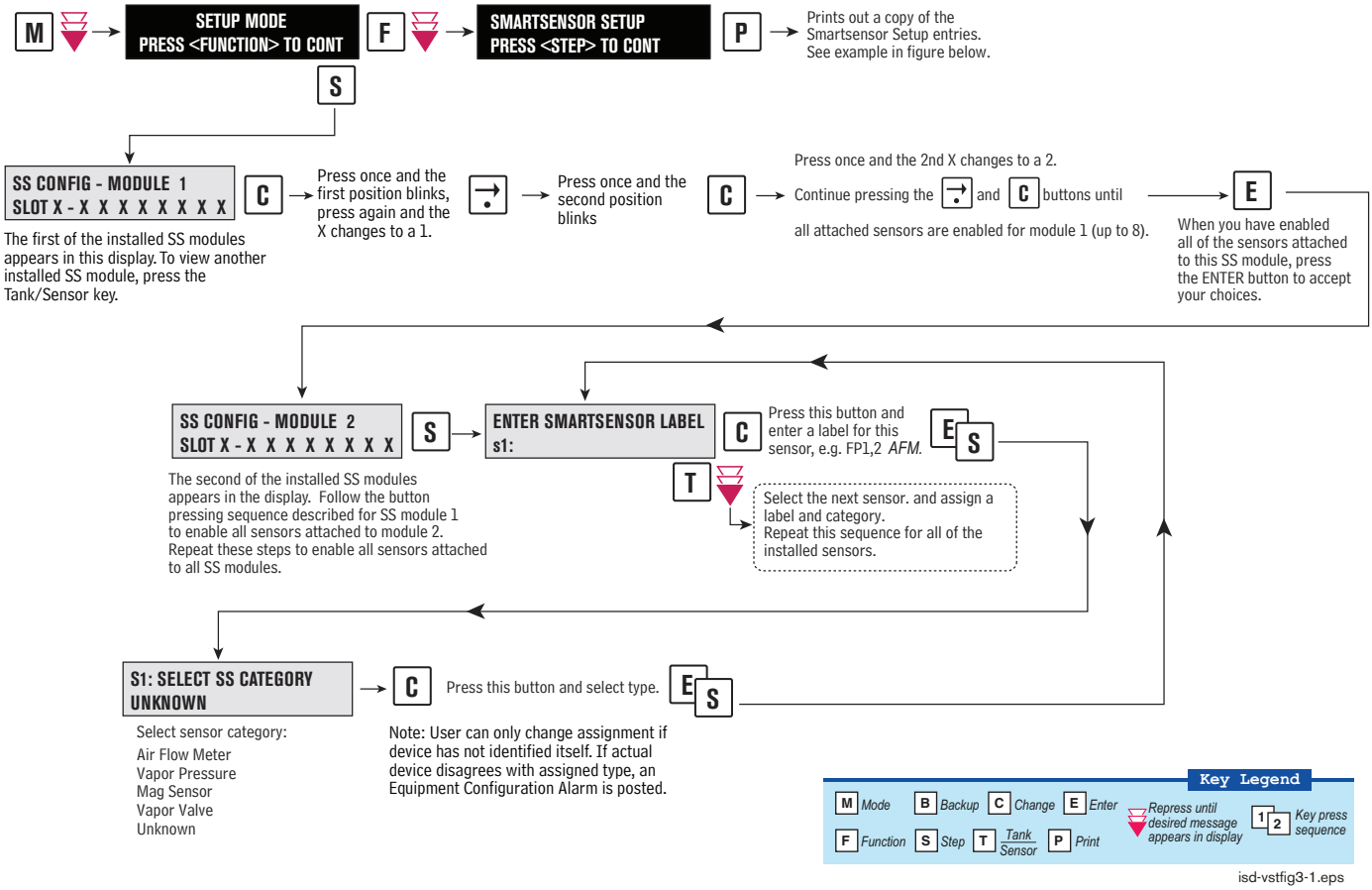


Figure 5. Smart Sensor Setup

```
SMARTSENSOR SETUP
---------------------

S01:FP 1  - 2
CATEGORY AIR FLOW METER

S02:VAPOR PRESSURE
CATEGORY VAPOR PRESSURE
```

isd-evr\sssetprt.eps

Figure 6. Smart Sensor Setup Printout Example

ATM Pressure Sensor Setup

The ATM Pressure Sensor is factory installed in the SmartSensor / Press module and preassigned to channel 8. At least one SmartSensor / Press module, which contains the ATM Pressure Sensor, must be installed in the console. You must configure at least one ATM Pressure Sensor for use by the Vapor Polisher or a PMC Set-up Fail will occur. NOTE: if more than one SmartSensor / Press module is installed, only one ATM Pressure Sensor needs to be configured.

Look in console and note the slot position of the SmartSensor / Press module. Enter the Setup Mode and press the FUNCTION key until you see the message:

SMARTSENSOR SETUP
PRESS <STEP> TO CONTINUE

Press STEP until you see the message:

SS CONFIG - MODULE *n*
SLOT *x* - X X X X X X X X

Where *x* is the slot number containing the SmartSensor / Press module. Press the → key to move the cursor to the last (8th) X. Press CHANGE and the message below should appear:

SLOT *x* - X X X X X X X 8
PRESS <STEP> TO CONTINUE

Press STEP:

ENTER SMARTSENSOR LABEL
s 8:

NOTE: In the example above, the ATM P sensor position is 8 but it could be16, 32, or 40 depending on the SmartSensor's module number.

Press CHANGE and enter a label:

ENTER SMARTSENSOR LABEL
s 8: (ATMP Sensor Label)

Press ENTER to accept your label:

s 8: (ATMP Sensor Label)
PRESS <STEP> TO CONTINUE

Press STEP:

s 8: SELECT SS CATEGORY
UKNOWN

Press CHANGE until you see the message:

s 8: SELECT SS CATEGORY
ATM P SENSOR

Press ENTER to accept the category. Press STEP, then BACKUP to return to the configuration display for Smart Sensor module 1:

SS CONFIG - MODULE 1 **SLOT *x* - X X X X X X X X**

This completes the ATM Pressure Sensor configuration.

EVR/ISD Setup

You must choose the appropriate data sheet from Appendix A for the vapor recovery system installed at your facility (e.g., Single or Multi-Hose Dispensers) and record in those sheets, all of the unique information from sensors/hose positions, prior to beginning the TLS EVR/ISD set up procedure below.

Figure 7 describes the first of the EVR/ISD setup programming diagrams.

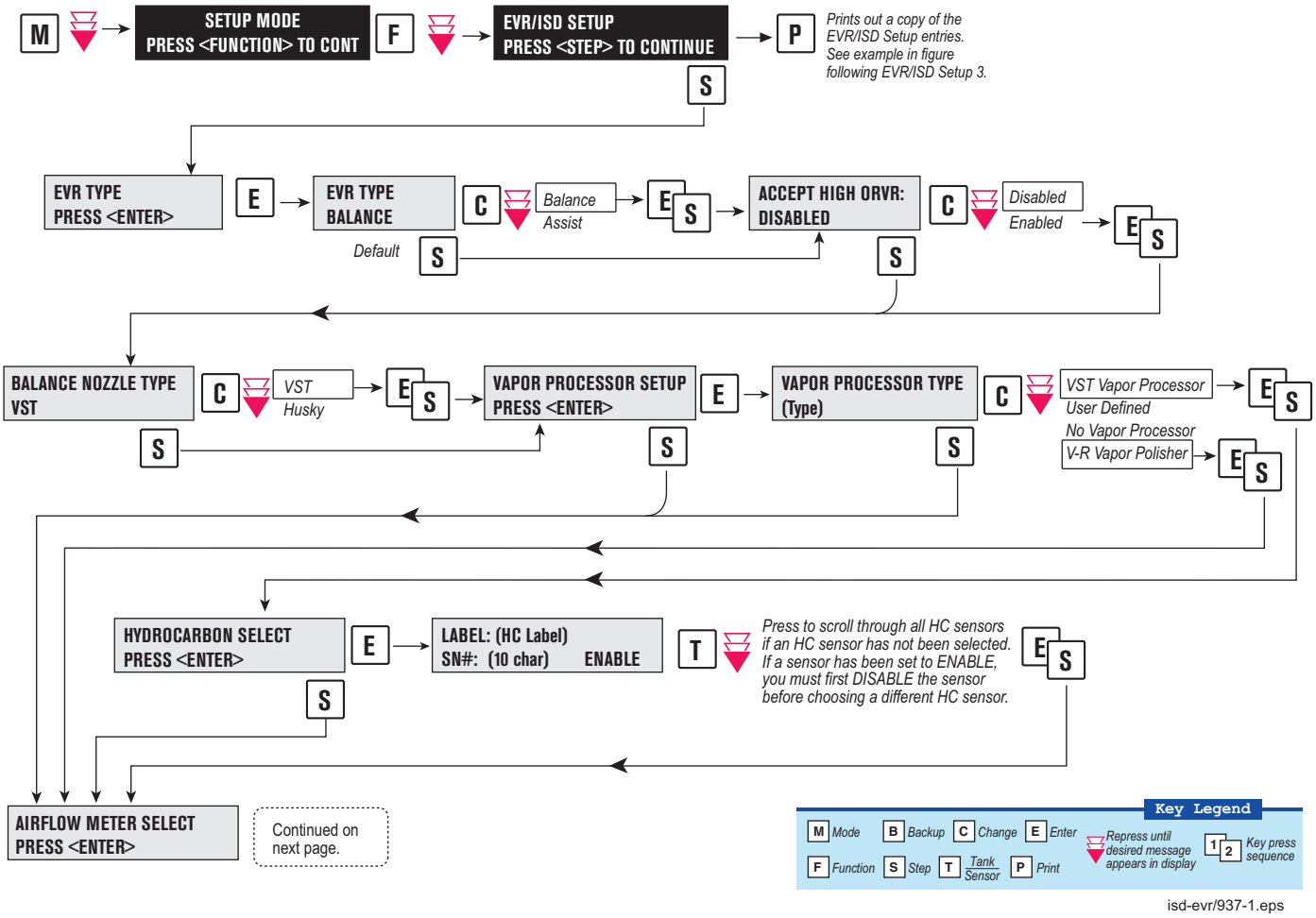


Figure 7. EVR/ISD Setup 1

Figure 8 describes the second of the EVR/ISD setup programming diagrams.

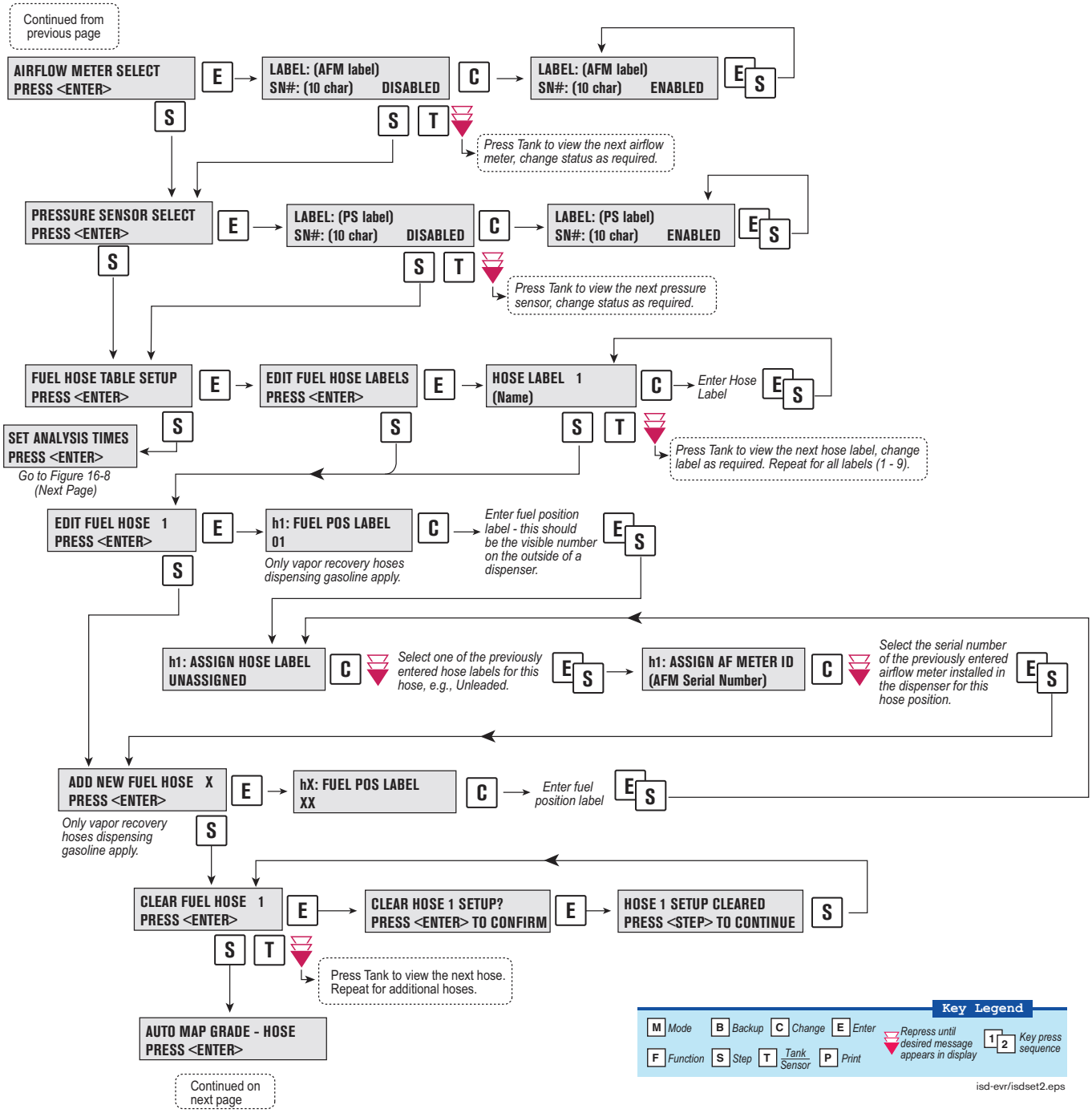


Figure 8. EVR/ISD Setup 2

Figure 9 describes the last of the EVR/ISD setup programming diagrams.

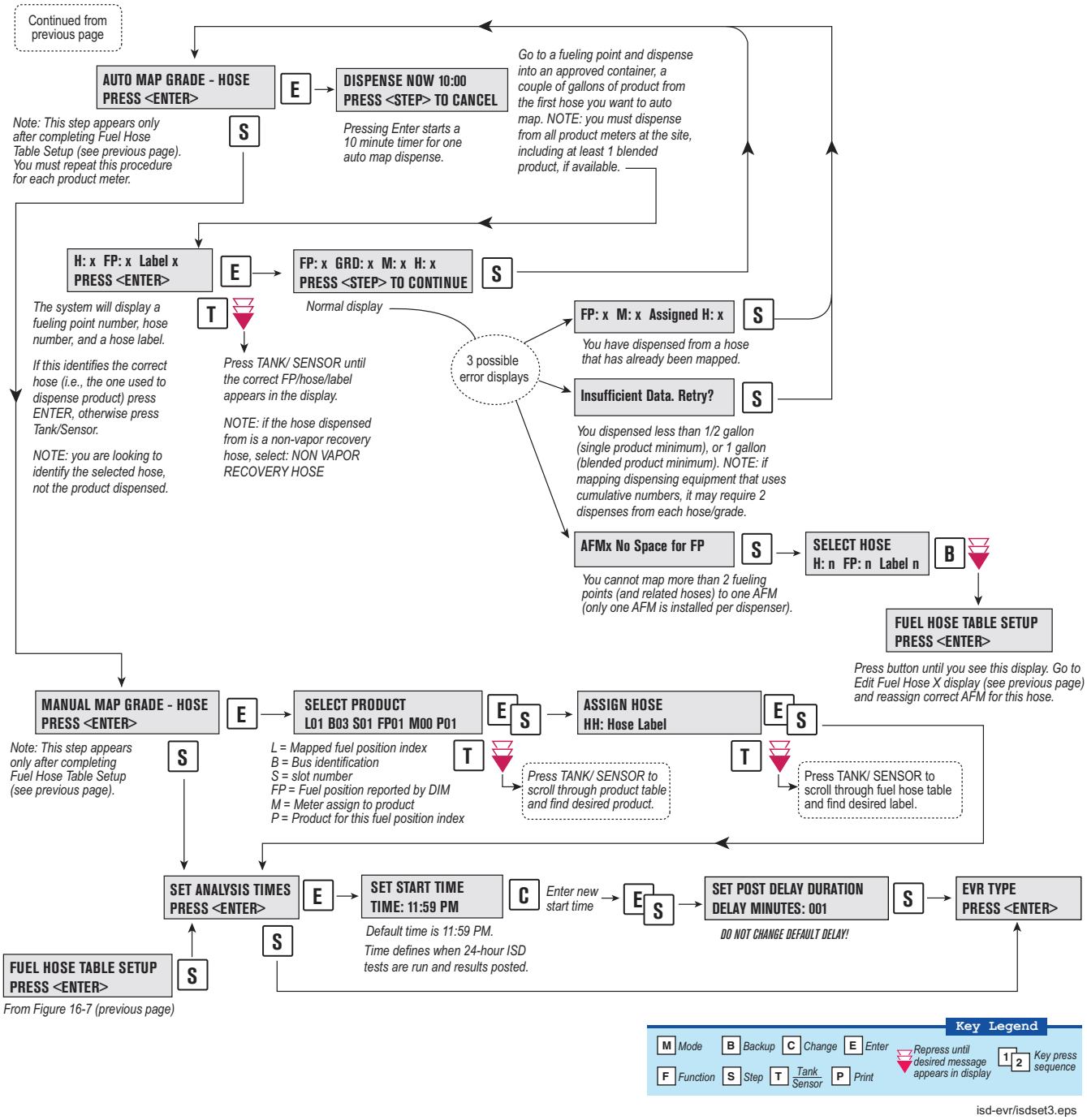


Figure 9. EVR/ISD Setup 3

```
EVR/ISD SETUP

EVR TYPE: BALANCE

BALANCE NOZZLE TYPE
VR/VST

VAPOR PROCESSOR TYPE
VEEDER-ROOT POLISHER

ANALYSIS TIMES
TIME: 11:59 PM
DELAY MINUTES: 1

ACCEPT HIGH ORVR:
DISABLED

ISD HOSE TABLE
ID  FP  FL  HL  AA  RR
------------------------
01  01  01  02  01  UU
02  02  02  02  01  UU
03  03  03  02  02  UU
04  04  04  02  02  UU
05  05  05  02  03  UU
06  06  06  02  03  UU
07  07  07  02  04  UU
08  08  08  02  04  UU
09  09  09  02  05  UU
10  10  10  02  05  UU
11  11  11  02  06  UU
12  12  12  02  06  UU
```

ID = Hose ID
FP = Mapped fuel position as TLS Console recognizes it (-1 = unassigned)
FL = Fuel position label as written on dispenser
HL = Hose label
AA = Airflow meter ID assigned
RR = Relay ID
UU = unassigned

```
ISD AIRFLOW METER MAP
ID SERIAL NUM LABEL
------------------------
 1 03001401   AFM1 FP1 -
 2 03001402   AFM2 FP3 -
 3 03001403   AFM3 FP5 -
 4 03001404   AFM4 FP7 -
 5 03001405   AFM5 FP9 -
 6 03001406   AFM6 FP11
```

ID = Airflow meter ID assigned
Serial Number = Airflow meter's serial number

```
ISD FUEL GRADE HOSE MAP
    1   2   3   4
FP MHH MHH MHH MHH AA
------------------------
01 101 301 901 U U  1
02 102 302 902 U U  1
03 103 303 903 U U  2
04 104 304 904 U U  2
05 105 305 905 U U  3
06 106 306 906 U U  3
07 107 307 907 U U  4
08 108 308 908 U U  4
09 109 309 909 U U  5
10 110 310 910 U U  5
11 111 311 911 U U  6
12 112 312 912 U U  6
```

FP = Mapped fuel position
M/H = Meter and hose for product X
AA = Airflow meter assigned to first (lowest X) product with meter and hose assigned (usually same for entire dispenser)
U = Unassigned
N = Not used by ISD

```
LABEL TABLE
------------------------
 1: UNASSIGNED
 2: BLEND3
 3: REGULAR
 4: MID GRADE
 5: PREMIUM
 6: GOLD
 7: BRONZE
 8: SILVER
 9: BLEND2
10: BLEND4
```

ID = Label ID
Label = User definable
00 = reserved, non-ISD

isd-evr/937-2.eps

Figure 10. Example VST ECS Printout

Output Relay Setup - VST ECS Membrane Processor

The Output Relay setup programs an output relay so that the TLS console can switch a controlled vapor processor on and off as shown in Figure 11.

