In-Station Diagnostics (ISD)

Install, Setup, & Operation Manual

For VST ECS Membrane Processors and Veeder-Root Polisher

VEEDER-ROOT

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INSTALLATION IN THE STATE OF CALIFORNIA

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.

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.

For ISD components installed after the initial ISD start-up, we warrant that these products shall be free from defects in material and workmanship for a period of fifteen (15) months from date of invoice. We will repair or replace the product if the product is returned to us; transportation prepaid, within the warranty period, and is determined by us to be defective.

This warranty applies only when the product is installed in accordance with Veeder-Root's specifications, and that a Warranty Registration and Checkout Form has been filed with Veeder-Root by an authorized Veeder-Root Distributor. This warranty will not apply to any product which has been subjected to misuse, negligence, accidents, systems that are misapplied or are not installed per Veeder-Root specifications, modified or repaired by unauthorized persons, or damage related to acts of God.

Veeder-Root is not liable for incidental, consequential, or indirect damages or loss, including, without limitation, personal injury, death, property damage, environmental damages, cost of labor, clean-up, downtime, installation and removal, product damages, loss of product, or loss of revenue or profits. **THE WARRANTY CONTAINED HEREIN IS EXCLUSIVE AND THERE ARE NO OTHER EXPRESS, IMPLIED, OR STATUTORY WARRANTIES. WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.**

Figures

Tables

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 relayor dispenser relay board is required (either 4-Output Relay module, I/O Combination module) to shut down each Submersible Turbine Pump (STP)or dispenser upon activation of certain ISD alarms (these alarms can also be assigned in Line Leak Disable setup to shut down the STPor dispenser 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
Input/Output Modules Installation	576013-614

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** Heed the adjacent instructions to avoid damage to equipment, property, environment or personal injury.

⚠ 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.

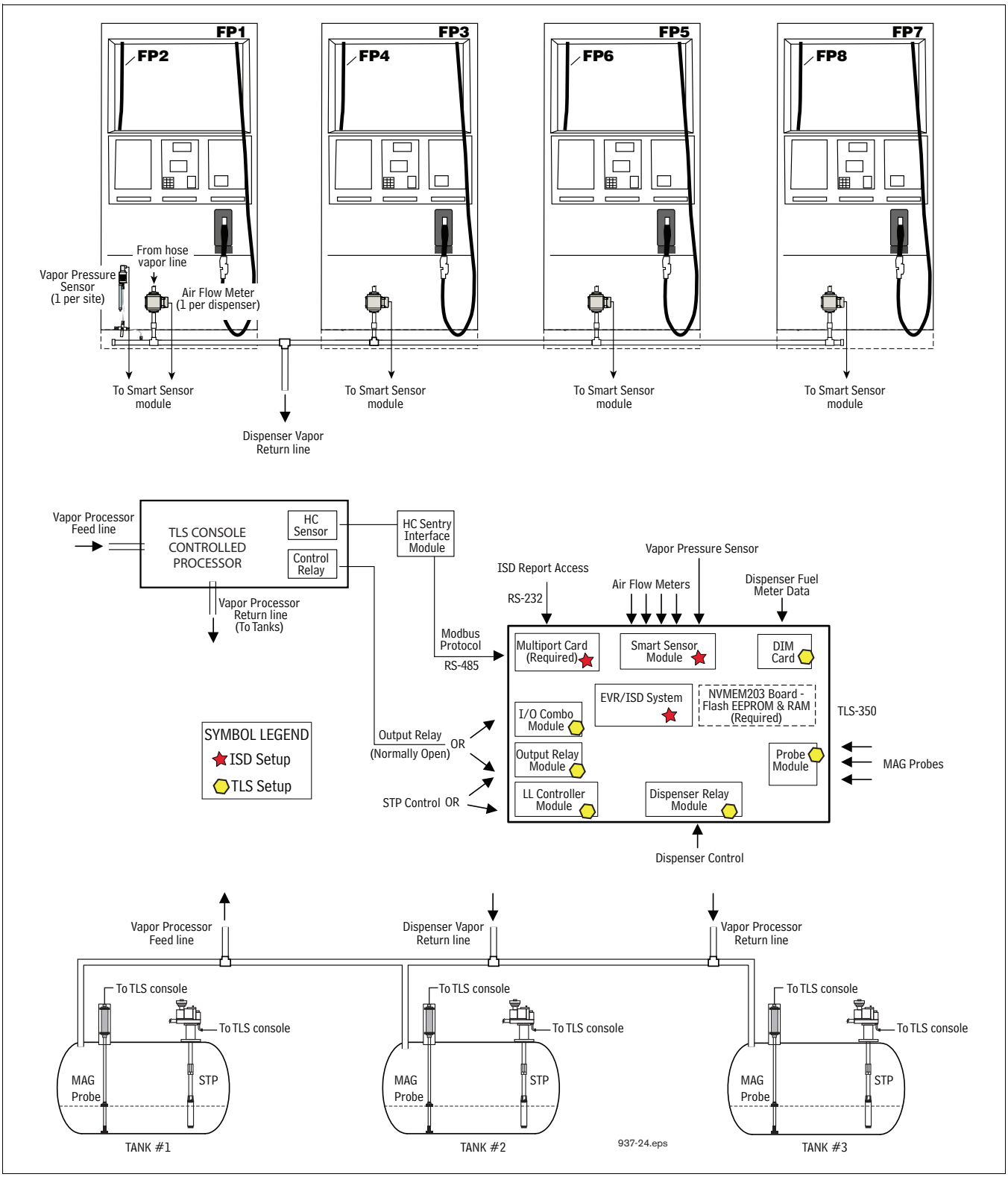


Figure 1. Example Site Diagram - TLS Console Controlled Vapor Processor

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 Moduleor Dispenser Relay 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.