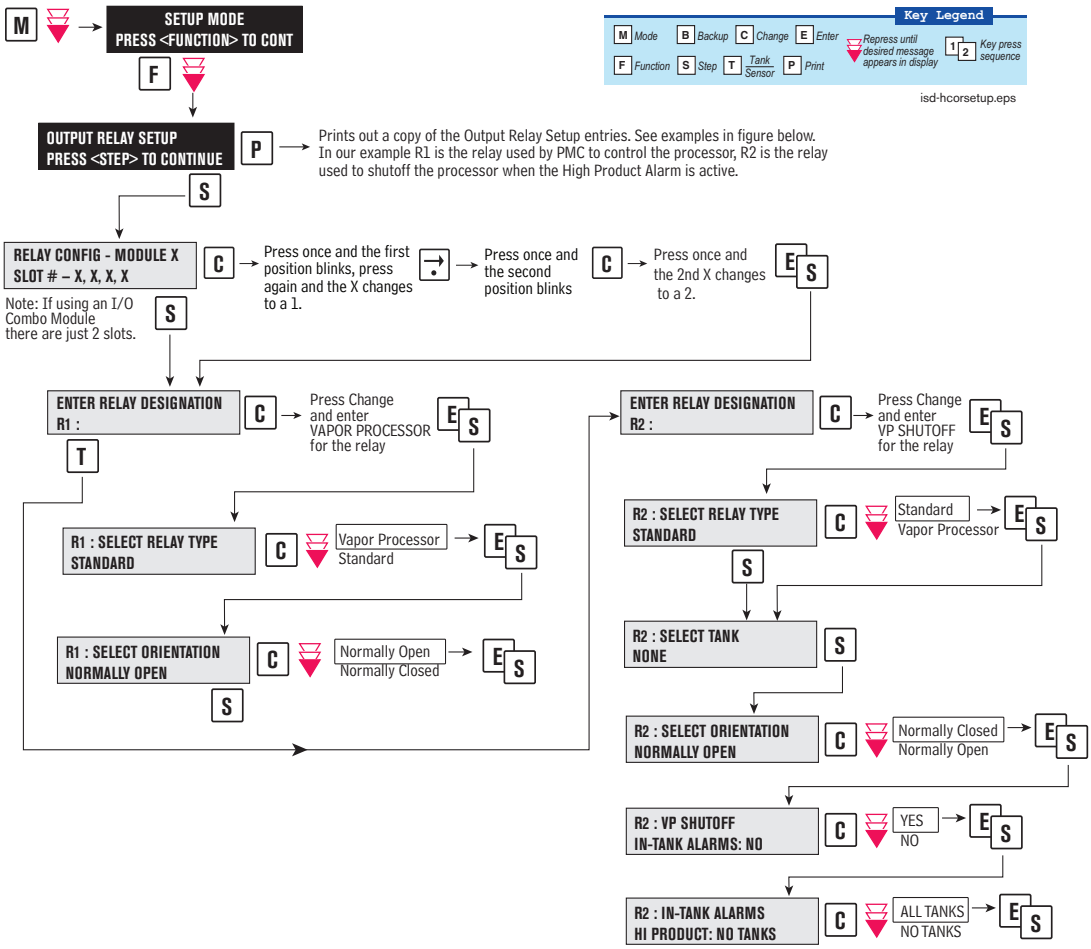


Figure 11. Output Relay Setup for VST ECS Membrane Processor

Figure 12 shows example setup printouts of the Output Relays setup.

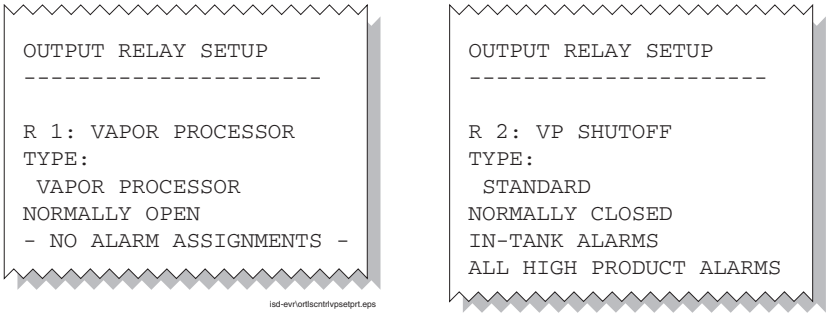


Figure 12. Output Relay Setup Printout Examples for TLS Console Controlled Processor

PMC Setup for VST ECS Membrane Processor

PMC setup allows you to select the maximum runtime and the start/stop pressure of TLS console controlled vapor processors (see Figure 13).

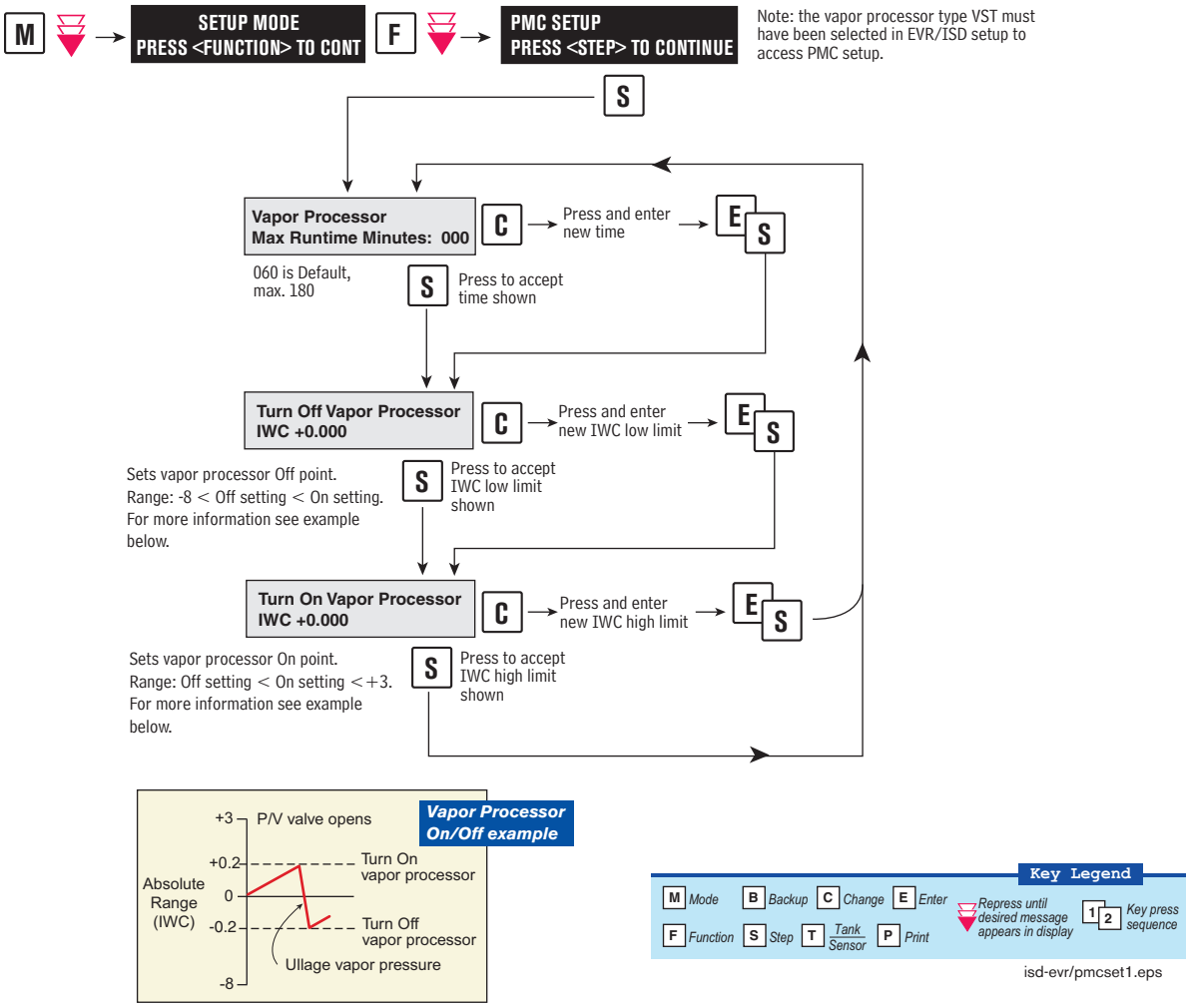


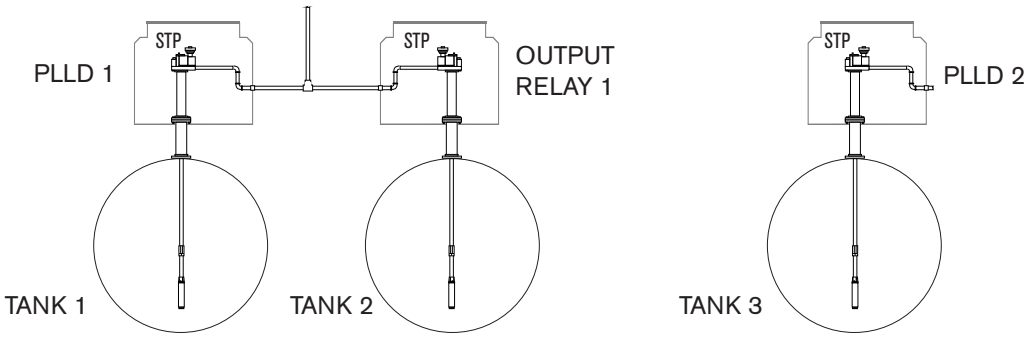
Figure 13. PMC Setup - VST ECS Membrane Processor

Alarm Setup

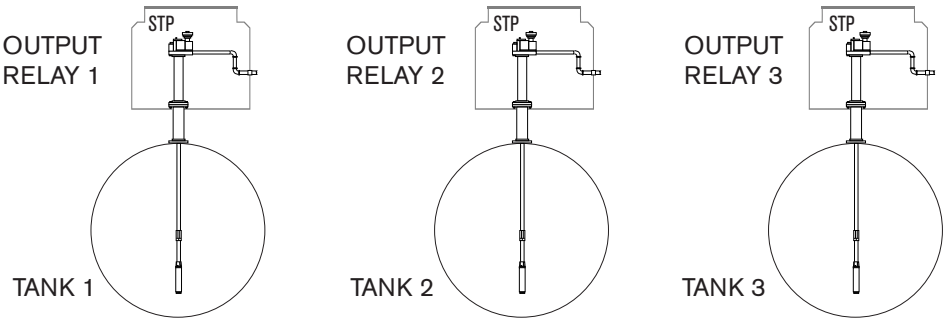
INTRODUCTION

California regulations (VAPOR RECOVERY CERTIFICATION PROCEDURE, CP-201, DATED MAY 25, 2006 CERTIFICATION PROCEDURE FOR VAPOR RECOVERY SYSTEMS AT GASOLINE DISPENSING FACILITIES, Sections 9.1.2) require shut down of dispensing systems that generate specific alarm conditions. To accomplish this, the TLS must be configured to control the gasoline tank's pump (diesel tanks are not monitored) in order to disable them when ISD shutdown alarm conditions occur. Prior to setting up ISD shut down alarms, you will need to determine how the site's tank pumps are controlled. If the site has line leak detection, you can shut down the line (tank) by assigning the ISD alarms in Line Leak Disable setup. In the absence of line leak detection, you can assign the ISD alarms to Output Relays which in turn can be wired to shut down the tank. Figure 14 illustrates two examples of tank pump control, one using a line leak/output relay combination and one using output relays.

EXAMPLE 1 - Line Leak Detector controls T1 and T3, Output Relay controls T2



EXAMPLE 2 - Output Relay 1 controls T1, Output Relay 2 controls T2, etc.



isd-evr/isdsetdia1.eps

Figure 14. Site Tank Control Examples

Referencing the figure above, in example 1, you would assign the ISD shut down alarms for tank 1 to PLLD 1 in PLLD Line Leak Disable setup, for tank 2 to a relay in Output Relay Setup, and for tank 3 to PLLD 2 in PLLD Line Leak Disable setup. In example 2, you would assign the ISD shut down alarms for tank 1 to output relay 1, tank 2 to output relay 2, and tank 3 to output relay 3.

ALARM SETUP FOR SITES WITH LINE LEAK DETECTION

Figure 15 illustrates the setup steps required to assign ISD Shut Down Alarms to a tank having a line leak detection system installed.

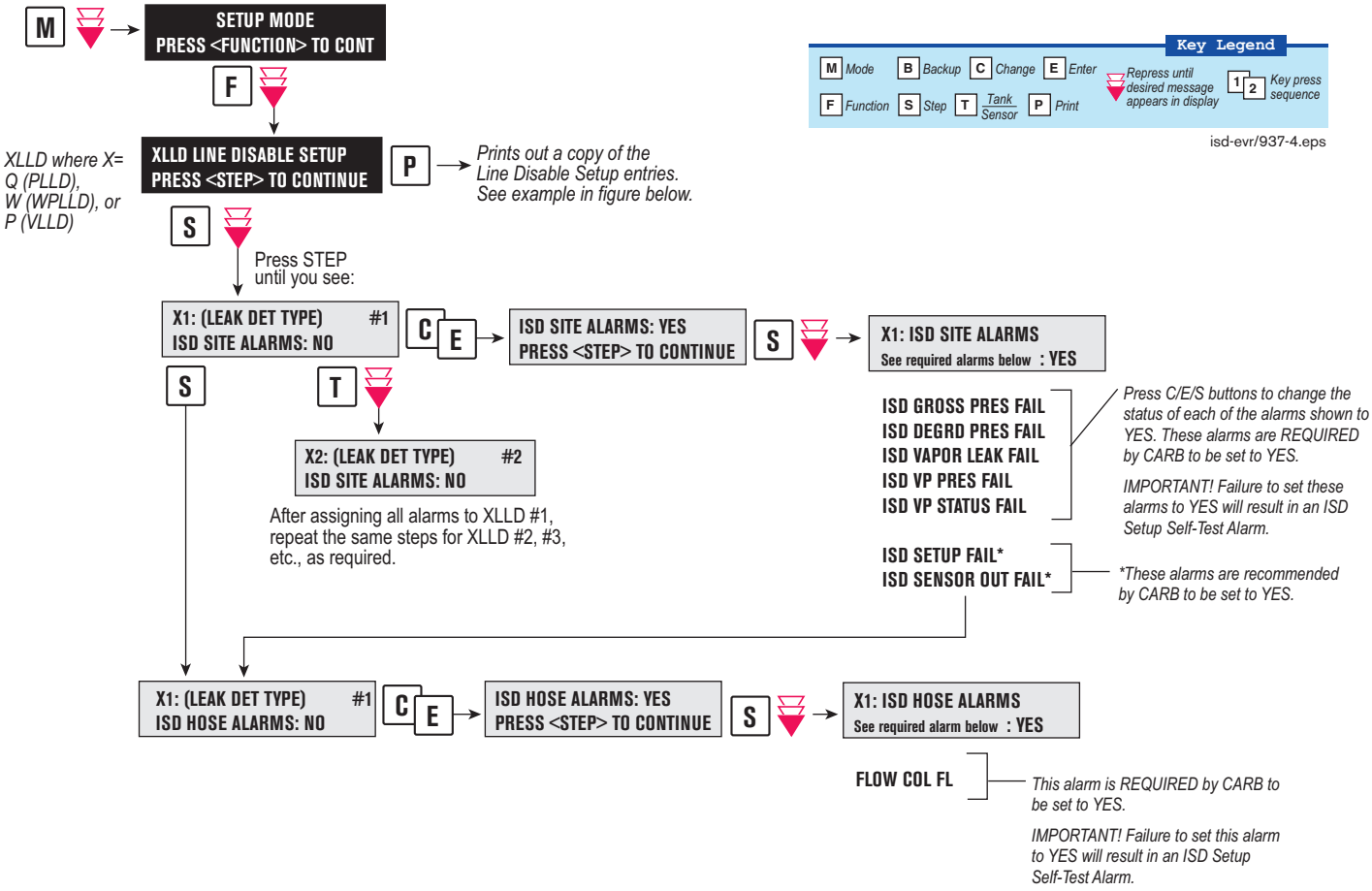


Figure 15. Assigning ISD Shut Down Alarms in Line Leak Disable Setup

Figure 16 shows a resulting printout of the Line Leak Disable setup with ISD alarms assigned.

```
PLLD LINE DISABLE SETUP
-----------------------

Q 1:UNLEADED

ISD SITE ALARMS
 ISD GROSS PRESSURE FAIL
 ISD DEGRD PRESSURE FAIL
 ISD VAPOR LEAKAGE FAIL
 ISD VP PRESSURE FAIL
 ISD VP STATUS FAIL
 ISD SETUP FAIL
 ISD SENSOR OUT FAIL

ISD HOSE ALARMS
 h1: FLOW COLLECT FAIL
```

isd-evr\937-5.eps

Figure 16. Example Line leak Disable Setup Printout

ALARM SETUP FOR SITES WITHOUT LINE LEAK DETECTION

Figure 17 illustrates the setup steps required to assign ISD Shut Down Alarms to a tank using either a Four Relay Output Module or an I/O Combination Module.

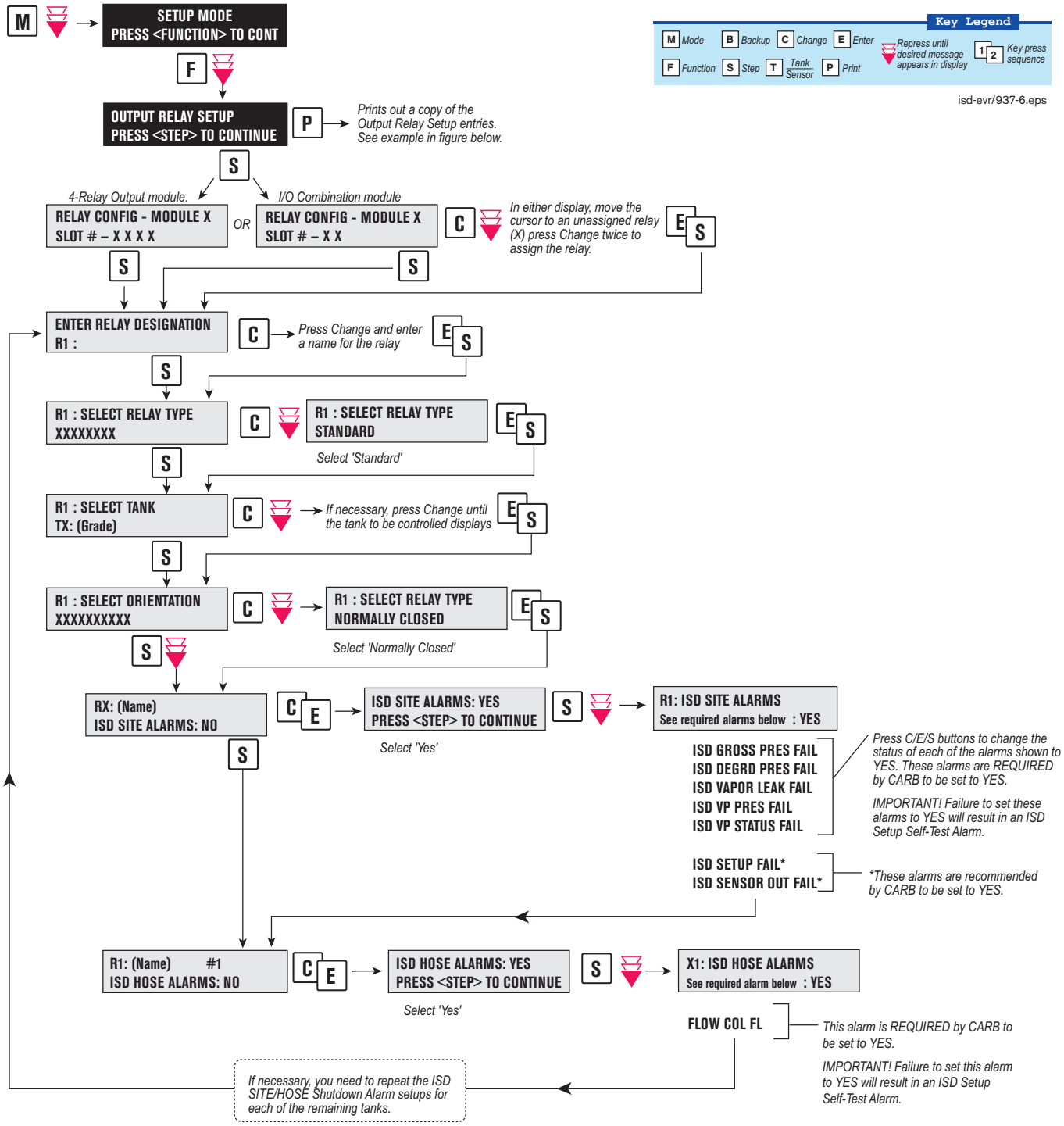


Figure 17. Assigning ISD Shut Down Alarms in Output Relay Setup

Figure 18 shows a resulting printout of the Output Relay setup with ISD alarms assigned.

```
OUTPUT RELAY SETUP
----------------------

R 1:(Input Name)
TYPE:
  STANDARD
NORMALLY CLOSED

ISD SITE ALARMS
 ISD GROSS PRESSURE FAIL
 ISD DEGRD PRESSURE FAIL
 ISD VAPOR LEAKAGE FAIL
 ISD VP PRESSURE FAIL
 ISD VP STATUS FAIL
 ISD SETUP FAIL
 ISD SENSOR OUT FAIL

ISD HOSE ALARMS
 h1: FLOW COLLECT FAIL
```

isd-evr\937-7.eps

Figure 18. Example printout - ISD Alarms Assignments - Output Relay Setup

4 ISD Operability Test Procedure

The following procedures shall be used at field sites to determine the operability of the Veeder-Root ISD system to satisfy the requirements documented in VAPOR RECOVERY CERTIFICATION PROCEDURE, CP-201, DATED MAY 25, 2006 CERTIFICATION PROCEDURE FOR VAPOR RECOVERY SYSTEMS AT GASOLINE DISPENSING FACILITIES. Testing the ISD equipment in accordance with this procedure will verify the equipment's operability for Vapor Containment Monitoring and Vapor Collection Monitoring.

Veeder-Root's TLS console ISD System Self-Test Monitoring algorithms are designed to verify proper selection, setup and operation of the TLS console modules and sensors and will not complete and report passing test results in the event of a failure of components used in the system. Completed ISD monitoring tests are evidence that:

- The system was properly powered for data collection
- All necessary ISD sensors were setup and connected
- All necessary ISD sensors were operating within specification
- All internal components including TLS console modules were properly setup and operating within specification

Veeder-Root recommends printing a copy of the ISD ALARM STATUS and ISD DAILY report (REF. Section 5, Operation of the ISD Install, Setup & Operation Manual) periodically to determine that compliance tests are being completed in accordance with local and state regulations.

A step-by-step worksheet for recording data from the following operability tests is provided in Appendix C.

Vapor Pressure Sensor Verification Test

PRINCIPLE AND SUMMARY OF TEST PROCEDURE

Determining UST Pressure

The pressure of the USTs is determined at the Phase I vapor recovery adaptor (dry break assembly) with a vapor coupler test assembly as shown in Figures 2 and 3 of TP-201.3 (Determination of 2 Inch WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities) or a modified dust cap test assembly as shown in Figure 19 and Figure 20. The test assembly is equipped with a center probe, which opens the dry break, and a quick connect fitting that is connected to an electronic pressure measuring device or digital manometer. The test assembly should open the dry break with minimal venting of the USTs. This test can be performed while product is being dispensed into motor vehicles.

Determining Ambient Pressure

The Vapor Pressure Sensor is subjected to ambient pressure by turning the Vapor Pressure Sensor valve, which is located in the dispenser closest to the tanks, to the Atmospheric Valve Position as shown in Figure 21. This test can be performed while product is being dispensed into motor vehicles.

BIASES AND INTERFERENCES

1. This test shall not be conducted within 30 minutes following gasoline transfer from a cargo tank.
2. This test shall not be conducted if the processor is operating (audible indication that the processor is running).

RANGE AND ACCURACY

Electronic Pressure Measuring Device such as a digital manometer

Minimum readability shall be 0.01 inches WC with measurement range(s) to include at least up to positive and negative ten (±10) inches WC with a minimum accuracy of plus or minus 0.05 inches WC of full scale.

EQUIPMENT

1. The dust cap test assembly shall be modified in the following manner:
   a. Install a probe in the center of the dust cap as shown in Figure 19 (one method is to tap and thread probe). The probe shall be of sufficient length to open approximately ½ inch of the dry break while allowing the cap to maintain a leak tight seal on the adaptor.
   b. Install female quick connect fitting on the top of the dust cap, offset from the center probe as shown in Figure 19. A Swagelok, part number SS-QC4-B-4-PM, quick connect fitting or equivalent can be used.
   c. Use "Tygon tubing" or equivalent to connect the manometer to the dust cap (Figure 20). Install a male quick connect fitting (Swagelok part number SS QC4-5-400 or equivalent can be used) on one end of a ferrule stainless steel tube (or equivalent material). Connect one end of the "Tygon tubing" to the stainless steel tube and connect the other end to the digital manometer (Figure 20).
2. Alternatively, the vapor coupler test assembly, Figures 2 and 3 of TP 201.3 may be used in lieu of the dust cap test assembly.
3. Digital Manometer (Electronic Pressure Measuring Device)

   Use a minimum range ±10.00 inches WC digital manometer to monitor the UST pressure with a minimum readability of 0.01 inches of WC. Dwyer Series 475 Mark III Digital manometer or equivalent can be used. A copy of the manufacturer's operating instructions shall be kept with the equipment.

CALIBRATION REQUIREMENTS

1. A copy of the most current calibration of the electronic pressure measuring device shall be kept with the equipment.
2. All electronic pressure measuring devices shall be bench tested for accuracy using a reference gauge, incline manometer or National Institute of Standards and Technology (NIST) traceable standard at least once every twelve (12) consecutive months. Accuracy checks shall be performed at a minimum of five (5) points (e.g., 10, 25, 50, 75 and 90 percent of full scale) each for both positive and negative pressure readings. Accuracy shall meet the requirements in the Range and Accuracy section above.

DETERMINING UST PRESSURE

Pre-Test Procedure

1. Turn on digital manometer and allow instrument to warm up for five minutes.
2. Zero out digital manometer using adjustment pod on top of instrument in accordance with manufacturer's instructions. Drift may be minimized by re zeroing immediately after use by venting both pressure ports to atmosphere and adjusting the knob until the display reads exactly zero.
3. Attach the male quick connect fitting to the female quick connect fitting on the modified vapor dust cap.
4. Attach digital manometer to open end of Tygon tubing.

Test Procedure

1. Attach the dust cap or vapor coupler test assembly to the vapor adaptor (Figure 20).
2. On the TLS Console front panel, use the 'mode key' to scroll to "DIAG MODE" then use the function and step keys, as shown in Figure 22 to view the current pressure value.
3. Simultaneously record the ullage pressure from the digital manometer (connected to the vapor coupler test assembly) and the TLS Console. Record the above information on Appendix C, Form 1 "Data Form for Vapor Pressure Sensor UST Pressure Test." Districts may require the use of an alternate form, provided it includes the same minimum parameters as identified in the Data Form.
4. Verify that the pressure reading from the TLS Console is within ±0.2 inches WC from the digital manometer reading. If difference is not within ±0.2 inches WC, the pressure sensor is not in compliance with the pressure sensor requirements.
5. Press the <MODE> key to leave the 'PMC DIAGNOSTIC' menu.

DETERMINING AMBIENT PRESSURE

Test Procedure for Testing Sensor Under Ambient Pressure

1. Access the Vapor Pressure Sensor, which is located in the dispenser closest to the tanks. Record which dispenser contains the pressure sensor and the pressure sensor serial number on the data form.
2. Remove the cap from the ambient reference port of the Vapor Pressure Sensor valve and open the valve to atmosphere by turning it 90 degrees so that the flow arrows point to both the Vapor Pressure Sensor sensing port and the ambient reference port (see Figure 21).
3. On the TLS Console front panel, use the 'mode key' to scroll to "DIAG MODE" then use the function and step keys, as shown in Figure 22 to view the current pressure value.
4. Verify that the pressure value is between +0.2 and -0.2 inches WC. If the pressure value is not within this range, the pressure sensor is not in compliance with the pressure sensor requirements.
5. Replace the cap on the ambient reference port of the Vapor Pressure Sensor valve. Restore the Vapor Pressure Sensor valve by turning it 90 degrees so that the flow arrows point to both the Vapor Pressure Sensor sensing port and the UST vapor space sensing line (ref. Figure 21).
6. Press the <MODE> key to leave the 'PMC DIAGNOSTIC' menu.
7. Record the above information on Appendix C, Form 2 "Data Form for Vapor Pressure Sensor Ambient Reference Test." Districts may require the use of an alternate form, provided it includes the same minimum parameters as identified in the Data Form.

ALTERNATE PROCEDURES

This procedure shall be conducted as specified. Any modifications to this test procedure shall not be used unless prior written approval has been obtained from the ARB Executive Officer, pursuant to Section 14 of CP-201.

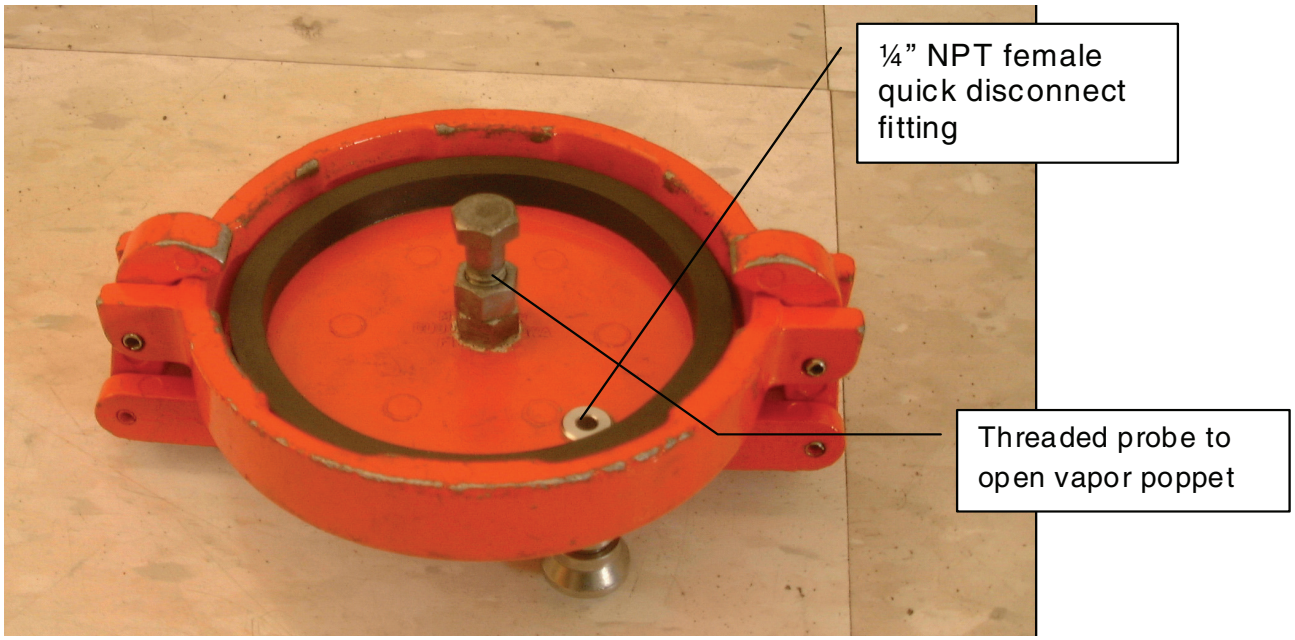


Figure 19. Typical modified vapor adaptor dust cap (bottom view)

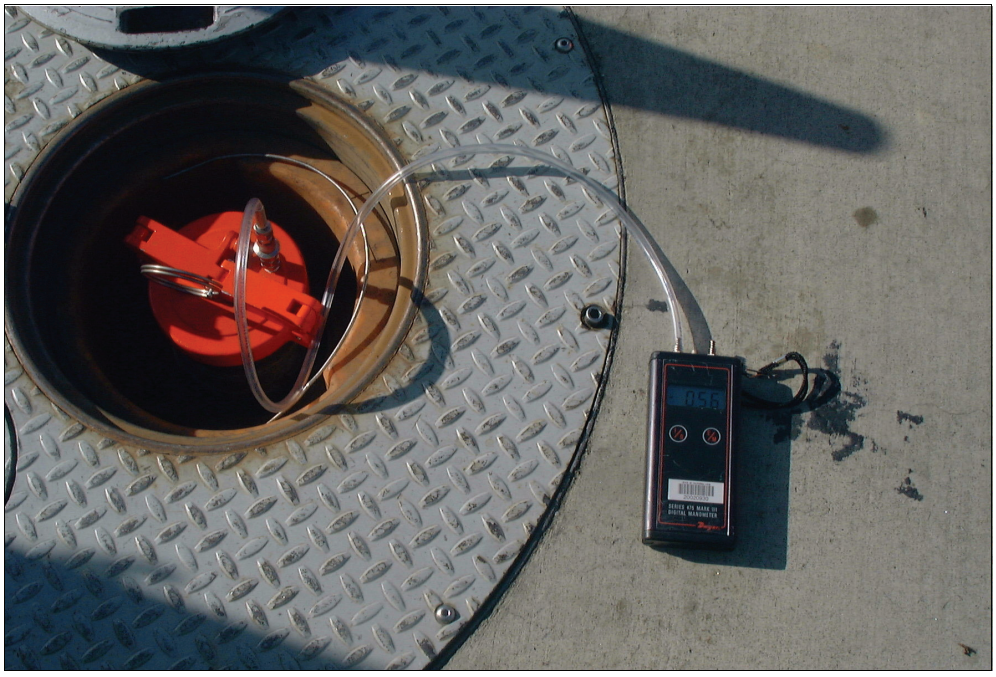


Figure 20. Typical field installation of UST Pressure Measurement Assembly

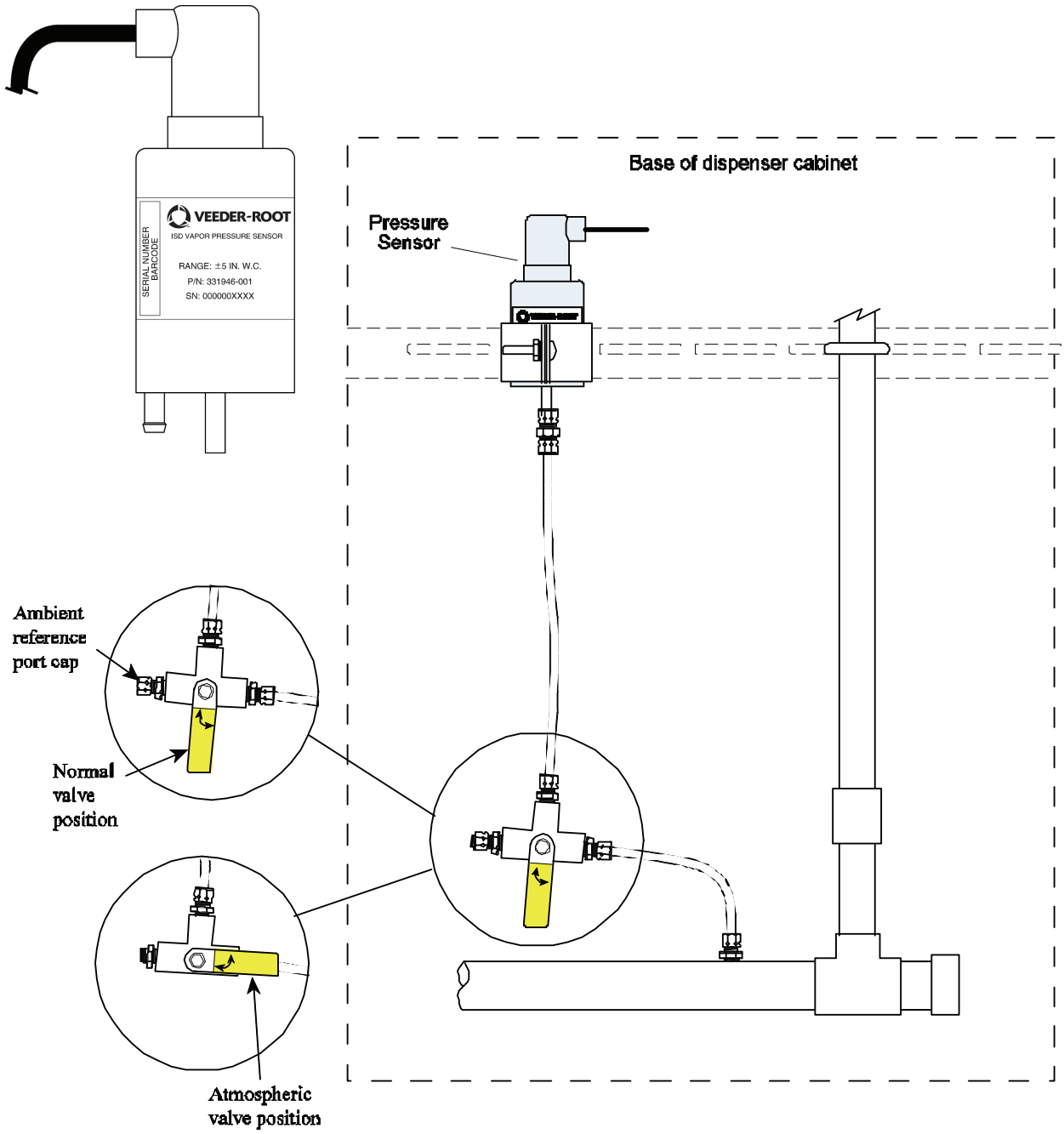


Figure 21. Vapor pressure sensor valve positions

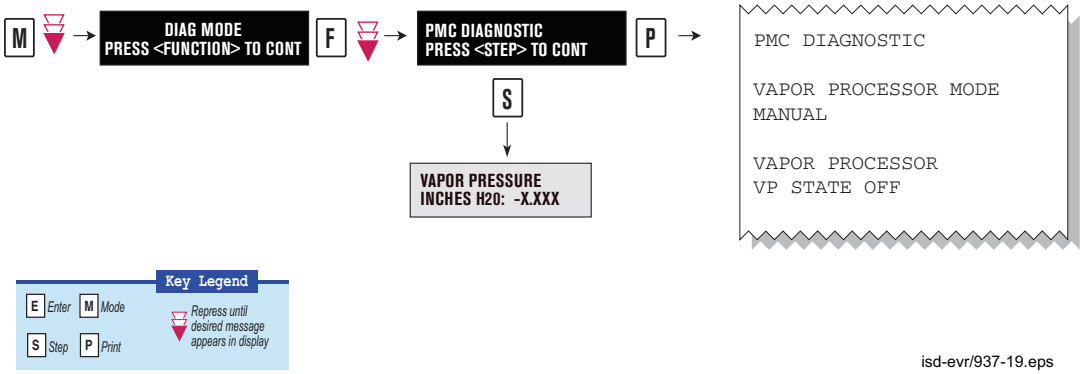


Figure 22. Accessing the vapor pressure sensor reading

Vapor Flow Meter Operability Test

This procedure is used to verify the setup and operation of the Vapor Flow Meter (VFM).

EQUIPMENT

Nitrogen High Pressure Cylinder with Pressure Regulator. Use a high pressure nitrogen cylinder capable of maintaining a pressure of at least 2000 pounds per square inch gauge (psig) and equipped with a compatible two-stage pressure regulator and a one psig relief valve. A ground strap is recommended during introduction of nitrogen into the system.

Flow meter. Use a flow meter (Rotometer) capable of accurately measuring nitrogen flow rate of 60 cubic feet per hour (cfh).

Pressure Measuring Device. An electronic pressure measuring device with a full range that shall not exceed 0-10 inches of water column (WC) with a minimum accuracy of 0.5 percent of full-scale. A 0-20 inches WC device may be used provided the minimum accuracy is 0.25 percent of full-scale.

Squeeze Bulb. A rubberized or equivalent device used to increase pressure to 5.00” WC.

Balance Nozzle Adapter (VST-STA-100). Provided by VST.

Surrogate Spout. Only the VST Surrogate Spout Assembly, VST-TSS-100, can be used to conduct the pre-test leak check. Figure 23 shows the VST Surrogate Spout Assembly.

Adapter Supply Hose. The nominal inside diameter of the flexible hose shall be between 0.75 and 1.00 inches, and the length of the tubing shall be between 3 feet and 6 feet.

Ball Valve. The nominal inside diameter of the ball valve shall be 0.25”.

Nitrogen Supply Line. The nominal inside diameter of the flexible tubing shall be between 0.25” and 0.375”.

Gas Volume Meter. Use a Dresser Measurement Roots Meter®, or equivalent (preferably fitted with a digital readout), to measure the volumetric flow rate through the Balance Nozzle Adapter. The gas volume meter shall be calibrated within180 days prior to conducting this procedure.