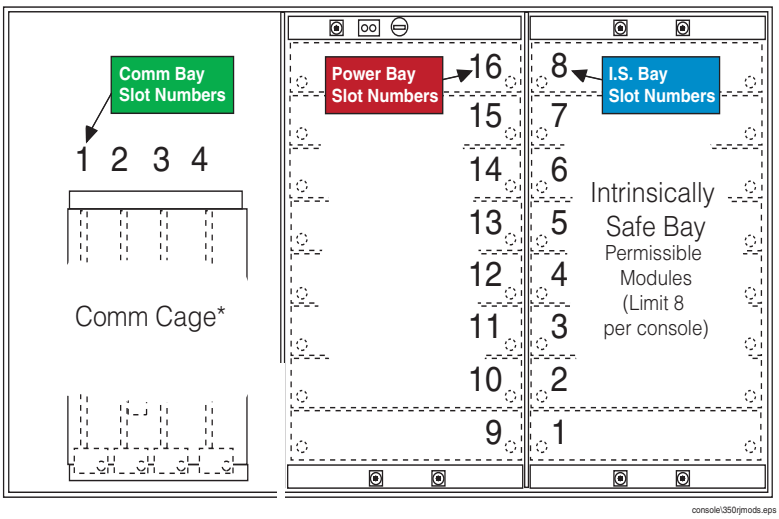


Figure 2. TLS console Interface Module Bays

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. Alternately, you can install Dispenser Relay Modules to control dispensing.

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 asshown 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.