Stopwatch. Use a stopwatch accurate to within 0.2 seconds.

Lubricant. Appropriate lubricant, either grease or spray lubricant, shall be used to ensure a tight seal on the interface of the nozzle and the Balance Nozzle Adapter.

Leak Detection Solution. Any liquid solution designed to detect gaseous leaks may be used to verify the pressure integrity of test equipment during this test.

Notebook personal computer (PC) with ISD PC Setup Tool Version 1.03 or later. Serial communication cables are required to connect to the ISD system.

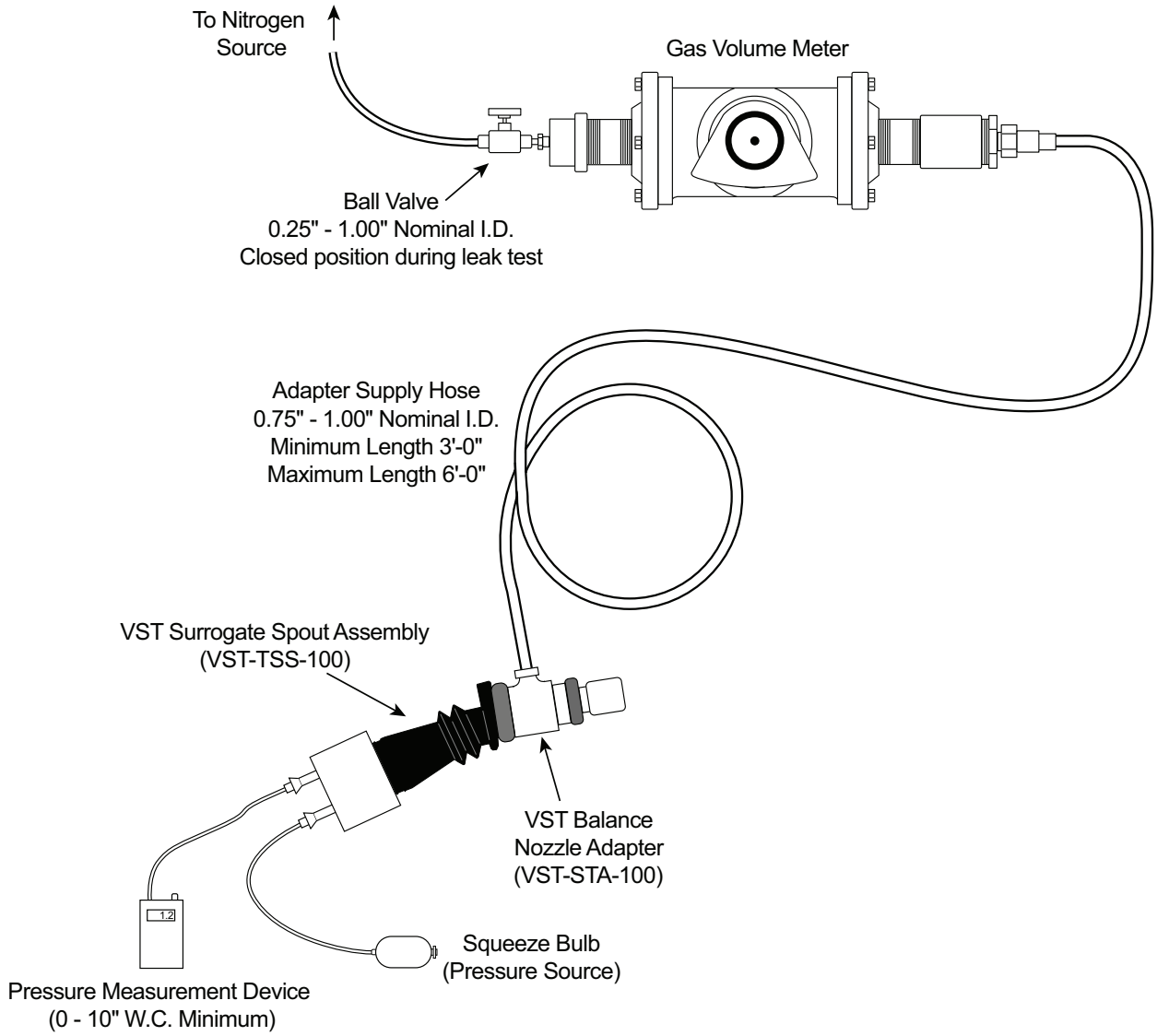


Figure 23. VST Surrogate Spout Assembly

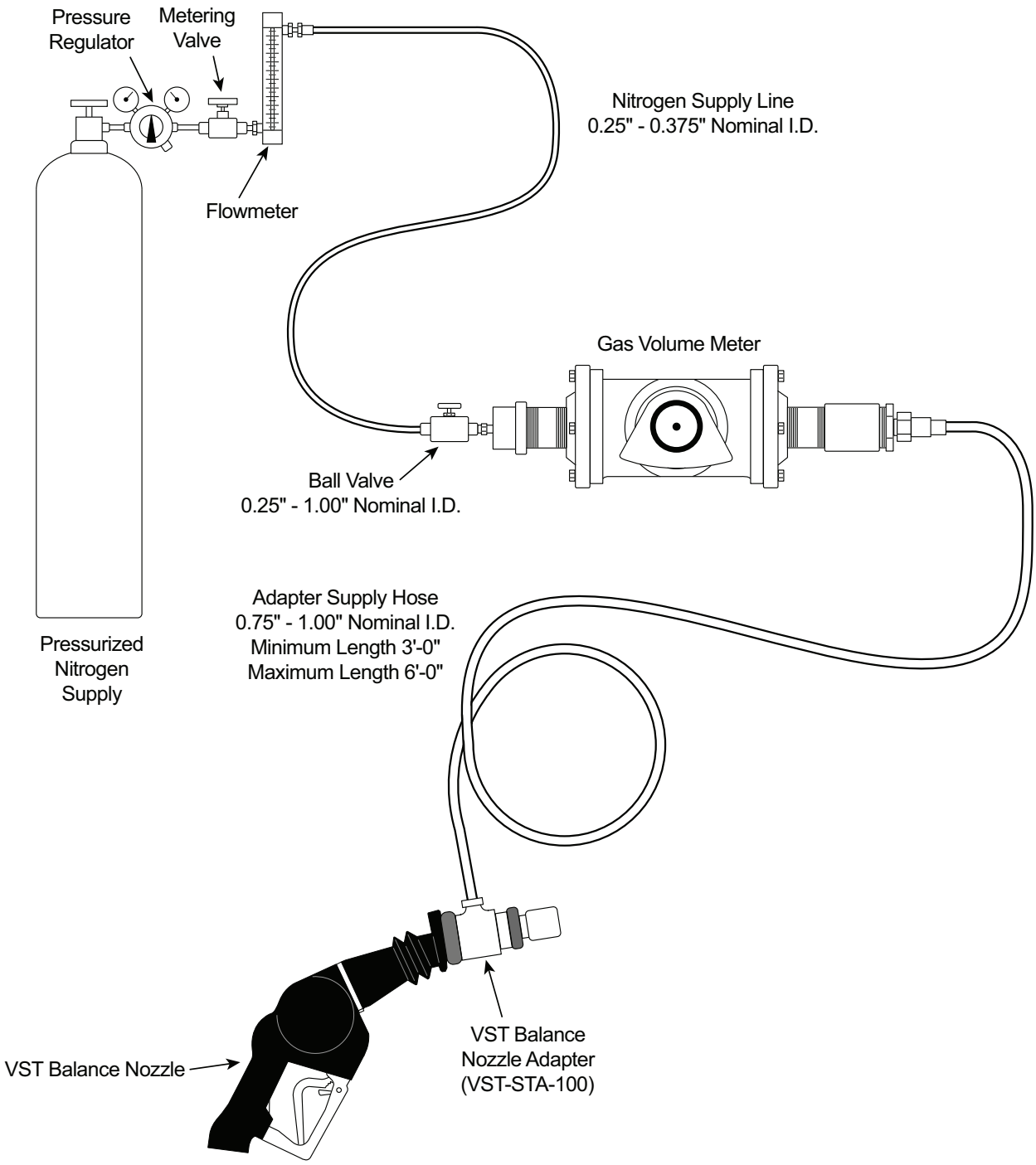


Figure 24. Vapor Flow Meter Test Assembly

PRE-TEST PROCEDURES

1. From the TLS, ISD Setup Menu print the ISD Setup Report. The ISD Hose Table will identify which VFM (column AA) is being used on each Fueling Position (FL).

```
ISD HOSE TABLE
ID  FP  FL  HL  AA  RR
------------------------
01  01  01  10  01  UU
02  02  02  10  01  UU
03  03  03  10  02  UU
04  04  04  10  02  UU
05  05  05  10  03  UU
06  06  06  10  03  UU
07  07  07  10  04  UU
08  08  08  10  04  UU
09  09  09  10  05  UU
10  10  10  10  05  UU
11  11  11  10  06  UU
12  12  12  10  06  UU

ISD AIRFLOW METER MAP
ID SERIAL NUM LABEL
------------------------
 1 00000111   AFM1 FP1 -
 2 00000112   AFM2 FP3 -
 3 00000113   AFM3 FP5 -
 4 00000114   AFM4 FP7 -
 5 00000115   AFM5 FP9 -
 6 00000116   AFM6 FP11
```

2. Connect the notebook PC running Veeder-Root's "ISD PC Setup Tool" terminal mode, v1.03 or higher, or use Microsoft HyperTerminal to the dedicated TLS serial port that is required for ISD reports access. Access the individual airflow meter totals for the airflow meter being tested using the following RS232 command: IV8700.

   Typical IV8700 Report

```
DEC 14, 2007  5:47 AM
AIR FLOW METER TOTALS
DATE-TIME                VOLUME
                    AFM  1    AFM  2    AFM  3    AFM  4
07-12-14 05:46:00 76739.892 63139.977 42860.023 44139.693
```

3. Conduct a pre-test leak check of the Balance Nozzle Adapter, the gas volume meter and the adapter supply hose by connecting the Balance Nozzle Adapter to a surrogate spout as shown in Figure 23. Turn the ball valve in the Figure 23 to the closed position. Raise the test pressure to 5.00" ±0.50" WC using a squeeze bulb. There shall not be a pressure drop of more than 1.00" WC from the above starting pressure for 30 seconds from the start of the test. If the leak test passes, proceed with the testing. If the leak test fails, proceed to isolate the source of the leak by pressurizing the test equipment again. Squirt liquid leak detector solution on interfaces and other potential leak sources and watch for the formation of bubbles. Once leak(s) are repaired, repeat the leak test procedure.

   Note: Leak checks shall be conducted in a shaded area or away from direct sunlight. Leak checks may be conducted during the testing to ensure leak integrity of test equipment.

4. Assemble the equipment as shown in Figure 24, Vapor Flow Meter Test Assembly. Leave the Balanced Nozzle Adaptor off of the nozzle at this time. Do not enable the dispenser to dispense product. Remove nozzle and utilize any method to keep the nozzle hook in the off position.
5. Ensure that the ground strap is properly connected to an acceptable ground.

   Note: The test requires that the nozzle be squeezed and liquid product must not flow from the dispenser.

TEST PROCEDURES

1. Prevent dispensing from all other fueling positions that use the VFM being tested.
2. Record the VFM serial number and fueling position being tested on the worksheet.
3. Completely drain any gasoline that may be in the nozzle and hose vapor return path by any acceptable method.
4. Continuing from Step 4 in the Pre-Test Procedures above, turn the ball valve to the open position and, adjust the nitrogen flow using the Rotometer to 60 cfh +/- 5.0 cfh.
5. Once the nitrogen flow is set, turn the ball valve to the closed position to stop the flow of nitrogen through the gas volume meter. This will ensure the nitrogen flow rate is set and the nitrogen can instantaneously be activated when the ball valve is turned to the open position.
6. Apply appropriate lubricant on the surface area in the Balance Nozzle Adapter. Lubricant can also be applied to the nozzle spout and the face seal (rubber boot) of the nozzle and the back of the Balance Nozzle Adapter if necessary.
7. Wait for two minutes of no air or liquid flow activity on the dispenser with the airflow meter being tested.
8. With the notebook PC connected to the TLS ISD, and the IV8700 Report page open, record the initial meter total for the VFM being tested on the worksheet.
9. Record the initial gas volume meter reading on the worksheet.
10. **Ensure the dispenser is <u>not</u> enabled to dispense product.** Simultaneously squeeze the nozzle handle to the full dispensing position and turn the ball valve to the open position to allow nitrogen to flow.

    Note: If the nozzle handle is not engaging the vapor/product valve within the nozzle, turn off the nitrogen flow using the ball valve; remove the Balance Nozzle Adapter from the nozzle to release the nitrogen pressure build up and repeat Steps 7 through 10. Excess pressure build up in the nozzle will engage the automatic shut-off diaphragm and not allow the vapor/product valve within the nozzle to open.
11. Monitor the gas volume meter display. Simultaneously stop the flow once 1.0 cubic feet (cf) +/- 0.10 cf of nitrogen is reached by turning the ball valve to the closed position and also releasing the nozzle handle.

    Note: Final volume values may be biased if the ball valve and the nozzle handle are not activated at the same time.
12. Record the end meter reading from the gas volume meter. Calculate the total cubic feet value by subtracting the initial meter reading obtained in Step 9 from the final meter reading in this step.
13. Convert the total cubic feet value to gallons using the equation on worksheet. Record the final gallon value on the worksheet.
14. Wait two minutes after each test run before obtaining the VFM reading from the notebook PC that is connected to the TLS ISD. A period of two minutes is required by the ISD system to receive and document total flow from the VFM.

15. Calculate the total VFM volume by subtracting the initial reading on Step 8 from the final reading on Step 14 and record the value on the worksheet.
16. Calculate the percent difference between the final gallons reading from the gas volume meter and the final VFM reading using the equation shown on the worksheet.

    Pass: If the volume percent difference between recorded ISD VFM and the gas volume meter is within 15%, check “Pass” on the worksheet, and repeat the Test Procedures for the next dispenser.

    Fail: If the volume percent difference between recorded ISD VFM and the gas volume meter is not within 15%, then go to Step 17.
17. Repeat Test Procedures using the opposite side of the dispenser. If test passes, continue to the next dispenser. If test fails, go to Step 18.
18. Conduct the leak test in Step 3 (of Pre-Test Procedures above) to evaluate the test equipment. If the equipment leak test passes go to Step 19. If the test fails, repair the leak and go to Step 17.
19. Replace the ISD flow meter and note the new vapor flow meter serial number on the form. Perform a Clear Test After Repair to reset tests for that dispenser, (see Section 7 of the ISD Install, Setup & Operation Manual, ISD/PMC Diagnostic Menus), at the TLS for both fueling positions on that dispenser.
20. After replacing the vapor flow meter repeat the Balance Vapor Flow Meter Operability Test.

POST-TEST PROCEDURES

1. Remove the Balance Nozzle Adapter and all equipment from the nozzle assembly.
2. A post-leak test of the equipment is not required if all the VFM’s are within range. For the VFM’s that are not within range, Steps 17 through 20 (of Test Procedures above) must be conducted. The leak test in Step 3 (of Pre-Test Procedures above) will be conducted to further evaluate the test equipment.
3. Prior to transportation, the inlet and outlet of the gas volume meter shall be carefully sealed to prevent foreign matter from entering the meter.

Site Shutdown Test

1. This test must be performed by a certified Veeder-Root contractor.
2. Remove power from TLS console.
3. Confirm power to submersible pumps is off by verifying that gasoline dispensing has been disabled.
4. Restore power to TLS console.
5. Complete Site Shutdown Worksheet

Veeder-Root Vapor Polisher Operability Test

See EO VR 204 Exhibit 11 and 12 for vapor polisher operability test.

Alarms

OVERVIEW OF TLS CONSOLE INTERFACE

The TLS console is continuously monitoring the vapor recovery system, PMC and ISD sensors for alarm conditions such as excessively high or low vapor collection, containment system vapor leakage and equipment problems.

During normal operation when the TLS console and monitored EVR/ISD System is functioning properly and no alarm conditions exist, the "ALL FUNCTIONS NORMAL" message will appear in the system status (bottom) line of the console display, and the green Power light will be On (see Figure 25).

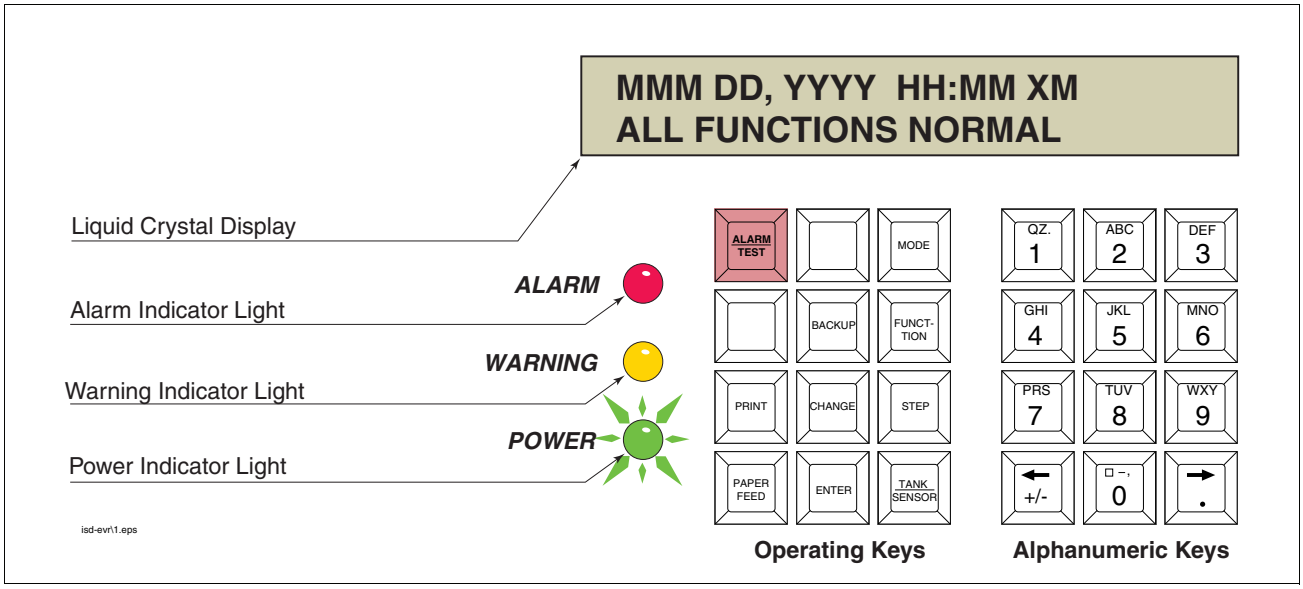


Figure 25. TLS console alarm interface

If an alarm condition occurs the system displays the condition type and its location. If more than one condition exists, the display will continuously cycle through the appropriate alarm messages. The system automatically prints an alarm report showing the alarm type, its location and the date and time the alarm condition occurred.

Warning and alarm posting causes the TLS console-based system to activate warning or failure indicator lights, an audible alarm, and an automatic strip paper printout documenting the warning or alarm. Historical reports of warning and alarm events are available for up to one year.

WARNING POSTING

Displayed messages alert you to the source and type of alarm. Printed messages show the type and location of the alarm. In the Warning example in Figure 26, the display's second line and printed message indicates that the containment system's vapor leak rate has increased above the allowed standard generating a warning.

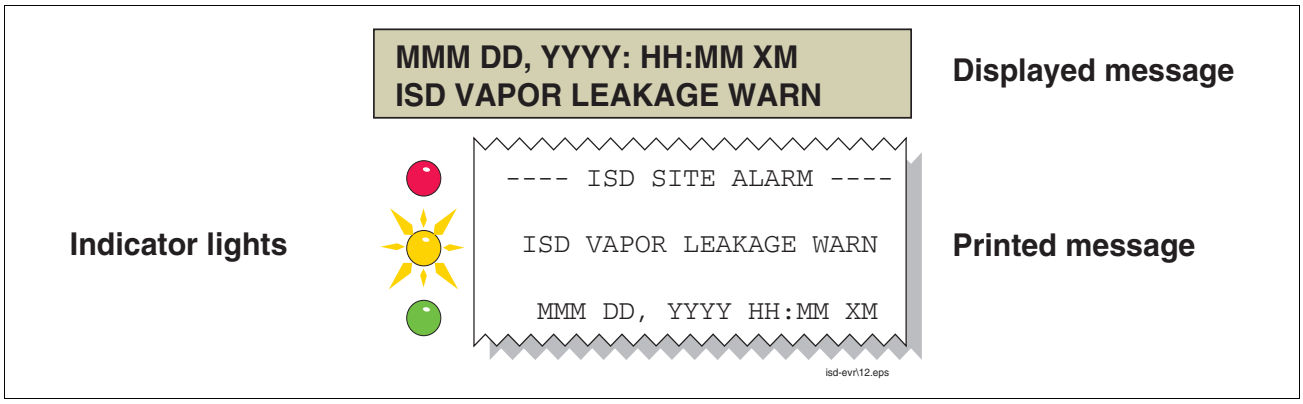


Figure 26. Example Warning posting

The TLS console also logs an entry to the Warning Log upon posting a warning.

ALARM POSTING

Displayed messages alert you to the source/number and type of alarm. Printed messages show the type and location of the alarm. In the alarm example in Figure 27 the display's second line and printed message indicates that vapor collection on hose 1, FP1 Super has dropped below the allowed standard resulting in a failure alarm. (By default, for unihose dispensers, FP1 BLEND3 will be displayed rather than FP1SUPER as shown below.)

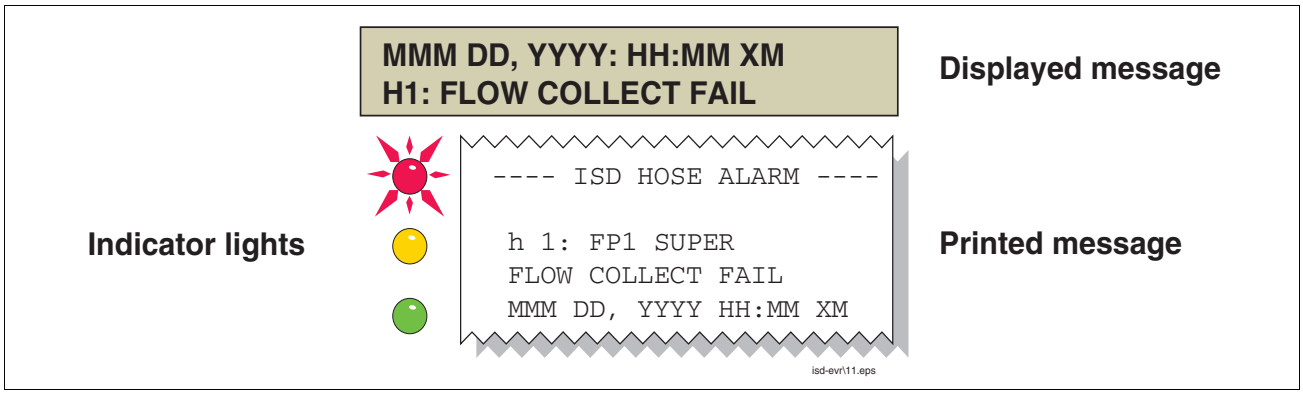


Figure 27. Example Alarm posting

Upon posting a failure alarm, the TLS console logs an entry to the Failure Log, prohibits fuel dispensing from all ISD gasoline fueling point(s) and logs a shutdown event to the Shutdown & Misc. Event Log.

The initial release of ISD will prohibit fuel dispensing from all gasoline fueling points by shutting down the submersible pumps in all gasoline tanks. The method of overriding an ISD Alarm shutdown is discussed in the “Site Reenable” section.

SITE REENABLE

The TLS console ALARM/TEST button allows you to perform a logged shutdown override and resume dispensing. Figure 28 illustrates the ISD alarm override procedure.

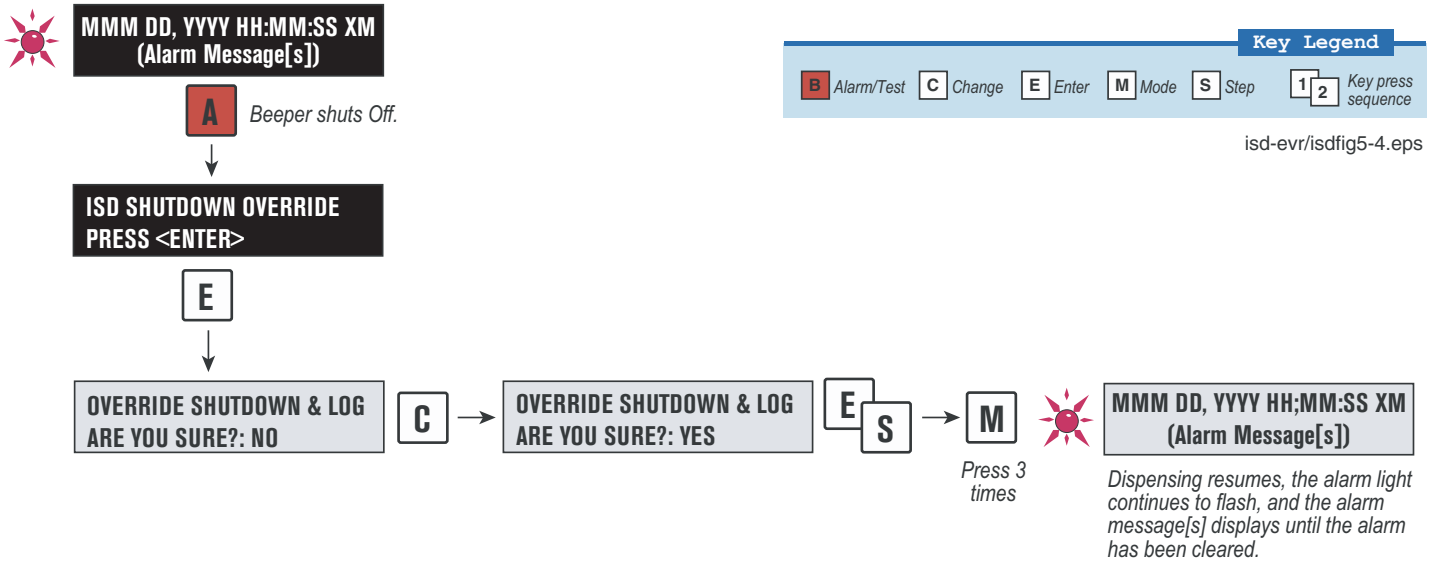


Figure 28. ISD Alarm Override Procedure

ALARM LOGS

Alarms will be recorded in the Warning Log or Failure Log of the monthly reports, which can be viewed electronically or via the integral printer (if queued in the most recent 10 events). The following example shows an excerpt from an electronically accessed monthly report.

Monthly Report Warning & Failure Log Examples:

```
WARNING ALARMS
DATE     TIME     DESCRIPTION                      READING         VALUE
08-03-15 00:01:26 FLOW PERFORMANCE HOSE BLOCKAGE   FP12 BLEND4      BLKD
08-02-17 00:00:49 FLOW PERFORMANCE HOSE BLOCKAGE   FP 1 BLEND4       0.59
08-02-01 00:01:07 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  22.39
FAILURE ALARMS
DATE     TIME     DESCRIPTION                      READING         VALUE
08-03-14 00:01:26 FLOW PERFORMANCE HOSE BLOCKAGE   FP12 BLEND4      BLKD
08-02-13 00:01:45 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  36.56
08-02-12 00:01:46 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  37.74
08-02-11 00:01:57 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  30.10
```

ALARM SEQUENCE

Each ISD monitoring test operates once each day on sensor data gathered over a fixed time interval and with a minimum required number of monitored events. The interval is a fixed number of calendar days depending on the test being run. As an example, the ISD Gross Pressure Containment Monitoring test requires seven calendar days of data. In this example, each daily test result represents a test based on the prior seven days' time period. When a test first fails, a warning is posted and a warning event is logged. If this condition persists for seven more consecutive days, an alarm is posted, a failure alarm event is logged and the site is shutdown. If the condition continues, additional failure events are logged and the site will continue to be shutdown each day.

ISD Alarm Summary

Table 3 summarizes the ISD Alarms - Alarms with a superscript 2 will result in a site shutdown.

Table 3. ISD Alarm Summary

Displayed Message	ISD Monitoring Category	Indicator Light	Cause	Suggested Troubleshooting[1]
ISD VAPOR LEAKAGE WARN	Containment	Yellow	Containment system leaks at 2 times the TP-201.3 standard	• Troubleshooting Guide found at www.vsthose.com. • Exhibit 4
ISD VAPOR LEAKAGE FAIL[2]	Containment	Red	8th Consecutive Failure of Pressure Integrity (Vapor Leak) Test	
ISD GROSS PRESSURE WARN	Containment	Yellow	95th percentile of 7-days' ullage pressure exceeds 1.3 IWC	• Troubleshooting Guide found at www.vsthose.com. • Exhibit 8 • Exhibit 9
ISD GROSS PRESSURE FAIL[2]	Containment	Red	8th Consecutive Failure of Gross Containment Pressure Test	
ISD DEGRD PRESSURE WARN	Containment	Yellow	75th percentile of 30-days' ullage pressure exceeds 0.3 IWC	
ISD DEGRD PRESSURE FAIL[2]	Containment	Red	31st Consecutive Failure of Degradation Pressure Test	
hnn: FLOW COLLECT WARN	Collection	Yellow	Vapor collection flow performance is less than 50%	• Troubleshooting Guide found at www.vsthose.com. • Exhibit 5 • Exhibit 13
hnn: FLOW COLLECT FAIL[2]	Collection	Red	2nd Consecutive Failure of Vapor Collection Flow Performance Monitoring Test	
ISD VP STATUS WARN[4]	Processor	Yellow	Failure of Vapor Processor Effluent Emissions or Duty Cycle test	• Troubleshooting Guide found at www.vsthose.com. • VP Emission Test • VP Duty Cycle Test
ISD VP STATUS FAIL[2,4]	Processor	Red	2nd Consecutive Failure of Vapor Processor Status test	

Table 3. ISD Alarm Summary

Displayed Message	ISD Monitoring Category	Indicator Light	Cause	Suggested Troubleshooting[1]
ISD VP PRESSURE WARN[4,5]	Processor	Yellow	90th percentile of 1 day ullage pressure exceeds 1 IWC[4] 90th percentile of 1 day ullage pressure exceeds 2.5 IWC[5]	• Troubleshooting Guide found at www.vsthose.com. • Exhibit 8 • Exhibit 9 • Ehibit 11 and 12
ISD VP PRESSURE FAIL[2,4,5]	Processor	Red	2nd Consecutive Failure of Vapor Processor Overpressure Test	
VP EMISSION WARN[3,4]	Processor	Yellow	Mass emission exceeded the certified threshold	• Troubleshooting Guide found at www.vsthose.com. • Exhibit 6 • Exhibit 9
VP EMISSION FAIL[4]	Processor	Red	2nd Consecutive Mass emission test failure	
VP DUTY CYCLE WARN[3,4]	Processor	Yellow	Duty cycle exceeds 18 hours per day 0r 75% of 24 hours	• Troubleshooting Guidefound at www.vsthose.com. • PMC Setup Procedure • Exhibit 8 • Exhibit 9 • Exhibit 4
VP DUTY CYCLE FAIL[4]	Processor	Red	2nd Consecutive Duty Cycle Test Failure	
ISD SENSOR OUT WARN	Self-Test	Yellow	Failure of Sensor Self-Test	• Confirm ISD sensor & module installation / communication per VR 204 IOM Section 16, Chapter 2
ISD SENSOR OUT FAIL	Self-Test	Red	8th Consecutive Failure of Sensor Self-Test	
ISD SETUP WARN	Self-Test	Yellow	Failure of Setup Test	• Confirm EVR/ISD programming per VR 204 IOM Section 16
ISD SETUP FAIL	Self-Test	Red	8th Consecutive Failure of Setup Test	

[1]See ISD Troubleshooting Manual, P/N 577013-819, and the VST ISD Troubleshooting Guide 9513-003 found at www.vsthose.com for a complete list of suggestions.

[2]SD Shutdown Alarms - see “Site Reenable” on page 16-36.

[3]This warning will result in a ISD VP Status Warn.

[4]VST ECS Membrane Processor.

[5]Veeder-Root Polisher

Other Alarms

Table 4 summarizes additional alarms that may be posted by ISD related equipment. These alarms are not critical to vapor recovery functionality, but could indicate erroneous setup or equipment malfunction. NOTE: Additional TLS console alarms listed in the TLS-3XX Operator's manual may be posted and may lead to an ISD shutdown alarm if persistent (see ISD Troubleshooting Manual for details).

Table 4. Other Alarms

Displayed Message	Indicator Light	Set Condition	Clear Condition
MISSING RELAY SETUP	Red	One or more required shutdown alarms have not been assigned to a relay.	Setup required shutdown alarms.
MISSING TANK SETUP	Red	There are no vapor recovery (gasoline) tanks defined or a gasoline pump has not been assigned to a control (shut down) device in at least one tank.	Complete gasoline tank setup.
MISSING HOSE SETUP	Red	There are no product meters assigned to a hose.	Assign at least 1 product meter to a hose.
hnn: VPRFLOW MTR SETUP	Red	Incoming transaction from a hose with an unavailable Vapor Flow Meter.	Configure Vapor Flow Meter (Smart Sensor) and enable it in ISD.
MISSING VAPOR PRES SEN	Red	There is no Vapor Pressure Sensor setup or detected.	Complete Vapor Pressure Sensor setup.
MISSING VAPOR FLOW MTR	Red	There is no Vapor Flow Meter setup or detected.	Complete Vapor Flow Meter setup.
fnn: CHK VAPOR FLOW MTR	Red	Failure of locked rotor test - possible locked vapor flow meter.	Locked rotor test passes or vapor flow meter deconfigured, or test cleared.

Reports

There are two main reports (CP-201 required) that are stored by the ISD system: the Monthly Status Report, stored for 12-months, and the Daily Status Report, stored for 365 days. A third report discussed in this section is the ISD Status Report. You can print out ISD reports from the TLS console front panel as shown in Figure 29.

- The monthly report includes:
  - ISD operational up-time (as a percentage)
  - EVR/ISD system pass time (as a percentage)
  - The Warning Log
  - The Failure Log
  - The Misc. Event Log
- The daily report includes:
  - Maximum and minimum ullage pressures
  - Results of the Vapor Containment Monitoring Gross (75th percentile), Degradation (95th percentile) ullage pressure test and Vapor Leakage Detection (CVLD) tests
  - Vapor Collection Monitoring test results for each fueling position
  - Vapor Processor Monitoring test results
- ISD Status Report
  - Last test report results

VIEWING ISD REPORTS

You can print out ISD reports from the TLS console front panel as shown in Figure 29.

.

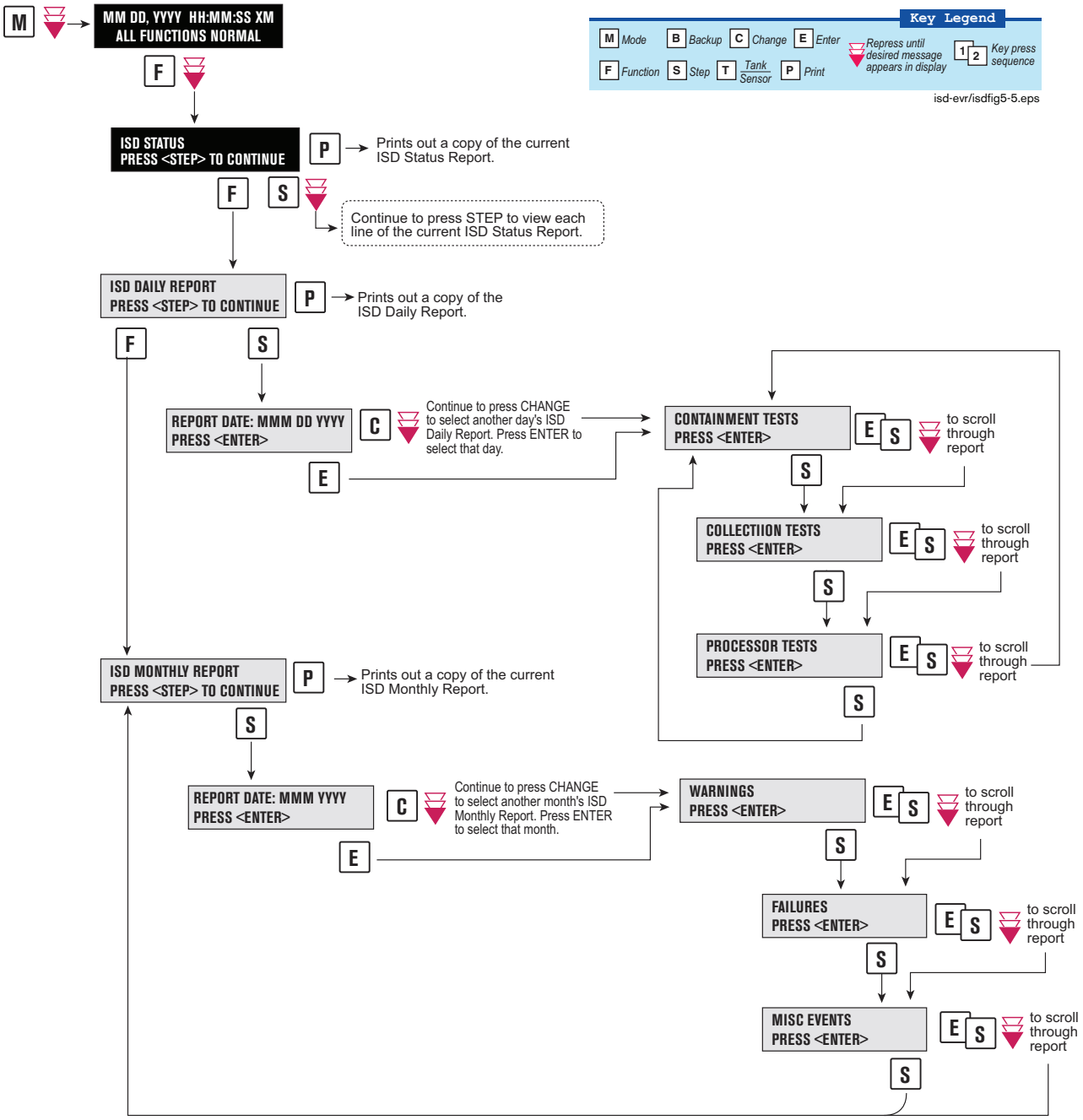


Figure 29. Printing ISD Reports on Console Printer

Figure 30 shows an example ISD Status Report.

```
ISD STATUS

(SITE NAME)
(SITE STREET)
(CITY,ST)
(PHONE)

(MMM DD, YYYY HH:MM XM)

EVR TYPE: BALANCE
ISD VERSION 01.02

REPORT DATE:SEP 22, 2004

CONTAINMENT TEST GROSS
STATUS: 0.1"WC NOTEST

CONTAINMENT TEST DEGRADE
STATUS: -1.1"WC NOTEST

CONTAINMENT TEST CVLD
STATUS: 3.26CFH NOTEST

COLLECTION FLOW TEST
STATUS: PASS

ISD SENSOR SELF TEST
STATUS: PASS

ISD SETUP SELF TEST
STATUS: PASS

VP STATUS TEST
STATUS: PASS

VP OVER PRESSURE TEST
STATUS: 0.2"WC PASS

EFFLUENT EMISSIONS TEST
STATUS  5.26     PASS

VP DUTY CYCLE TEST
STATUS  5.00     PASS
```

This menu appears only if EVR type = BALANCE

isd-evr\937-8.eps

Figure 30. ISD Status Report Example - TLS console printout

Figure 31 shows an example ISD Daily Report.

```
ISD DAILY REPORT

(SITE NAME)
(SITE STREET)
(CITY,ST)
(PHONE)
(MMM DD, YYYY HH:MM XM)

EVR TYPE: BALANCE
ISD VERSION 01.02
VAPOR PROCESSOR TYPE
VEEDER-ROOT POLISHER

REPORT DATE: MMM  DD
ISD VERSION 01.02

OVERALL STATUS   PASS
EVR CONTAINMENT  NOTEST
EVR COLLECTION   PASS
STAGE1   2 of   2 PASS
VAPOR PROCESSOR  PASS
SELF TEST        PASS
ISD MONITOR UP-TIME 100%

    ----------------
CONTAINMENT TESTS

GROSS    95%   -0.0N "WC
DGRD     75%   -0.7N "WC
VAPOR LEAK        0N CFH
MAX             0.9  "WC
MIN            -5.0  "WC

    ----------------
COLLECTION TESTS
GROSS
V/L(#)

FP 1: BLEND4
V/L = 0.94( 32)
FP 2: BLEND4
V/L = 0.96( 66)
::::::
FP11: BLEND4
V/L = 1.08( 40)
FP12: BLEND4
V/L = 1.09( 56)

    ----------------
PROCESSOR TESTS
         :
VP OVER PRESSURE TEST
STATUS -0.09"WC  PASS

VP STATUS TEST
STATUS           PASS

EFFLUENT EMISSIONS TEST
0.084 LB/1KG   PASS

VP DUTY CYCLE TEST
STATUS  0.55     PASS

    ----------------
SELF TEST

SETUP TEST       PASS
SENSOR OUT TEST  PASS
```

isd-evr\937-9.eps

Figure 31. ISD Daily Report Example - TLS console printout

Figure 32 shows an example ISD Monthly Report.

```
ISD MONTHLY REPORT

(SITE NAME)
(SITE STREET)
(CITY,ST)
(PHONE)
(MMM DD, YYYY HH:MM XM)

EVR TYPE: BALANCE
ISD VERSION 01.02
VAPOR PROCESSOR TYPE
VEEDER-ROOT POLISHER

REPORT DATE: MMM YYYY

OVERALL STATUS   PASS
EVR CONTAINMENT  NOTEST
EVR COLLECTION   PASS
STAGE1   2 of   2 NOTEST
VAPOR PROCESSOR  PASS
SELF TEST        PASS
ISD MONITOR UP-TIME:100%
EVR/ISD PASS TIME: 100%

    ----------------
DATE  TIME  DEVICE  HOSE
DESCRIPTION        VALUE

    ----------------
LAST 10 WARNINGS


    ----------------
LAST 10 FAILURES


    ----------------
LAST 10 MISC EVENTS

 1-02-08 11:59PM
READINESS ISD
ISD:PP EVR:PNP PENDING

 1-01-08 11:59PM
READINESS ISD
ISD:PP EVR:NNP PENDING
```

isd-evr\937-10.eps

Note: Warning & Failures lists include monitoring results from:
- Containment
- Stage 1
- Collection
- Processor

Up to 10 failures and 10 warnings

FP is fueling position number
BLEND is a hose label
BLKD refers to blocked condition

Note: Events
At least 1 action event for every failure listed above.