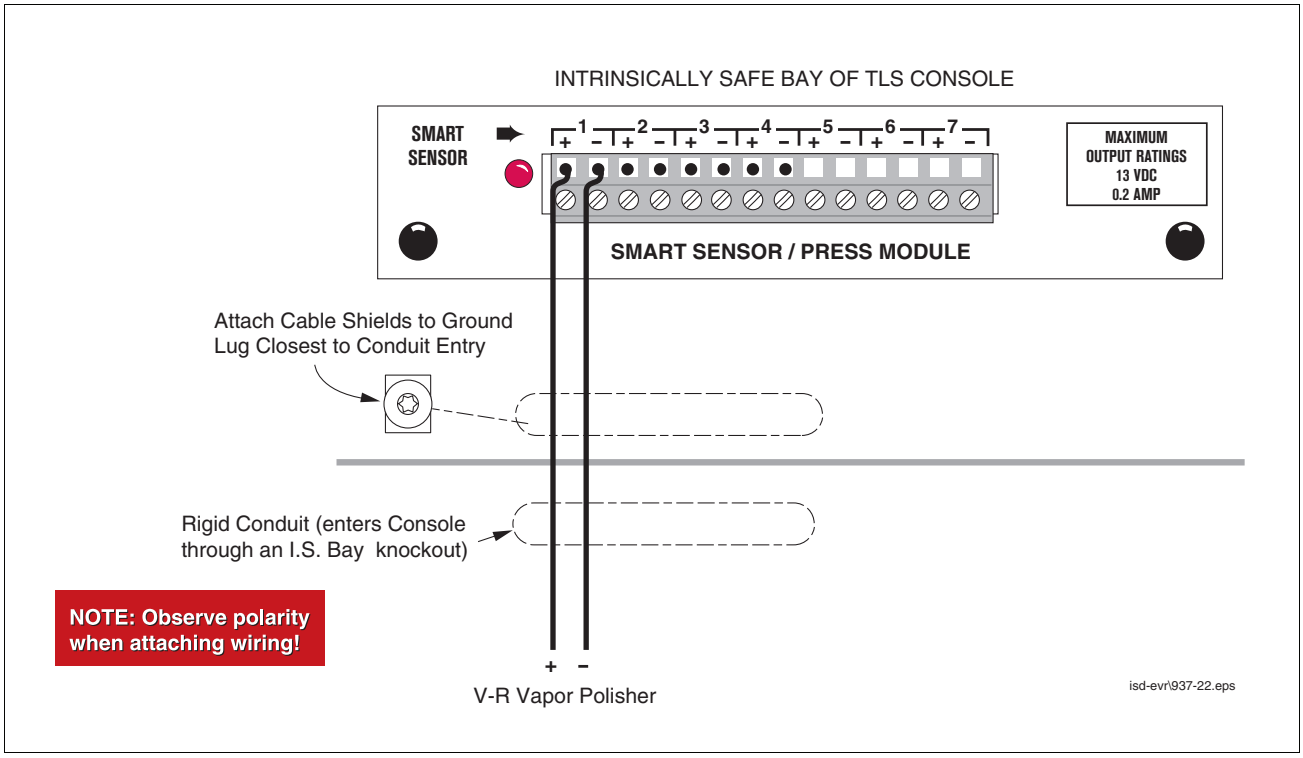


Figure 3. V-R Vapor Polisher Connections to TLS Console

TLS Console with VST ECS Membrane Processor

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

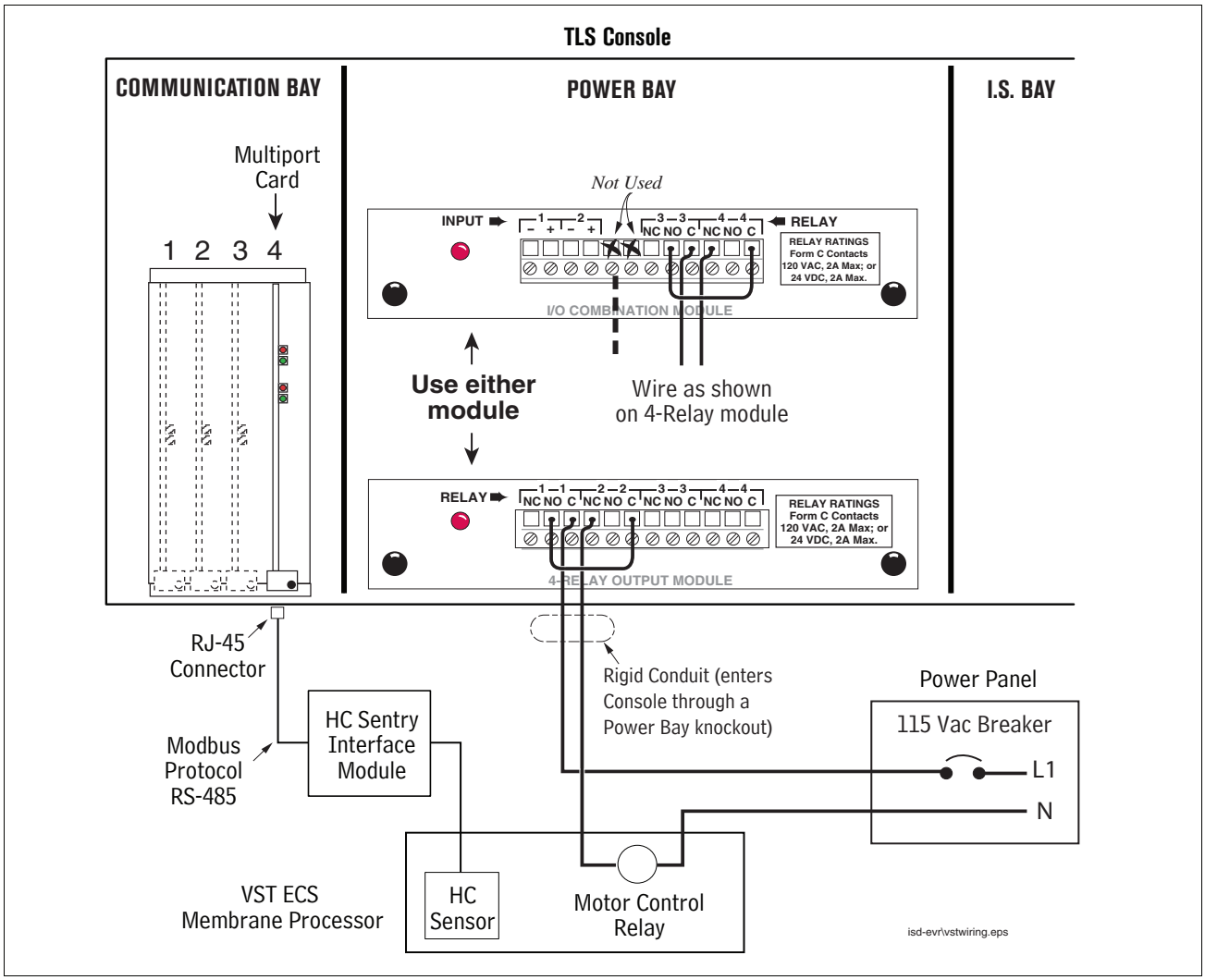


Figure 4. VST ECS Membrane Processor Connections to TLS Console

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 ormore TLS setups below must be performed to shut down the tankor the dispenser should certain ISD alarms occur:

- For ISD sites with line leak detection - XLLD Line Disable Setup (go to Figure 16)

  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 18)

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

- For ISD sites with dispenser shutdown - Dispenser Relay Setup (go to Figure xxx)

  This setup assigns ISD alarms to a relay that will shut down the dispenser.

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.

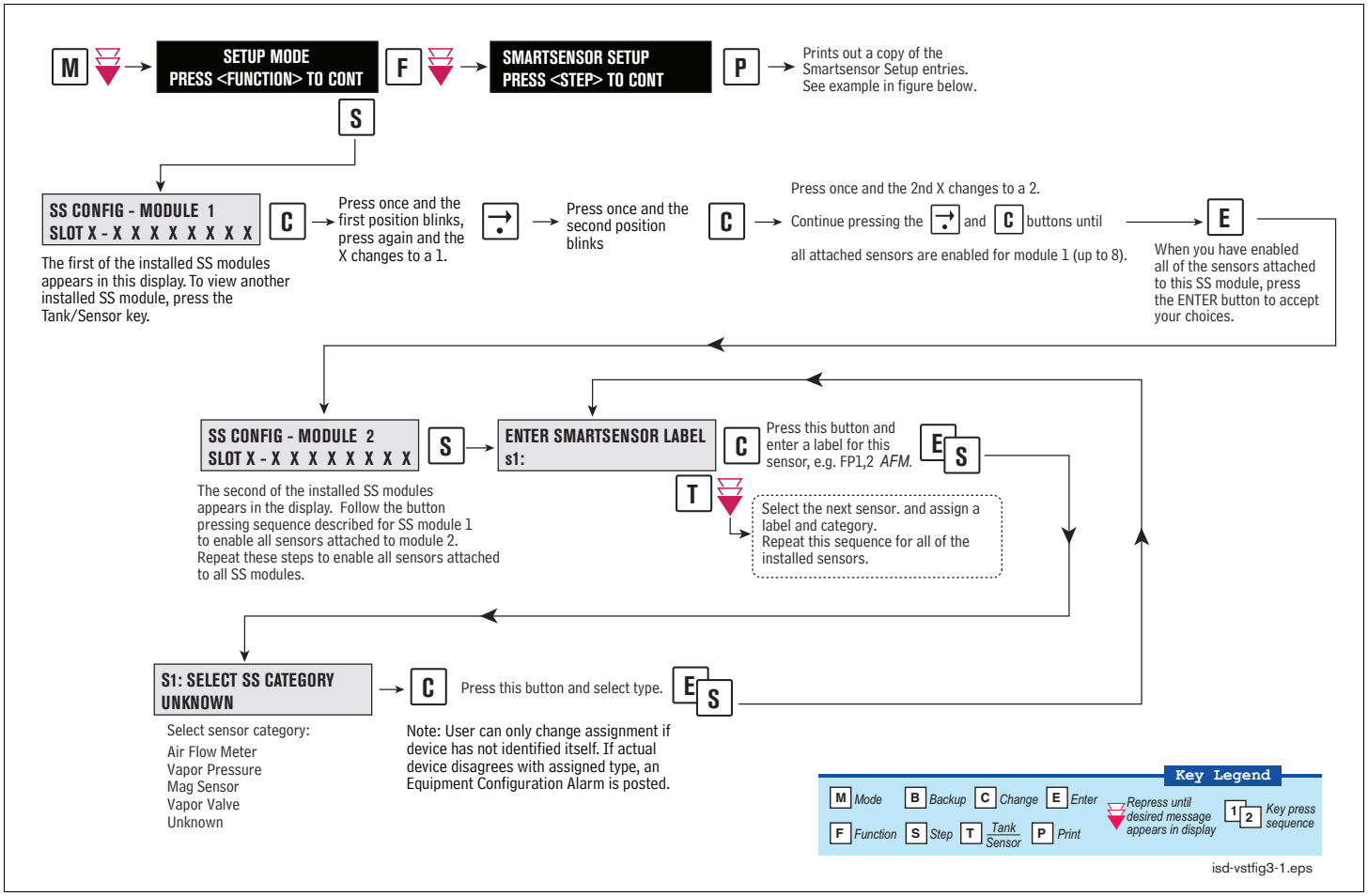


Figure 5. Smart Sensor Setup

```
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.

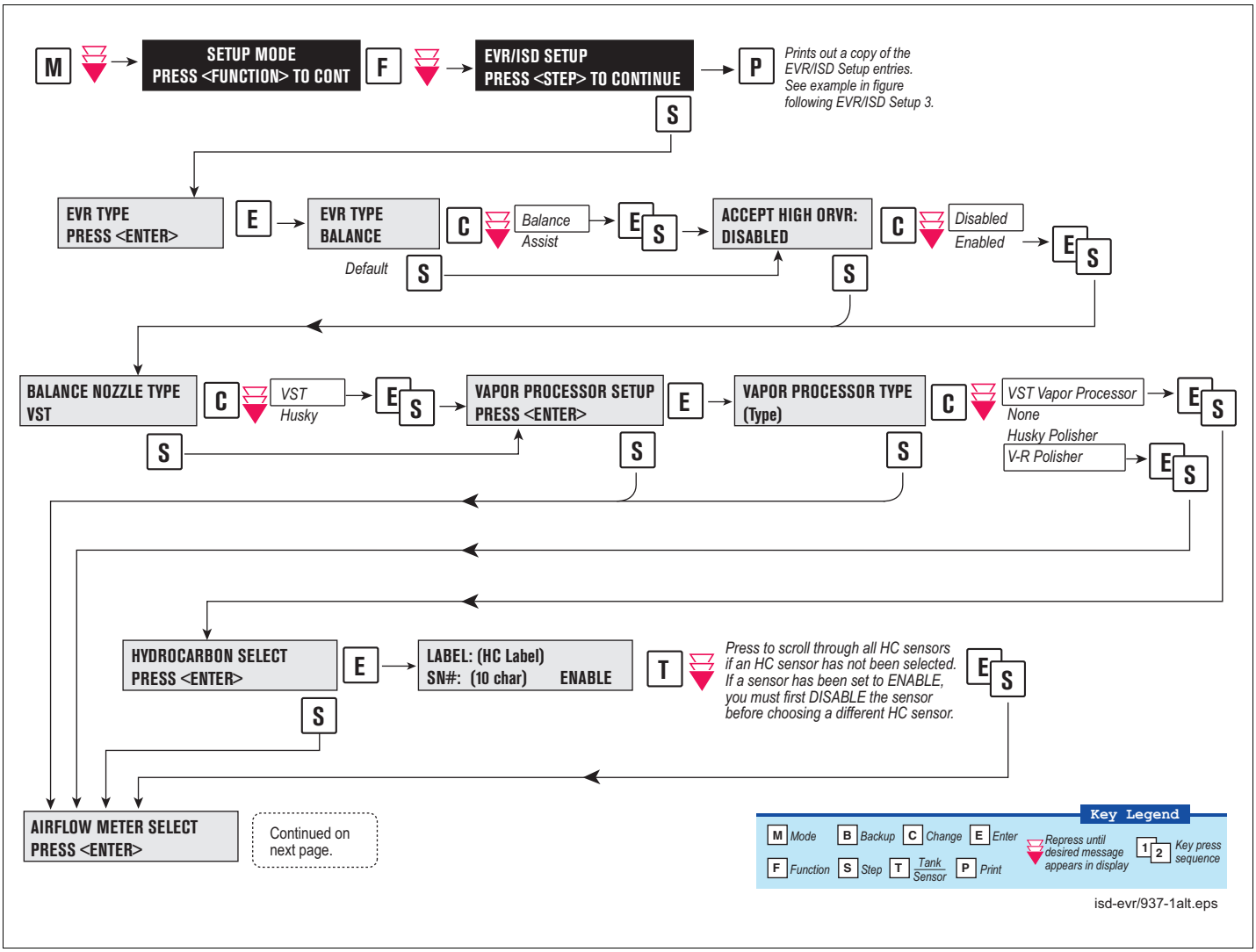


Figure 7. EVR/ISD Setup 1

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

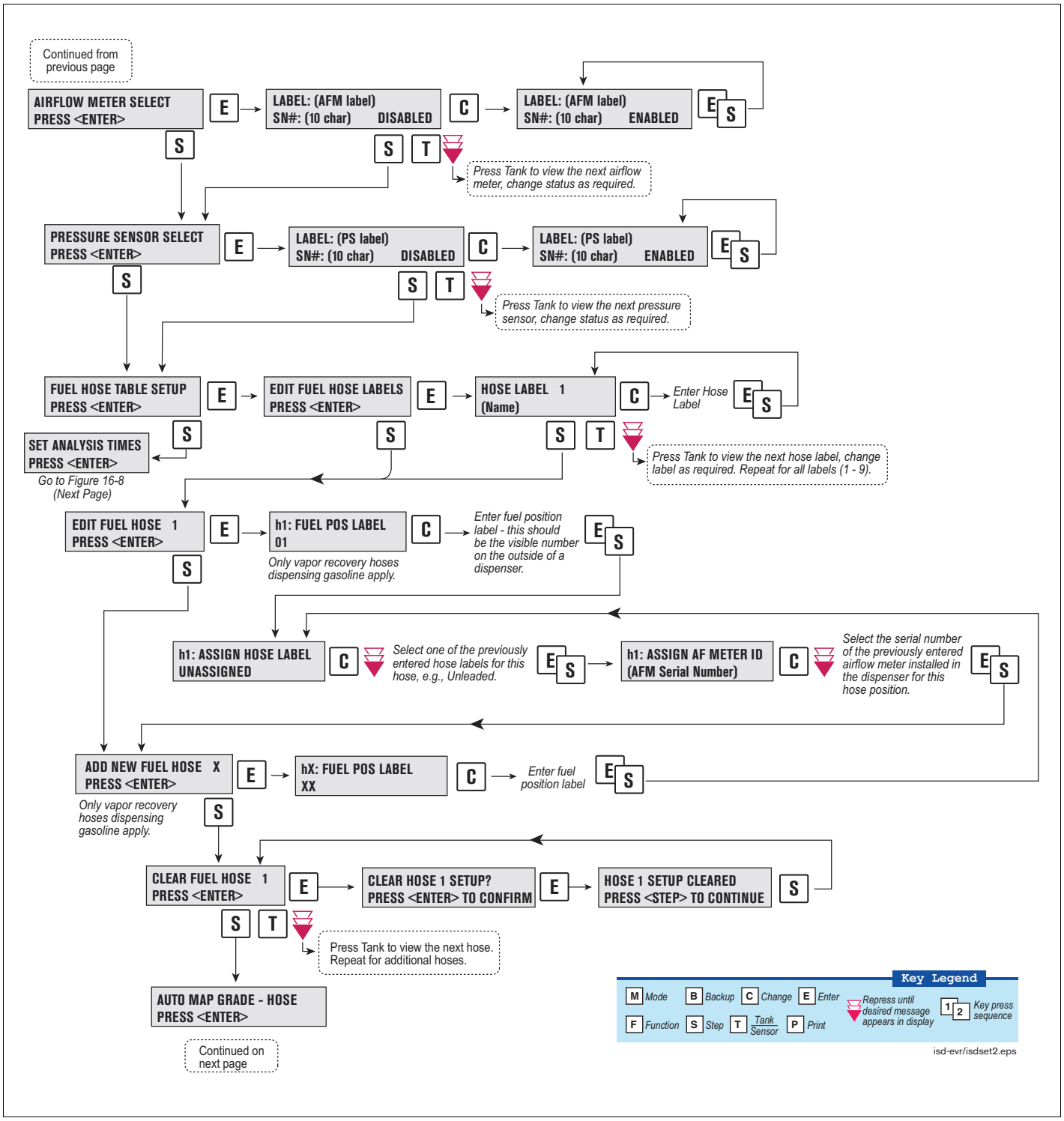