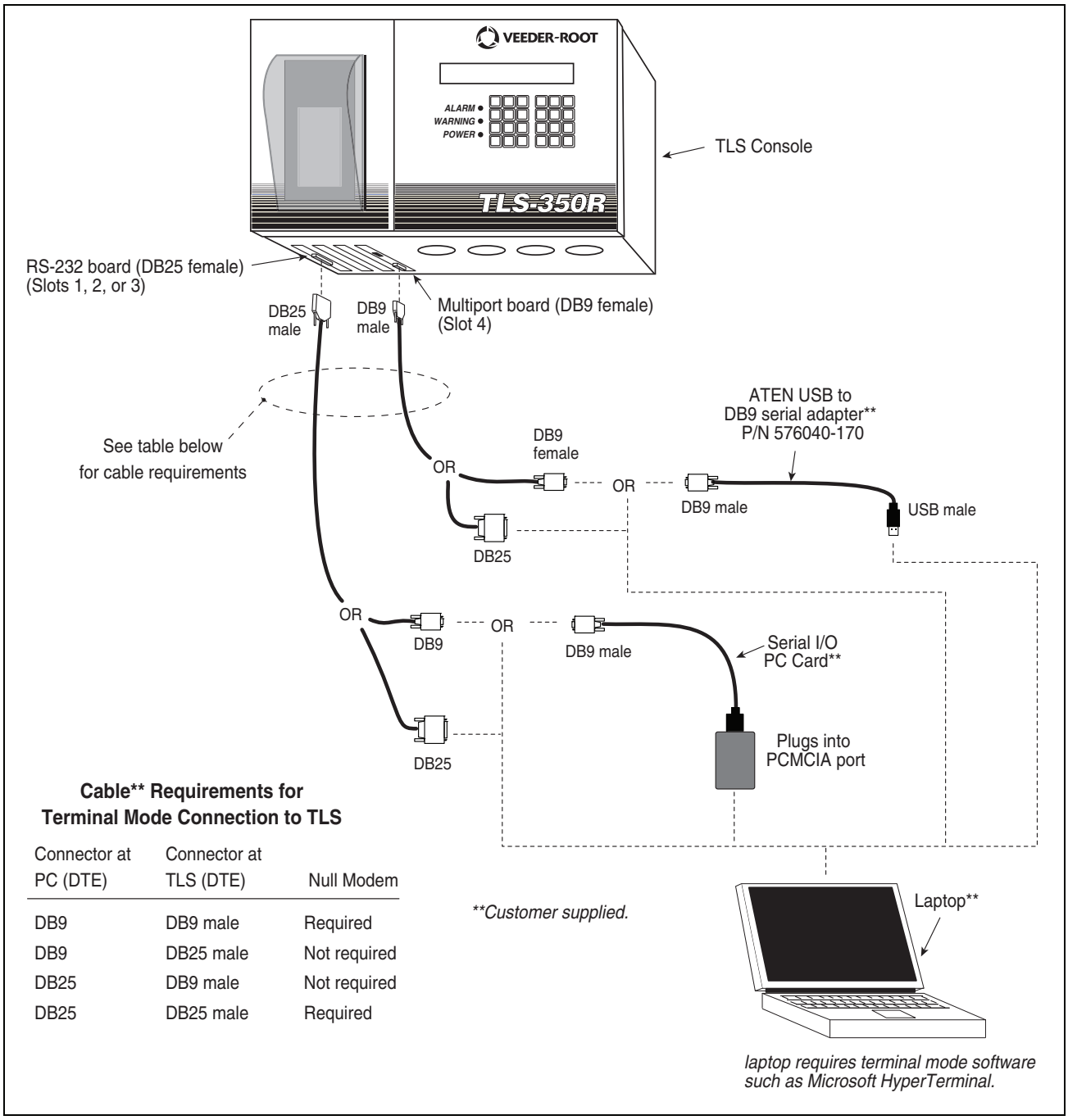
Description is truncated to include action. Up to 10 shut down and misc. events.

Figure 32. ISD Monthly Report Example - TLS console printout

Viewing ISD Reports via RS-232 Connection

CONNECTING LAPTOP TO CONSOLE

Connect your laptop to the TLS console's RS-232 or Multiport module using one of the methods shown in the examples in Figure 33 below.



Cable Requirements for Terminal Mode Connection to TLS**

Connector at PC (DTE)	Connector at TLS (DTE)	Null Modem
DB9	DB9 male	Required
DB9	DB25 male	Not required
DB25	DB9 male	Not required
DB25	DB25 male	Required

***Customer supplied.*

Figure 33. Connecting laptop to TLS console for serial communication

CONNECTING LAPTOP TO CONSOLE

1. Open your laptop's serial communication program, e.g., HyperTerminal. You can typically find HyperTerminal under: Start/Programs/Accessories/Communications.
2. After opening the terminal software program, ignore (cancel) any modem/dialing related request windows since you will be directly connecting to the console via serial communications. When the Connection Description window appears (Figure 34), enter a connection name, e.g., TLSDIRECT, and click the OK button.

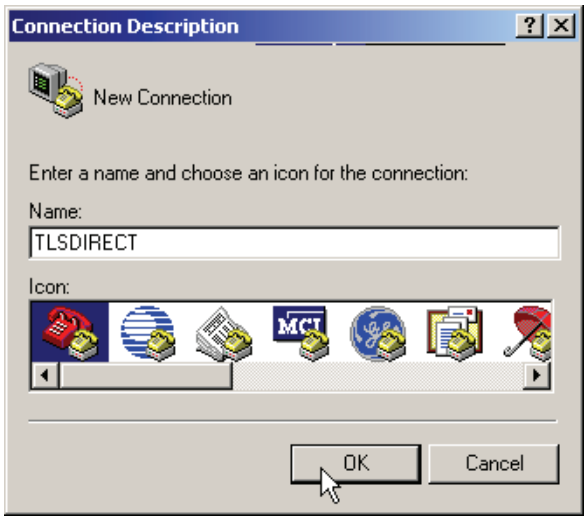


Figure 34. Connection Description window

3. After clicking the OK button, you may see a repeat of the modem/dialing windows, in which case ignore (cancel) them all.
4. When the Connect To window appears (Figure 35), depending on your connection method, select either COM1 (If RS-232 port on laptop), USB-Serial Controller (if using USB port on laptop), or Serial I/O PC Card (if using PCMCIA port on laptop) in the 'Connect using' drop down box, then click OK button.

Figure 35. Connect To window

5. Next you should see the 'Port Settings' window.

IMPORTANT! The settings of the laptop's com port must match those of the console's com port to which you are connected.

a. Go to the console front panel press the MODE key until you see:

```
SETUP MODE
PRESS <FUNCTION> TO CONT
```

b. Press the FUNCTION key until you see the message:

```
COMMUNICATIONS SETUP
PRESS <STEP> TO CONTINUE
```

c. Press the STEP key until you see the message:

```
PORT SETTINGS
PRESS <ENTER>
```

d. Press the PRINT key to printout the port settings for all communication modules installed in the console. Figure 36 shows an example port settings printout with the RS-232 module installed. Using the console port settings in the example below, your HyperTerminal 'Port Settings' window entries would be Bits per second - 2400, Data bits - 7, Parity - Odd, Stop Bits - 1. For the 'Flow Control' entry select None. Click OK.

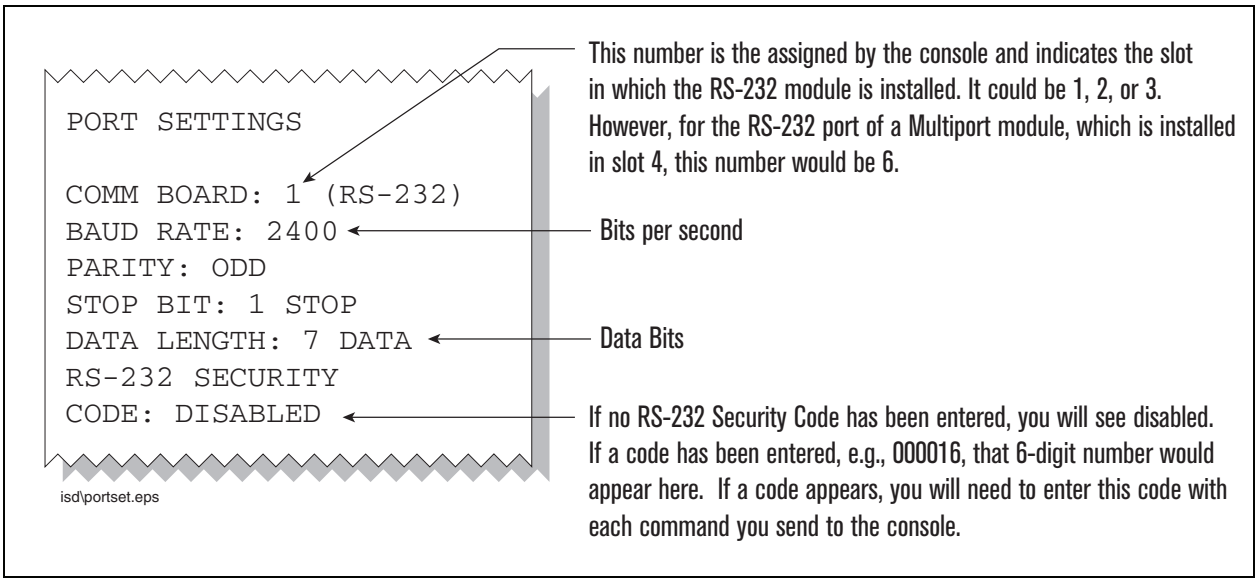


Figure 36. Console comm port settings prinout example

In the example port settings printout above, the RS-232 Security Code is disabled. If the code was enabled you would see a 6-digit number which you will need to enter to access the console (refer to the 'Sending Console Commands' paragraph below for more information).

6. After entering your port settings, the program's main window appears (Figure 37).

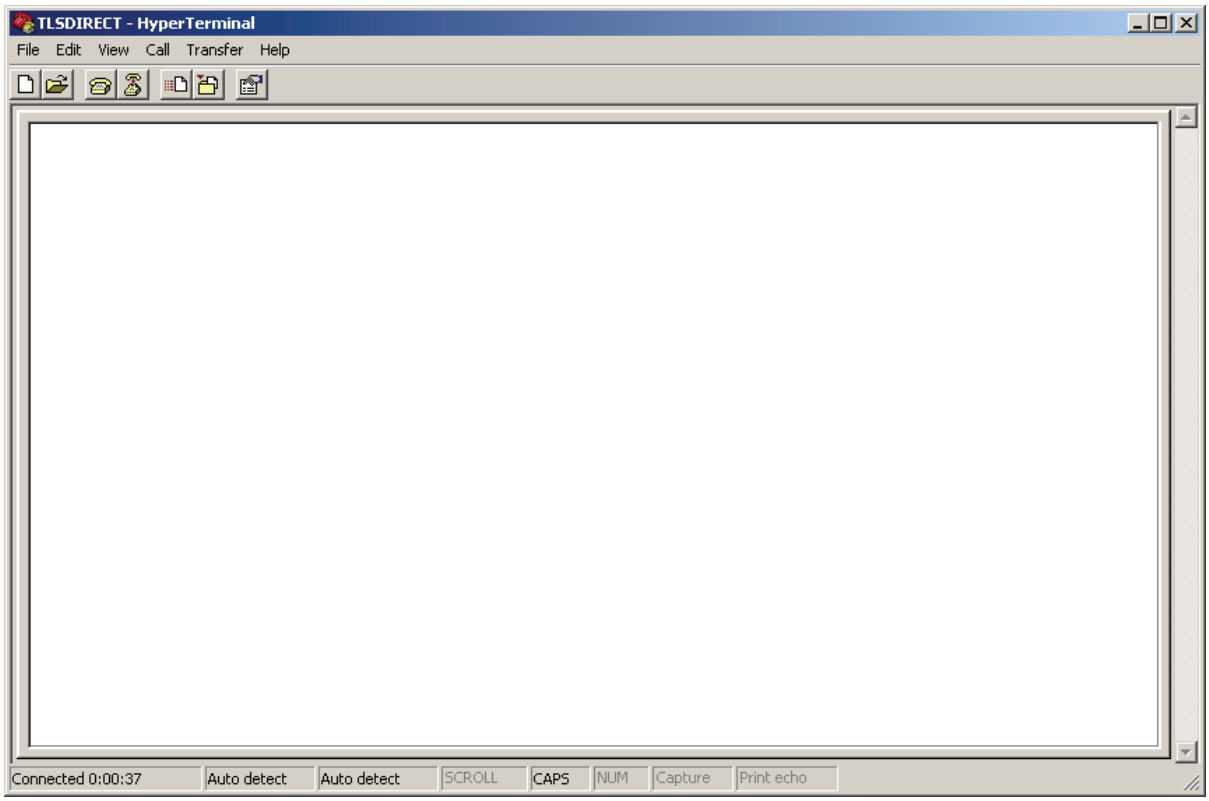


Figure 37. HyperTerminal main window

SENDING CONSOLE COMMANDS

Table 5 shows four important ISD console commands: IV0500, IV0200, IV0100, and IB6100. The <SOH> shown in the table means that you must press and hold the **Cntrl** key while you press the **A** key.

For example, let's say you want to see the Daily Report Details for the last 10 days.

Note: If you want to see the characters of the command as you type them in, click on File menu, then select Properties/Settings (tab)/ASCII Setup and click the check box for 'Echo typed characters locally', then click OK to close the window(s) and return to the main screen.

If the RS-232 Security Code is disabled - press and hold the Ctrl key while you press the A key, then type in IV0500010. If the RS-232 Security Code is enabled (e.g., 000016) you must enter the security code before the command - press and hold the Ctrl key while you press the A key, then type in 000016IV0500010.

You will see the typed command on the screen: ☺IV0500010 followed by the response (report) from the console. The ☺ symbol indicates CrtlA and the ♥ symbol indicates the end of the response.

If the console recognizes the command the response displays as soon as the command is typed in.

If the console does not recognize the command you would see something like ☺IV0500010☺9999FF1B♥ which indicates the console did not recognize the command.

All responses (Reports) can be printed or saved to a file. See the terminal program's help file for instructions.

Table 5. Serial Commands for ISD Alarm, Monthly, and Daily Reports

Report Type	Serial Command (PC to Console)*
Daily Report Details (See example Figure 38)	<SOH>IV0500ddd Where ddd = number of days, 001 = yesterday and today, 002 = two days ago, etc.
Monthly Status Report (See example Figure 39)	<SOH>IV0200yyyymm Where yyyy = year number, e.g. 2003, mm = month number, 01 = January, 02 = February, etc.
Alarm Status (See example Figure 40)	<SOH>IV0100
V80 Vapor Processor Runtime Diagnostic Report (See examples Figure 41 and Figure 42)	<SOH>IV8000
Vapor Valve Status Report (See example Figure 43)	<SOH>IB6100
Daily Vapor Polisher Diagnostic Report (See example Figure 45)	<SOH>IV8800

*<SOH> = Control A. For more information on TLS console serial commands, refer to the V-R Serial Interface Manual.

```
IV0500
JAN  8, 2008  3:52 PM                                                    isd-evr\937-11.eps

(SITE NAME)
(SITE STREET)
(CITY, ST)
(PHONE)

ISD DAILY REPORT DETAILS

EVR TYPE: BALANCE
ISD TYPE: 01.02
VAPOR PROCESSOR TYPE: VEEDER-ROOT POLISHER

OVERALL STATUS             :WARN            EVR VAPOR COLLECTION :PASS
EVR VAPOR CONTAINMENT      :WARN
ISD MONITOR UP-TIME        :100%            STAGE I TRANSFERS: 10 of 10 PASS
EVR/ISD PASS TIME          : 81%            VAPOR PROCESSOR      :PASS

Status Codes: (W)Warn (F)Fail (D)Degradation Fail (G)Gross Fail
(ISD-W)ISD Self-Test Warning (ISD-F)ISD Self-Test Fail (N)No Test

       ISD   ISD  ---CONTAINMENT TESTS---     STAGE        ---COLLECTION TESTS
       EVR   %UP  GROSS  DGRD  MAX  MIN  LEAK   I   VAPOR  FP1   FP2   FP3
DATE  STATUS TIME  95%    75%  "WC  "WC  CFH   XFR  PRCSR  BLEND BLEND BLEND
12/28   W    100%  0.2  -0.3   0.7 -2.5   18W PASS  PASS   0.94  1.07  1.10
12/29   W    100%  0.2  -0.3   0.7 -3.0   16W PASS  PASS   0.95  0.85  1.11
12/30   PASS 100%  0.2  -0.3   0.7 -4.1    0  PASS  PASS   0.95N 0.99  1.02
12/31   PASS 100%  0.2  -0.3   0.8 -3.0    0  PASS  PASS   0.97  0.96  1.17
01/01   PASS 100%  0.2  -0.3  -0.2 -3.3    0        PASS   0.86  1.02  0.99
01/02   PASS 100%  0.2  -0.3   0.9 -5.0    0  PASS  PASS   0.94  0.96  1.20
01/03   PASS 100%  0.2  -0.3   1.1 -4.3    0  PASS  PASS   0.82  1.10  1.13
01/04   PASS 100%  0.4  -0.3   1.9 -2.8    0        PASS   1.07  1.01  1.10
01/05   PASS 100%  0.2  -0.3   2.8 -5.0    0  PASS  PASS   0.97  1.12  0.84
01/06   PASS 100%  0.2  -0.3   0.4 -5.0    0  PASS  PASS   0.80  1.23  1.11
01/07   PASS 100%  0.2  -0.3   0.6 -5.0    0  PASS  PASS   0.93  0.96  1.07

---COLLECTION TESTS-DAILY AVERAGE HOSE FLOW PERFORMANCE-----------------------
      FP4   FP5   FP6   FP7   FP8   FP9   FP10  FP11  FP12
DATE  BLEND BLEND BLEND BLEND BLEND BLEND BLEND BLEND BLEND
12/28 1.06  1.16  0.96  1.21  1.10  1.03  1.08  1.13  1.13
12/29 1.03  1.12  1.16  1.07  1.13  1.01  0.97  1.06  1.06
12/30 1.04  0.96  0.95  1.06  1.11  0.97  1.14  1.18  0.94
12/31 1.07  1.20  1.05  1.10  1.00  0.90  1.09  1.07  1.27
01/01 1.03  1.18  1.19  0.85  1.16  1.24  1.13  1.31  1.16
01/02 0.94  0.98  1.10  0.97  1.10  0.91  0.98  1.08  1.09
01/03 1.12  0.96  1.17  1.12  1.07  1.06  1.12  1.12  1.10
01/04 1.04  1.18  1.09  1.16  1.16  0.90  1.19  1.05  1.13
01/05 1.13  0.94  1.11  1.02  1.10  1.10  1.21  1.19  1.04
01/06 1.11  1.14  1.09  1.10  1.18  0.95  1.15  1.09  1.05
01/07 0.96  1.13  1.07  0.84  1.13  1.02  1.06  1.12  1.00
```