Figure 8. EVR/ISD Setup 2

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

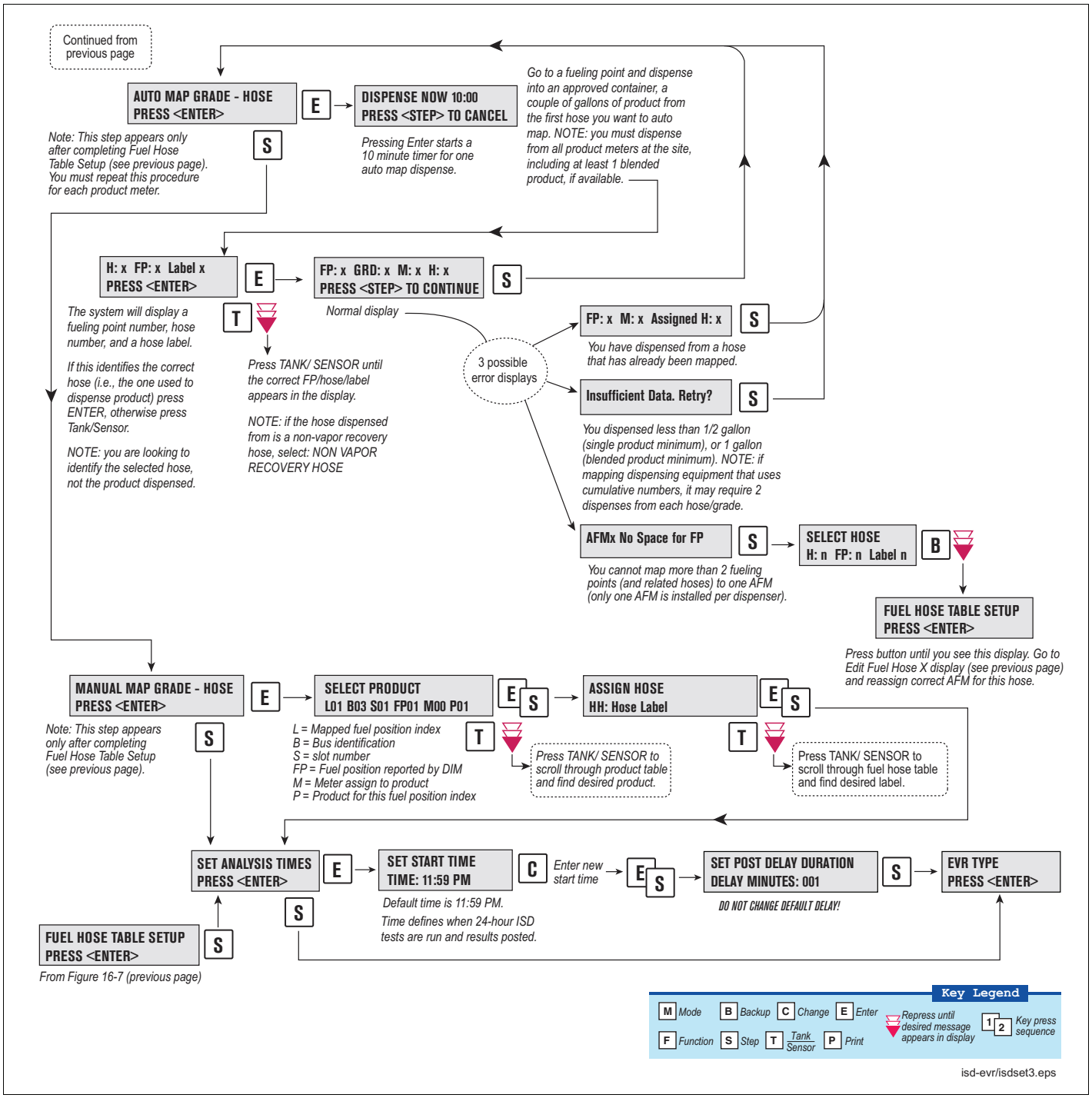


Figure 9. EVR/ISD Setup 3

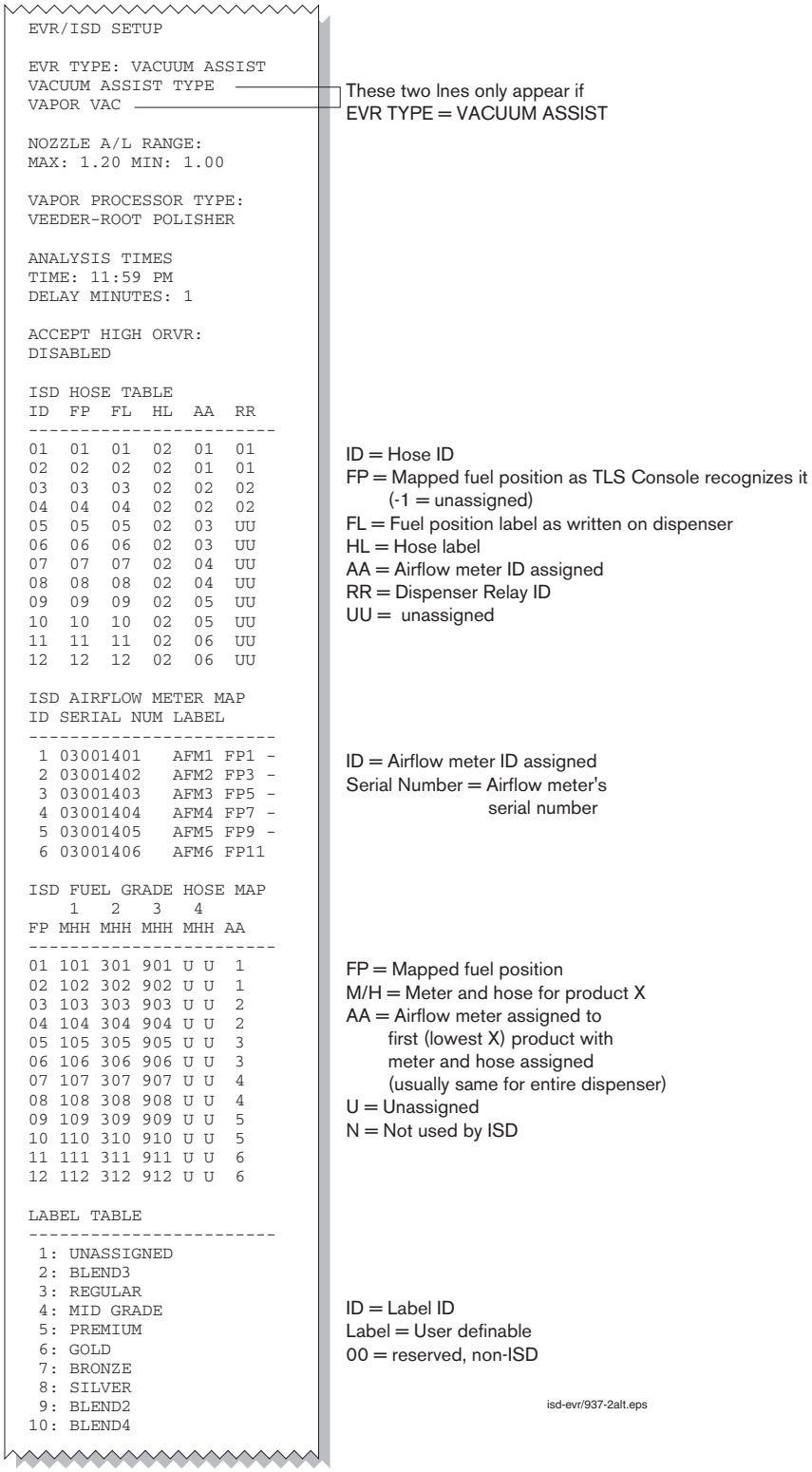


Figure 10. Example VST ECS Printout

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.

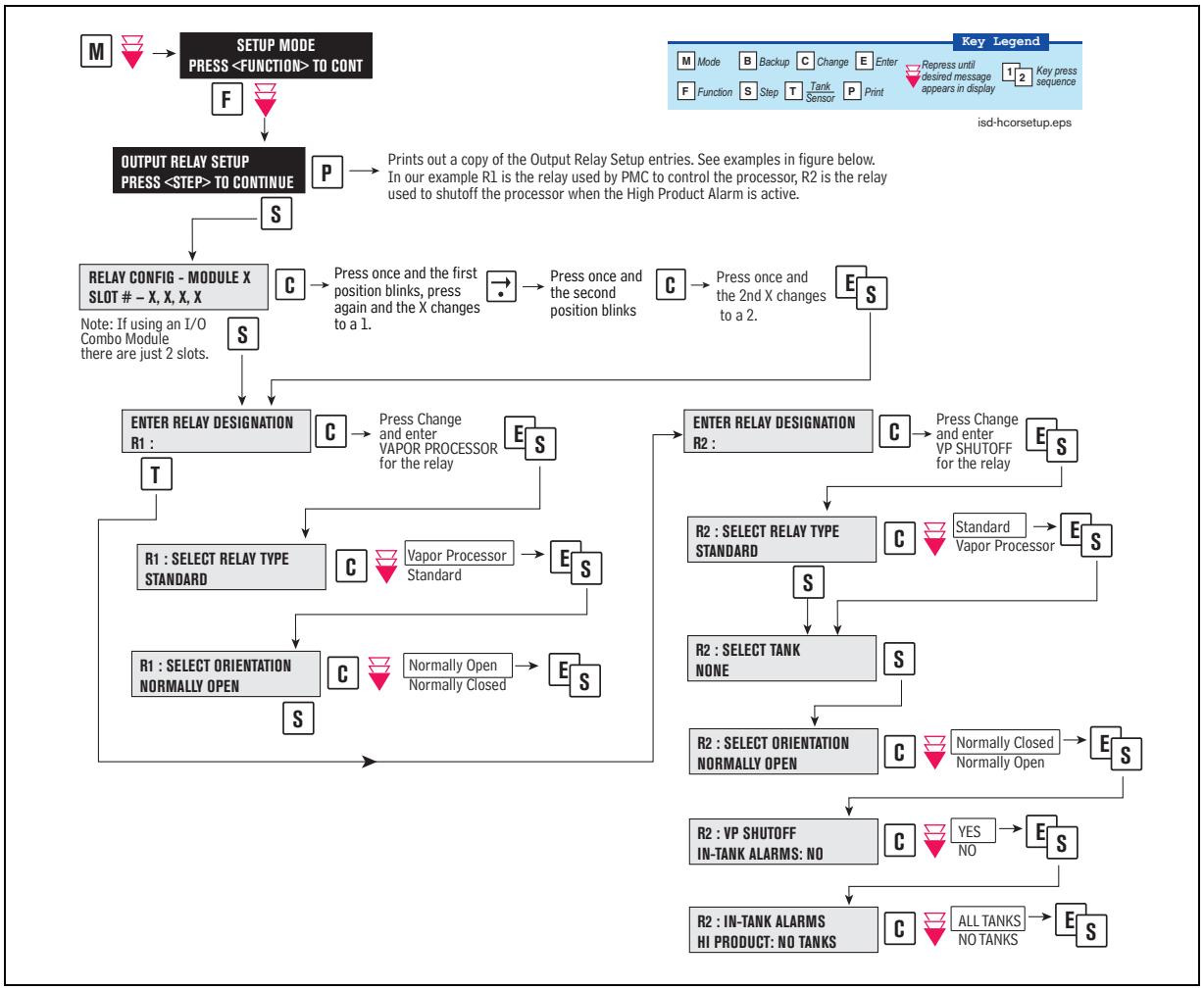


Figure 11. Output Relay Setup for VST ECS Membrane Processor

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

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

R 1: VAPOR PROCESSOR
TYPE:
 VAPOR PROCESSOR
NORMALLY OPEN
- NO ALARM ASSIGNMENTS -
```