Figure 38. ISD Daily Report Details - Serial to PC Format

```
IV0200
JAN  8, 2008  3:53 PM                                                    isd-evr\937-12.eps

(SITE NAME)
(SITE STREET)
(CITY, ST)
(PHONE)

ISD MONTHLY STATUS REPORT

EVR TYPE: BALANCE
ISD TYPE: 01.02
VAPOR PROCESSOR TYPE: VEEDER-ROOT POLISHER

OVERALL STATUS             :FAIL            EVR VAPOR COLLECTION :FAIL
EVR VAPOR CONTAINMENT      :WARN
ISD MONITOR UP-TIME        :100%            STAGE I TRANSFERS: 33 of 33 PASS
EVR/ISD PASS TIME          : 77%            VAPOR PROCESSOR      :WARN

CARB EVR CERTIFIED OPERATING REQUIREMENTS

ISD MONITORING TEST PASS/FAIL THRESHOLDS
                                                     PERIOD    BELOW  ABOVE

VAPOR COLLECTION BALANCE SYS FLOW PERFORMANCE         1DAYS     0.60  ----
VAPOR CONTAINMENT GROSS FAIL, 95th PERCENTILE         7DAYS     ----  1.30"wcg
VAPOR CONTAINMENT DEGRADATION, 75th PERCENTILE       30DAYS     ----  0.30"wcg
VAPOR CONTAINMENT LEAK DETECTION FAIL @2"WCG          7DAYS     ----  9.38cfh
STAGE I VAPOR TRANSFER FAIL, 50th PERCENTILE         20MINS     ----  2.50"wcg
VAPOR PROCESSOR PRESSURE FAIL                         1DAYS     ----  1.00"wcg
VAPOR PROCESSOR MASS EMISSION FAIL (LB/1KG)           1DAYS     ----  0.64
VAPOR PROCESSOR DUTY CYCLE FAIL                       1DAYS     ----  75.00%

WARNING ALARMS
DATE     TIME     DESCRIPTION                      READING         VALUE
07-12-30 00:02:33 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  15.51
07-12-29 00:02:07 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  18.24
07-12-28 00:02:01 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  17.34
07-12-27 00:01:36 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  17.11
07-12-26 00:01:41 VAPOR CONTAINMENT LEAKAGE        CFH@2 INCHES WC  18.66
07-12-10 00:02:05 FLOW PERFORMANCE HOSE BLOCKAGE   FP 8 BLEND4      BLKD
07-12-06 00:02:40 VAPOR PROCESSOR OVER PRESSURE    DAILY 90%         2.6
FAILURE ALARMS
DATE     TIME     DESCRIPTION                      READING         VALUE
07-12-11 00:02:05 FLOW PERFORMANCE HOSE BLOCKAGE   FP 8 BLEND4      BLKD

SHUTDOWN & MISCELLANEOUS EVENTS
DATE     TIME     DESCRIPTION                      ACTION/NAME
07-12-13 19:52:52 VAPOR PROCESSOR                 TEST MANUALLY CLEARED
07-12-11 00:02:18 FLOW PERFORMANCE BLK            DISABLED FP 08
```

Figure 39. ISD Monthly Status Report - Serial to PC Format

```
IV0100
JAN  8, 2008  3:53 PM                                          isd-evr\937-13.eps

(SITE NAME)
(SITE STREET)
(CITY, ST)
(PHONE)

ISD ALARM STATUS REPORT

EVR TYPE: BALANCE
ISD TYPE: 01.02
VAPOR PROCESSOR TYPE: VST VAPOR PROCESSOR

OVERALL STATUS             :PASS            EVR VAPOR COLLECTION :PASS
EVR VAPOR CONTAINMENT      :PASS
ISD MONITOR UP-TIME        :100%            STAGE I TRANSFERS:  2 of  2 PASS
EVR/ISD PASS TIME          :100%            VAPOR PROCESSOR      :PASS

WARNING ALARMS
DATE     TIME     DESCRIPTION                     READING         VALUE
07-12-30 00:02:33 VAPOR CONTAINMENT LEAKAGE       CFH@2 INCHES WC  15.51
07-12-29 00:02:07 VAPOR CONTAINMENT LEAKAGE       CFH@2 INCHES WC  18.24
07-12-28 00:02:01 VAPOR CONTAINMENT LEAKAGE       CFH@2 INCHES WC  17.34
07-12-27 00:01:36 VAPOR CONTAINMENT LEAKAGE       CFH@2 INCHES WC  17.11
07-12-26 00:01:41 VAPOR CONTAINMENT LEAKAGE       CFH@2 INCHES WC  18.66
07-12-10 00:02:05 FLOW PERFORMANCE HOSE BLOCKAGE  FP 8 BLEND4      BLKD
07-12-06 00:02:40 VAPOR PROCESSOR OVER PRESSURE   DAILY 90%         2.6
07-11-16 00:02:17 FLOW PERFORMANCE HOSE BLOCKAGE  FP 8 BLEND4      BLKD
07-11-13 00:02:28 FLOW PERFORMANCE HOSE BLOCKAGE  FP 8 BLEND4      BLKD
07-11-11 00:03:19 FLOW PERFORMANCE HOSE BLOCKAGE  FP 6 BLEND4      BLKD

FAILURE ALARMS
DATE     TIME     DESCRIPTION                     READING         VALUE
07-11-14 00:02:18 FLOW PERFORMANCE HOSE BLOCKAGE  FP 8 BLEND4      BLKD
07-11-12 00:02:38 FLOW PERFORMANCE HOSE BLOCKAGE  FP 6 BLEND4      BLKD
07-11-09 00:03:41 CONTAINMENT GROSS OVER PRESSURE WEEKLY 95%        4.60
07-11-03 00:01:25 VAPOR PROCESSOR OVER PRESSURE   DAILY 90%         2.6
07-10-31 00:02:45 VAPOR PROCESSOR STATUS
                  VP EMISSIONS FAIL               LB/1KB           0.693
07-10-28 00:00:39 VAPOR PROCESSOR OVER PRESSURE   DAILY 90%         2.6
07-10-19 00:01:27 VAPOR PROCESSOR OVER PRESSURE   DAILY 90%         2.6
07-10-15 00:03:14 FLOW PERFORMANCE HOSE BLOCKAGE  FP 2 BLEND4      BLKD
07-10-15 00:03:13 FLOW PERFORMANCE HOSE BLOCKAGE  FP 1 BLEND4      BLKD
07-10-14 00:03:11 FLOW PERFORMANCE HOSE BLOCKAGE  FP 2 BLEND4      BLKD

SHUTDOWN & MISCELLANEOUS EVENTS
DATE     TIME     DESCRIPTION                     ACTION/NAME
07-12-13 19:52:52 VAPOR PROCESSOR                TEST MANUALLY CLEARED
07-11-18 00:02:24 READINESS ISD:PP EVR:PPP       ISD & EVR READY
07-11-17 13:09:06 READINESS ISD:PP EVR:NNN       EVR READINESS PENDING
07-11-17 13:09:06 ISD STARTUP
07-11-17 13:03:24 ISD SHUTDOWN
07-11-14 00:02:18 FLOW PERFORMANCE BLK           DISABLED FP 08 BLEND4
07-11-12 00:02:38 FLOW PERFORMANCE BLK           DISABLED FP 06 BLEND4
07-11-09 00:03:41 CONTAINMENT GROSS              DISABLED DISPENSERS
07-11-04 01:00:00 TIME CHANGE DETECTED AT:      07-11-04 02:00:13
07-11-03 00:01:25 VAPOR PROCESSOR PROBLEM        DISABLED DISPENSERS
```

Figure 40. ISD Alarm Status Report - Serial to PC Format

Figure 41 shows an example VST Vapor Processor Runtime Diagnostic Report.

```
IV8000
SEP 30, 2007 12:27 AM

(SITE NAME)
(SITE STREET)
(CITY,ST)
(PHONE)
(MMM DD, YYYY HH:MM XM)

VAPOR PROCESSOR
                    ELAPSED    PRESSURE INCHES H2O    RUNTIME
DATE-TIME ON        MINUTES       ON        OFF        FAULT
 5-04-07  3:31PM     8.87         0.244    -0.202        NO
 5-05-07  4:17AM     3.35         0.202    -0.212        NO
 5-07-07 10:17PM     3.50         0.206    -0.221        NO
 5-07-07 10:28PM    15.12         0.384    -0.356        NO
 5-08-07  8:16PM    21.77         0.325    -0.211        NO
 5-09-07  6:35PM    20.60         0.368    -0.276        NO
 5-10-07  8:03PM     6.18         0.226    -0.398        NO
 5-10-07  8:15PM     2.55         0.231    -0.227        NO
 5-13-07  8:55PM    18.23         0.314    -0.205        NO
```

isd-evr\fig5-18.eps

Figure 41. VST Vapor Processor Runtime Diagnostics Report - Serial to PC Format

Figure 42 shows an example V-R Vapor Polisher Runtime Diagnostic Report and Table 4 explains the `IV8000` report's event codes.

```
IV8000
FEB  4, 2008  1:01 PM

TLS_350 UST
VEEDER-ROOT TEST LAB
125 POWDER FOREST DR
SIMSBURY, CT 06070

VAPOR POLISHER
VALVE EVENT          PRESSURE
DATE-TIME              "WC      EVENT CODE
 1-31-08  3:44PM      -0.700    OPEN PURGE
 1-31-08  3:47PM       0.038    CLOSE FORCE PURGE
 1-31-08  3:51PM      -0.255    OPEN PURGE
 1-31-08  8:08PM      -0.300    CLOSE PURGE Hi P
 2-01-08  1:59PM      -0.300    OPEN PURGE
 2-01-08  2:18PM      -0.263    OPEN PURGE
 2-01-08  2:33PM      -0.289    OPEN PURGE
 2-04-08 11:22AM      -0.560    NO EVENT
 2-04-08 11:28AM      -0.560    OPEN PURGE
 2-04-08 11:48AM      -0.300    OPEN PURGE
 2-04-08 12:28PM      -0.263    OPEN PURGE
 2-04-08 12:42PM      -0.299    OPEN PURGE
```

Figure 42. V-R Vapor Polisher Runtime Diagnostics Report - Serial to PC Format

Table 6. Vapor Processor Runtime Diagnostic Report Event Codes

Event Code	Cause	Event Code	Cause
NO EVENT	The valve changed state outside of the carbon canister algorithm.	CLOSE FULL	Canister load has reached 100%. Further loading is not allowed.
CLOSE TEST	Manual operation of the valve	CLOSE NEAR FULL	Canister load has exceeded 80%. Further loading is not allowed unless pressure exceeds +1.3.
OPEN TEST	Manual operation of the valve	CLOSE EMPTY	Excess purging has completed.
CLOSE PURGE HI P	The canister state is in excess purge and the pressure is above -0.5.	OPEN PURGE	Canister load is >0% and pressure <-0.25
CLOSE PURGE TIME	The canister state is in excess purge and the time is outside 6AM to 4PM.	OPEN EXCESS PURGE	Canister load is 0%, Excess purge is incomplete, pressure <-1.5, time is between 6AM and 4PM.
CLOSE FORCE PURGE	Canister is in startup period. Loading with pressures <+1.05 is not allowed until startup period is complete.	OPEN FILL	Canister valve is open for loading: • When pressure is greater than or equal to 0.75 IWC and Canister load is less than 80%.. • Pressure is greater than or equal to 1.3 IWC and Canister load is greater than 80% and less than 100%
CANISTER EMPTY	Canister was loaded above 1% and purged to 0%. No valve state change.		

Figure 43 shows an example Vapor Valve Status report.

```
IB6100
FEB  4, 2008  1:09 PM
s 2:Vapor valve

VAPOR VALVE
SERIAL NUMBER     123456
VALVE POSITION:     OPEN
OPEN CAP:        CHARGED
CLOSE CAP:       CHARGED
AMBNT TEMP:      65.08 F
OUTLET TMP:      75.05 F
SENSOR FAULTS:
 NONE
```

Figure 43. Vapor Valve Status Report - Serial to PC Format

The IB6100 command reports the current state of the Vapor Valve Components. The current position of the valve is reported as Open or Closed. The Capacitors are used to move the valve and are reported as Charged or Discharged. Outlet Temperature is the Canister thermal probe temperature. Ambient Temperature is the temperature at the Vapor Valve ambient temperature sensor. Sensor Faults are the active faults reported by the Vapor Valve. The IB6100 (Figure 43) command only provides active Sensor Fault conditions. Use the IB6200 command to see archived fault conditions (Figure 44).

```
IB6200
SEP 19, 2008  1:05 PM

BIG 3 OIL
123 POWER DRIVE
HELENA, MT
(406) 123-4567

SMART SENSOR SUB ALARM HISTORY

ID  TYPE  ALARM TYPE           SUB ALARM                STATE
DATE    TIME
 9   14   SENSOR FAULT ALARM   TEMPERATURE RANGE FAULT  CLEAR   9-19-08
11:50AM
 9   14   SENSOR FAULT ALARM   TEMPERATURE RANGE FAULT  ALARM   9-19-08
11:46AM
```

Figure 44. Smart Sensor Sub Alarm History Report - Serial to PC Format

Figure 45 shows an example PMC Daily Vapor Polisher Diagnostic Report.

```
IV8800
OCT  2, 2008  2:58 PM

PMC DAILY VAPOR POLISHER DIAGNOSTIC

                   LOAD  PRGE  MIN%  MAX%  SELF   PRESS
DATE/TIME           HRS   HRS  LOAD  LOAD  TEST    TEST
08-10-02 14:58:58  3.1   2.5    15    69  WARN    FAIL
```

Figure 45. PMC Daily Vapor Polisher Diagnostic Report - Serial to PC Format

6 Maintenance

TLS Console

The TLS console, including interface modules, do not require scheduled maintenance. ISD System Self-Test Monitoring algorithms are designed to verify proper selection, setup and operation of the TLS console and sensors. Servicing should be performed in accordance with the In-Station Diagnostic System Troubleshooting Guide, Manual 577013-819 in response to warning or alarm conditions.

Air Flow Meter

There is no recommended maintenance, inspection nor calibration for the Air Flow Meter. Servicing should be performed in accordance with the In-Station Diagnostic System Troubleshooting Guide, Manual 577013-819 in response to warning or alarm conditions.

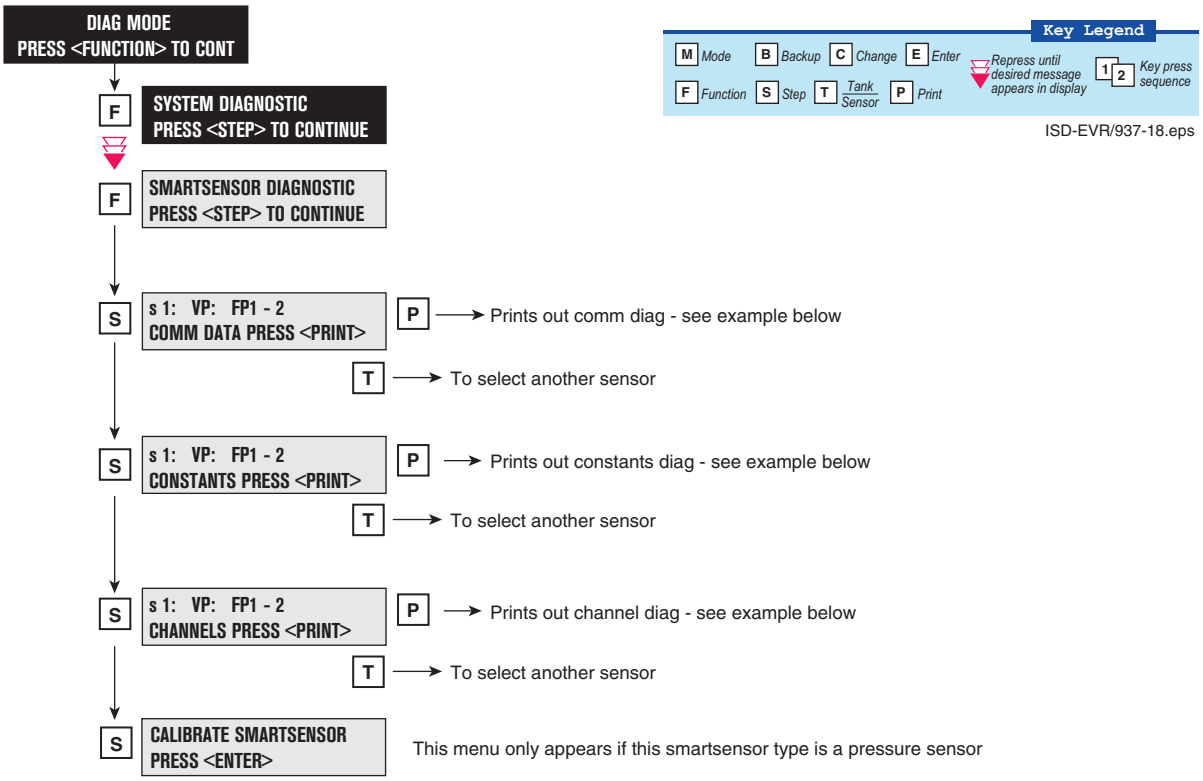
Vapor Pressure Sensor

There is no recommended maintenance, inspection nor calibration for the Vapor Pressure Sensor. Servicing should be performed in accordance with the In-Station Diagnostic System Troubleshooting Guide, Manual 577013-819 in response to warning or alarm conditions.

7 Diagnostic Menus

The diagnostic menus below are accessed and viewed from the TLS console front panel.

Smart Sensor Diagnostic Menu




```
SS COMM DIAG
-----------------------
s 1: AFM1   FP1-2
SAMPLES READ     58
SAMPLES USED     54
PARITY ERR        0
PARTIAL READ      0
COMM ERR          0
RESTARTS          0
```

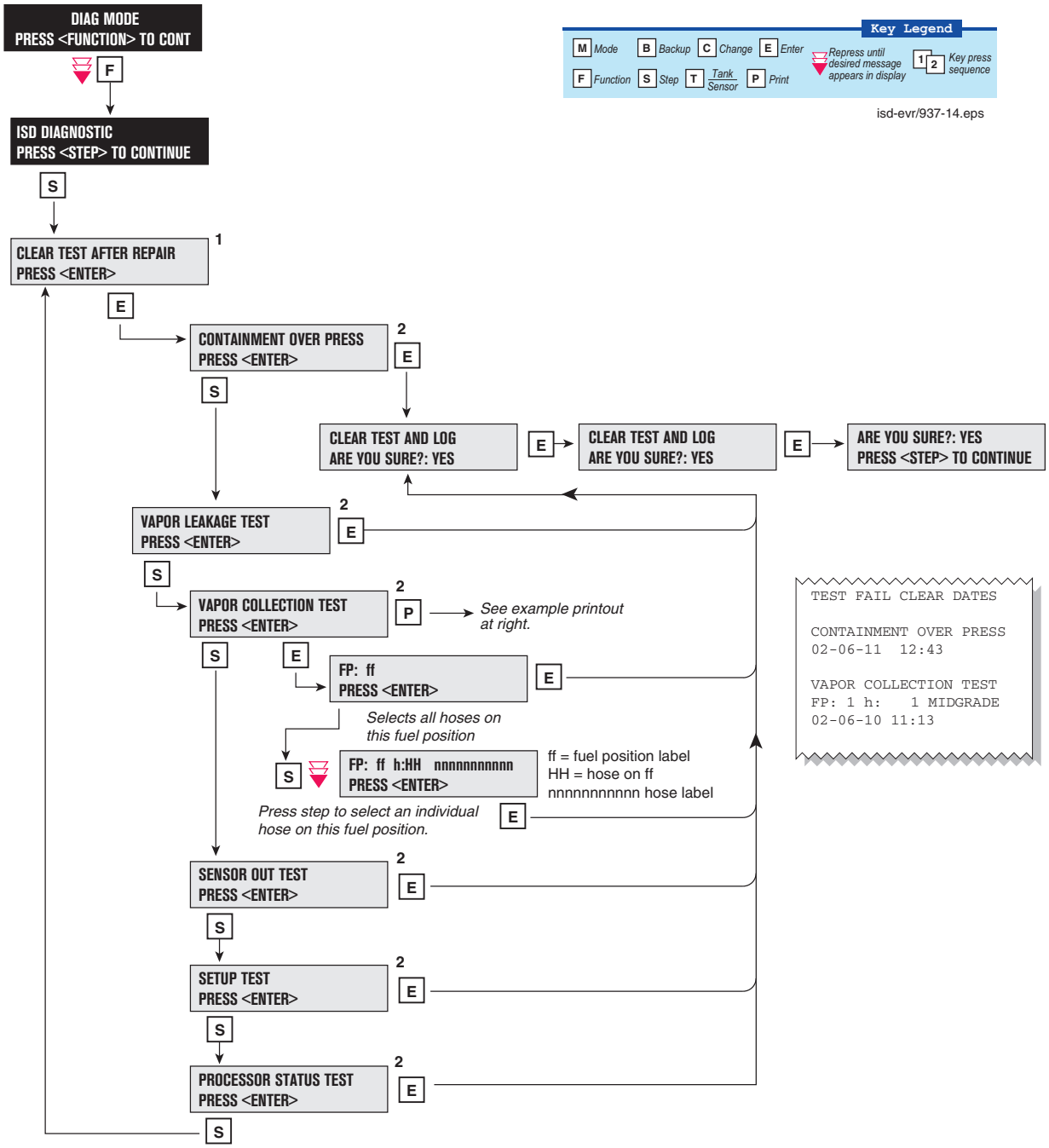
```
SS CONSTANTS DIAG
-----------------------
s 1: AFM1   FP1-2

VAPOR PRESSURE
SERIAL NUMBER      1007
PROTOCOL VERSION      0
```

```
SS CHANNEL DIAG
-----------------------
s 1: AFM1   FP1-2
YY-MM-DD  HH:MM:SS
C00 B50B 3D68 00E0 0000
C04 0000 03EF 0000 0004
C08 0A3C 3D68 5693 0081
C12 80C4 80A4 0104 2579
C16 0000 0000 00A3 03D6
C20 0709 0032 04C9 880F
```

Figure 46. Smart Sensor Diagnostic Menu

ISD Diagnostic Menu



Notes:

1. All repair dates are saved in the Miscellaneous Event Log.
2. Reference the Clear Test Repair Menu table on the next page.