isd-evr\ortlscntrlvpsetprt.eps

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

R 2: VP SHUTOFF
TYPE:
 STANDARD
NORMALLY CLOSED
IN-TANK ALARMS
ALL HIGH PRODUCT ALARMS
```

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).

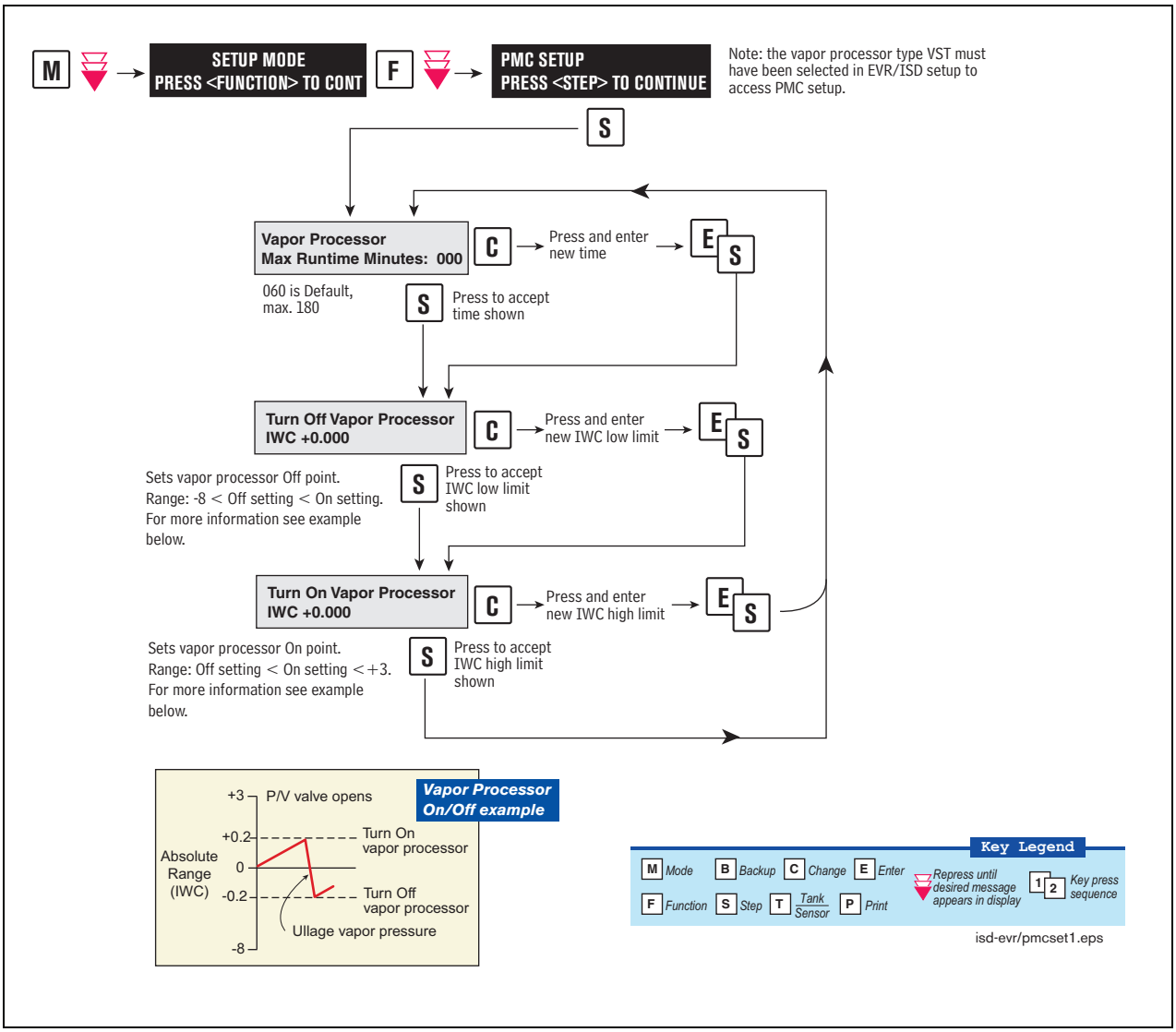


Figure 13. PMC Setup - VST ECS Membrane Processor

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)or the gasoline dispensers 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 pumpsor dispensers 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 or assign ISD alarms to Dispenser Relays which can be used to shut down the dispenser. Figure 14 illustrates two examples of tank pump control, one using a line leak/output relay combination and one using output relays.