Figure 47. ISD Diagnostic Menu

Table 7. Clear Test Repair Menu

Menu Selection	Clears Alarms	Reset Dates
Containment Over Press	ISD GROSS PRESSURE WARN ISD GROSS PRESSURE FAIL ISD DEGRD PRESSURE WARN ISD DEGRD PRESSURE FAIL ISD VP PRESSURE WARN ISD VP PRESSURE FAIL	Containment Test Time
Vapor Leakage Test	ISD VAPOR LEAKAGE WARN ISD VAPOR LEAKAGE FAIL	Vapor Leak Test Time
Vapor Collection Test	GROSS COLLECT WARN GROSS COLLECT FAIL DEGRD COLLECT WARN DEGRD COLLECT FAIL FLOW COLLECT WARN FLOW COLLECT FAIL AIRFLOW MTR SETUP	Hose Test Time
Sensor Out Test	ISD SENSOR OUT WARN ISD SENSOR OUT FAIL	Sensor Out Test Time
Setup Test	ISD SETUP WARN ISD SETUP FAIL	Setup Self Test Time
Processor Status Test	ISD VP STATUS WARN ISD VP STATUS FAIL VP EMISSIONS WARN VP EMISSIONS FAIL VP DUTY CYCLE WARN VP DUTY CYCLE FAIL	Valid Vapor Processor Test Time

VST ECS Membrane Processor Diagnostic Menu

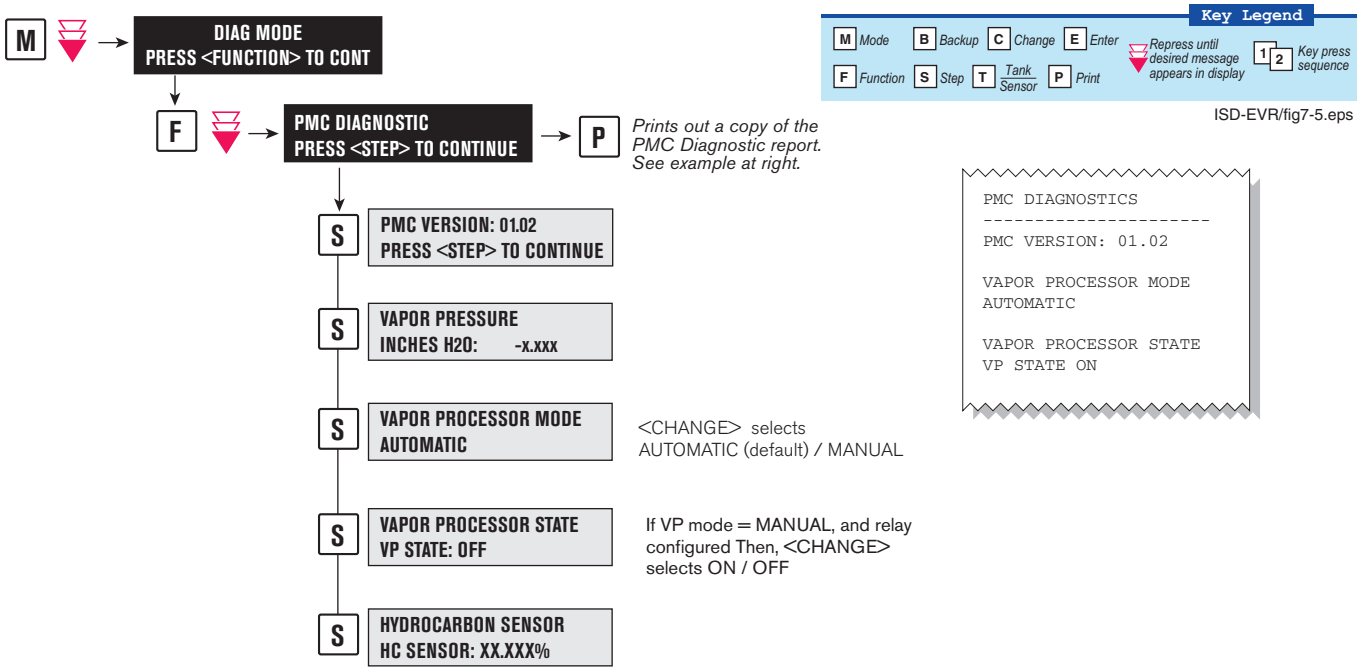


Figure 48. VST ECS Membrane Processor Diagnostic Menu

Veeder-Root Vapor Polisher Diagnostics

AUTOMATIC CONTROL

If PMC mode is in AUTOMATIC, PMC will control flow through the canister using a vapor control valve. The control algorithms will monitor tank pressure, vapor temperature and carbon temperature to monitor carbon canister loading. When the pressure is positive the valve is opened to relieve the pressure and begin loading the canister. When the UST pressure becomes negative the valve is opened and the purging process begins. The valve will close when the canister has either reached capacity or the canister is empty after purging.

MANUAL CONTROL

If PMC mode is in MANUAL, the diagnostic menu allows the valve to be opened (ON) or closed (OFF) manually. This feature is to support testing operation of the valve without waiting for canister to reach loading or purging thresholds. It also provides the necessary controls to perform 2" decay tests. The current UST ullage space vapor pressure will also be available through the diagnostic menu.

Veeder-Root Vapor Polisher PMC Diagnostic Menu

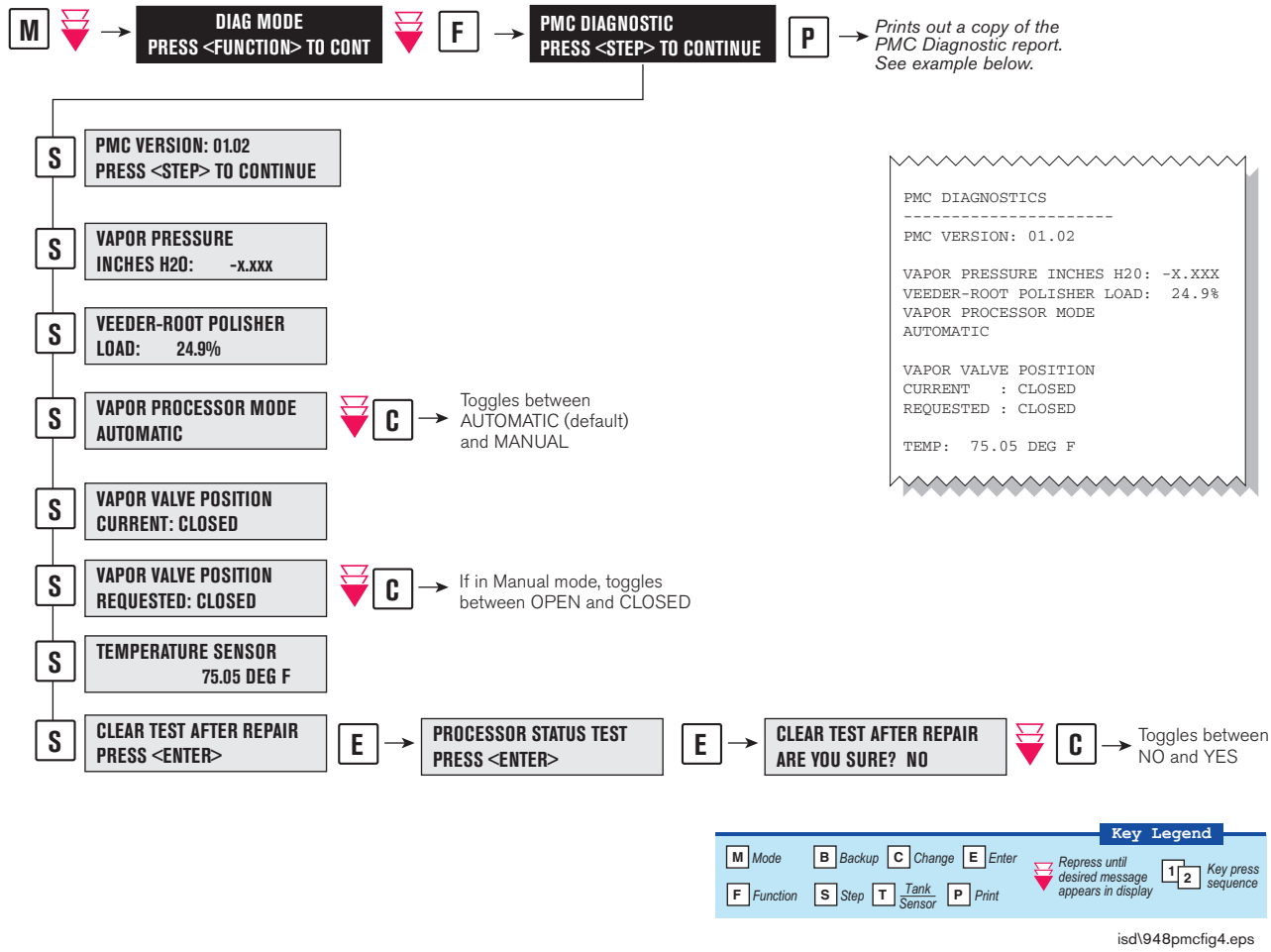


Figure 49. PMC Diagnostic Menus

Appendix A: Site EVR/ISD Equipment Location Worksheet

You should create a table listing each hose, fueling point, Air Flow Meter's serial number, etc.. This information will be required when you perform the EVR/ISD Setup hose/meter dispenses. This appendix contains blank worksheets for sites with single- and multi-hose dispensers. You are advised to fill in all of the appropriate information about your installed equipment, complete the TLS console's EVR/ISD setup, then perform the Product Meter ID dispensing procedure.

Single-Hose Fueling Position Dispensers

FILL OUT - USE TO SETUP HOSE TABLE					AUTOMAP CHECK LIST			
					Product Dispense(s)[6]			
Hose ID[1]	FP[2]	Hose Label[3]	AFM Serial Number[4]	AFM Label[5]	1st	2nd	3rd	4th
1		Blend		AFM FP__&__				
2		Blend						
3		Blend		AFM FP__&__				
4		Blend						
5		Blend		AFM FP__&__				
6		Blend						
7		Blend		AFM FP__&__				
8		Blend						
9		Blend		AFM FP__&__				
10		Blend						
11		Blend		AFM FP__&__				
12		Blend						
13		Blend		AFM FP__&__				
14		Blend						
15		Blend		AFM FP__&__				
16		Blend						

[1]Each hose must have a unique number (1 - 99).

[2]This is the Fuel Position Label which is the visible number on the outside of the dispenser (1 -2 digits).

[3]The hose label is always Blend for single-hose dispensers.

[4]This is the serial number on the Air Flow Meter (1 per dispenser).

[5]This is the AFM label entered in EVR/ISD setup (1 per dispenser and must be in the format shown, e.g., AFM FP1&2 - *where 1 and 2 refer to the one [or two] numbers on the outside of the dispenser*).

[6]After you have entered the contents of columns 1 - 5 into the TLS EVR/ISD hose table setup, you now must follow automap procedure and dispense from each gas meter AND one blend grade that feeds each hose. Enter a check beneath each product following a dispense from the hose.

FILL OUT - USE TO SETUP HOSE TABLE					AUTO MAP CHECK LIST			
					Product Dispense(s)			
Hose ID	FP	Hose Label	AFM Serial Number	AFM Label	1st	2nd	3rd	4th
17		Blend		AFM FP__&__				
18		Blend						
19		Blend		AFM FP__&__				
20		Blend						
21		Blend		AFM FP__&__				
22		Blend						
23		Blend		AFM FP__&__				
24		Blend						
25		Blend		AFM FP__&__				
26		Blend						
27		Blend		AFM FP__&__				
28		Blend						
29		Blend		AFM FP__&__				
30		Blend						
31		Blend		AFM FP__&__				
32		Blend						
33		Blend		AFM FP__&__				
34		Blend						
35		Blend		AFM FP__&__				
36		Blend						

FILL OUT - USE TO SETUP HOSE TABLE					AUTO MAP CHECK LIST			
					Product Dispense(s)			
Hose ID	FP	Hose Label	AFM Serial Number	AFM Label	1st	2nd	3rd	4th
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
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		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						
		Blend		AFM FP__&__				
		Blend						

Multi-Hose Fueling Position Dispensers

FILL OUT - USE TO SETUP HOSE TABLE					AUTOMAP CHECK LIST
Hose ID[1]	FP[2]	Hose Label[3]	AFM Serial Number[4]	AFM Label[5]	Product Dispense[6]
				AFM FP__&__	
				AFM FP__&__	

[1]Each hose must have a unique number (1 - 99).

[2]This is the Fuel Position Label which is the visible number on the outside of the dispenser (1 -2 digits).

[3]The hose label is the grade.

[4]This is the serial number on the Air Flow Meter (1 per dispenser).

[5]This is the AFM label entered in EVR/ISD setup (1 per dispenser and must be in the format shown, e.g., AFM FP1&2 - *where 1 and 2 refer to the one [or two] numbers on the outside of the dispenser*).

[6]After you have entered the contents of columns 1 - 5 into the TLS EVR/ISD hose table setup, you now must follow automap procedure and dispense from each hose. Enter a check in this column following a dispense from the hose.

FILL OUT - USE TO SETUP HOSE TABLE					AUTOMAP CHECK LIST
Hose ID	**FP**	**Hose Label**	**AFM Serial Number**	**AFM Label**	**Product Dispense**
				AFM FP__&__	
				AFM FP__&__	
				AFM FP__&__	

FILL OUT - USE TO SETUP HOSE TABLE					AUTOMAP CHECK LIST
Hose ID	**FP**	**Hose Label**	**AFM Serial Number**	**AFM Label**	**Product Dispense**
				AFM FP__&__	
				AFM FP__&__	
				AFM FP__&__	

FILL OUT - USE TO SETUP HOSE TABLE					AUTOMAP CHECK LIST
Hose ID	**FP**	**Hose Label**	**AFM Serial Number**	**AFM Label**	**Product Dispense**
				AFM FP__&__	
				AFM FP__&__	
				AFM FP__&__	

FILL OUT - USE TO SETUP HOSE TABLE					AUTOMAP CHECK LIST
Hose ID	**FP**	**Hose Label**	**AFM Serial Number**	**AFM Label**	**Product Dispense**
				AFM FP__&__	
				AFM FP__&__	
				AFM FP__&__	

Appendix B: ISD Operability Test Procedure Data Forms

Use these forms to check off and record the results from the ISD Operability Testing procedure steps.

Form 1

Data Form for Vapor Pressure Sensor UST Pressure Test

DATE OF TEST _____

SERVICE COMPANY NAME	SERVICE COMPANY'S TELEPHONE
SERVICE TECHNICIAN	SST or VEEDER-ROOT TECH CERTIFICATION # (as applicable) ICC or DISTRICT TRAINING CERTIFICATION (as applicable)
STATION NAME	DISTRICT PERMIT #
STATION ADDRESS CITY	STATE ZIP

PRESSURE SENSOR LOCATION: DISPENSER FUELING POINT (FP) NUMBERS	FP #_____	PRESSURE SENSOR SERIAL NUMBER: _____

STEP 3	DIGITAL MANOMETER VALUE _____ inches WC
STEP 3	TLS 350 SENSOR VALUE _____ inches WC (OBTAIN VALUE USING TLS CONSOLE KEYPAD SEQUENCE SHOWN IN FIG. 4-4, STEP 7)
STEP 4	TLS 350 Sensor Value within ±0.2 inches WC of Digital Manometer Value? Yes ☐ No ☐ IF NO: THE PRESSURE SENSOR IS NOT IN COMPLIANCE WITH THE PRESSURE SENSOR REQUIREMENTS.
STEP 5	MODE KEY PRESSED TO EXIT CALIBRATE SMART SENSOR MENU? ☐

Form 2

Data Form for Vapor Pressure Sensor Ambient Reference Test

DATE OF TEST _____

SERVICE COMPANY NAME		SERVICE COMPANY'S TELEPHONE	
SERVICE TECHNICIAN		SPQ or VEEDER-ROOT TECH CERTIFICATION # (as applicable) ICC or DISTRICT TRAINING CERTIFICATION (as applicable)	
STATION NAME		DISTRICT PERMIT #	
STATION ADDRESS	CITY	STATE	ZIP
STEP 1	PRESSURE SENSOR LOCATION: DISPENSER FUELING POINT (FP) NUMBERS FP # _____	PRESSURE SENSOR SERIAL NUMBER:_____	
STEP 2	REFERENCE PORT CAP REMOVED? VALVE SET TO AMBIENT REFERENCE PORT (PER FIG. 4-3)?	☐ ☐	
STEP 3	NON-CALIBRATED SENSOR VALUE _____Inches WC (OBTAIN VALUE USING TLS CONSOLE KEYPAD SEQUENCE SHOWN IN FIG. 4-4, STEP 7)		
STEP 4	PRESSURE BETWEEN +0.20 & -0.20? Yes ☐ No ☐ IF NO: THE PRESSURE SENSOR IS NOT IN COMPLIANCE WITH THE PRESSURE SENSOR REQUIREMENTS.		
STEP 5	REFERENCE PORT CAP REPLACED? VALVE SET TO NORMAL VALVE POSITION (PER FIG 4-3)?	☐ ☐	
STEP 6	MODE KEY PRESSED TO EXIT CALIBRATE SMART SENSOR MENU?	☐	

Operability Test Procedure Data Worksheet

Veeder-Root In-Station Diagnostics (ISD)
Balance Vapor Flow Meter Operability Test Procedure

		Date of Test
Service Company Name		Service Company's Telephone
Service Technician		Veeder-Root Tech Certification #
Station Name		District Permit #
Station Address	City	State Zip

		ISD Flow Meter Total			Gas Flow Meter Total						
0	0	08	4.13	4.15	4.9	4.12	4.12	4.13	4.15		
Meter SN	Fueling Pos	Start	Stop	Difference Gal (Stop – Start)	Start	Stop	Difference Cubic Feet (Stop – Start)	Cubic feet To gallons[1]	% Diff [2]	Pass	Fail

[1] $Gallons = CubicFeet \times 7.481$

[2] $\%Diff = \frac{ISDDiffGal - GasFlowMeterDiffGal}{GasFlowMeterDiffGal} \times 100$

Site Shutdown Test Data Form

DATE OF TEST _____

SERVICE COMPANY NAME	SERVICE COMPANY'S TELEPHONE
SERVICE TECHNICIAN	VEEDER-ROOT TECH CERTIFICATION #
STATION NAME	DISTRICT PERMIT #
STATION ADDRESS CITY ST ATE ZIP	

STEP 1.	POWER REMOVED FROM TLS CONSOLE?	☐
STEP 2.	POWER TO SUBMERSIBLE PUMPS REMOVED BY TLS? (VERIFY GASOLINE FUELING DISABLED)	☐
STEP 3.	POWER RESTORED TO TLS CONSOLE?	☐

COMMENTS (INCLUDE DESCRIPTION OF REPAIRS MADE)

VEEDER-ROOT

For technical support, sales or other assistance, please visit:
www.veeder.com