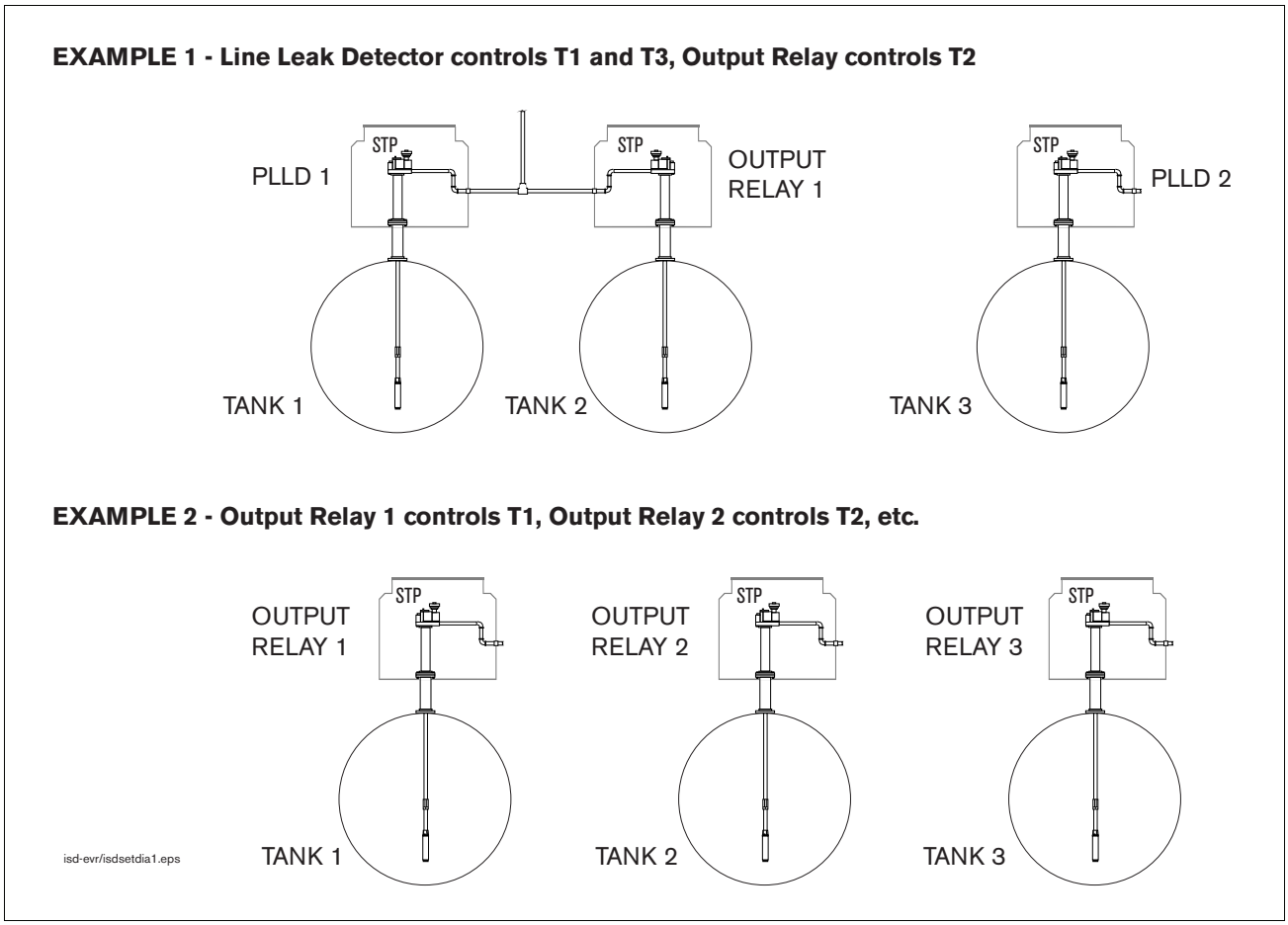


Figure 14. Site Tank Control Examples

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.

Figure 15 illustrates two examples of dispenser control using Dispenser Relay modules.

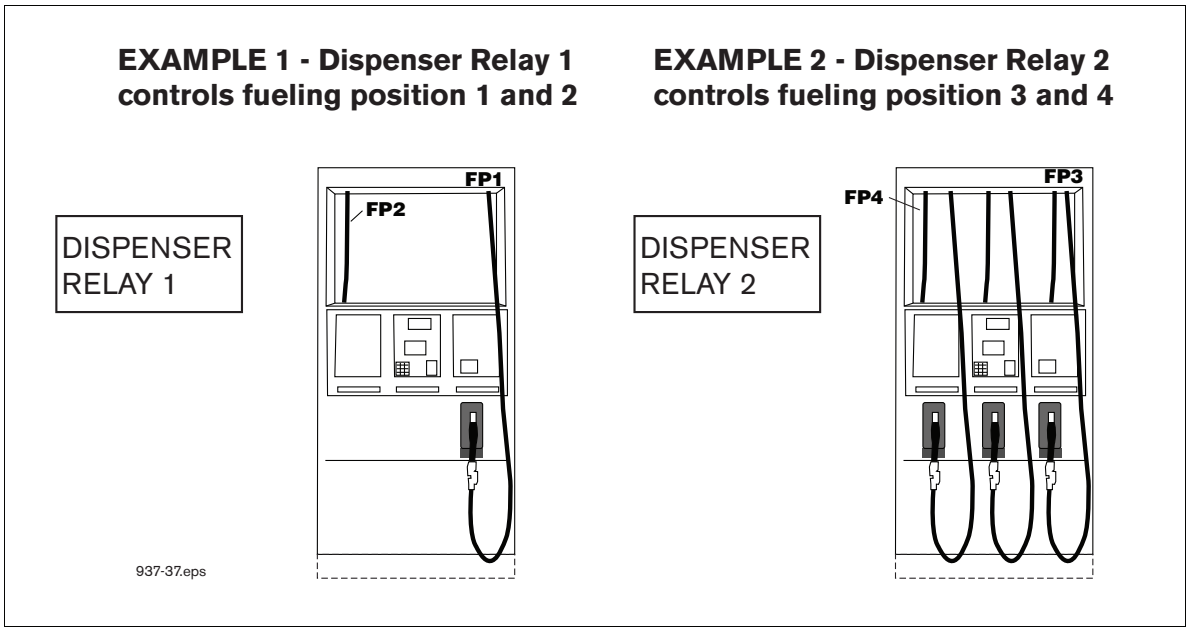


Figure 15. Dispenser Control Examples

You can assign ISD containment shut down alarms to the submersible pump output relays and assign ISD collection alarms to the dispenser relay as shown above.

ALARM SETUP FOR SITES WITH LINE LEAK DETECTION

Figure 16 illustrates the setup steps required to assign ISD Shut Down Alarms to a tank having a line leak detection system installed.

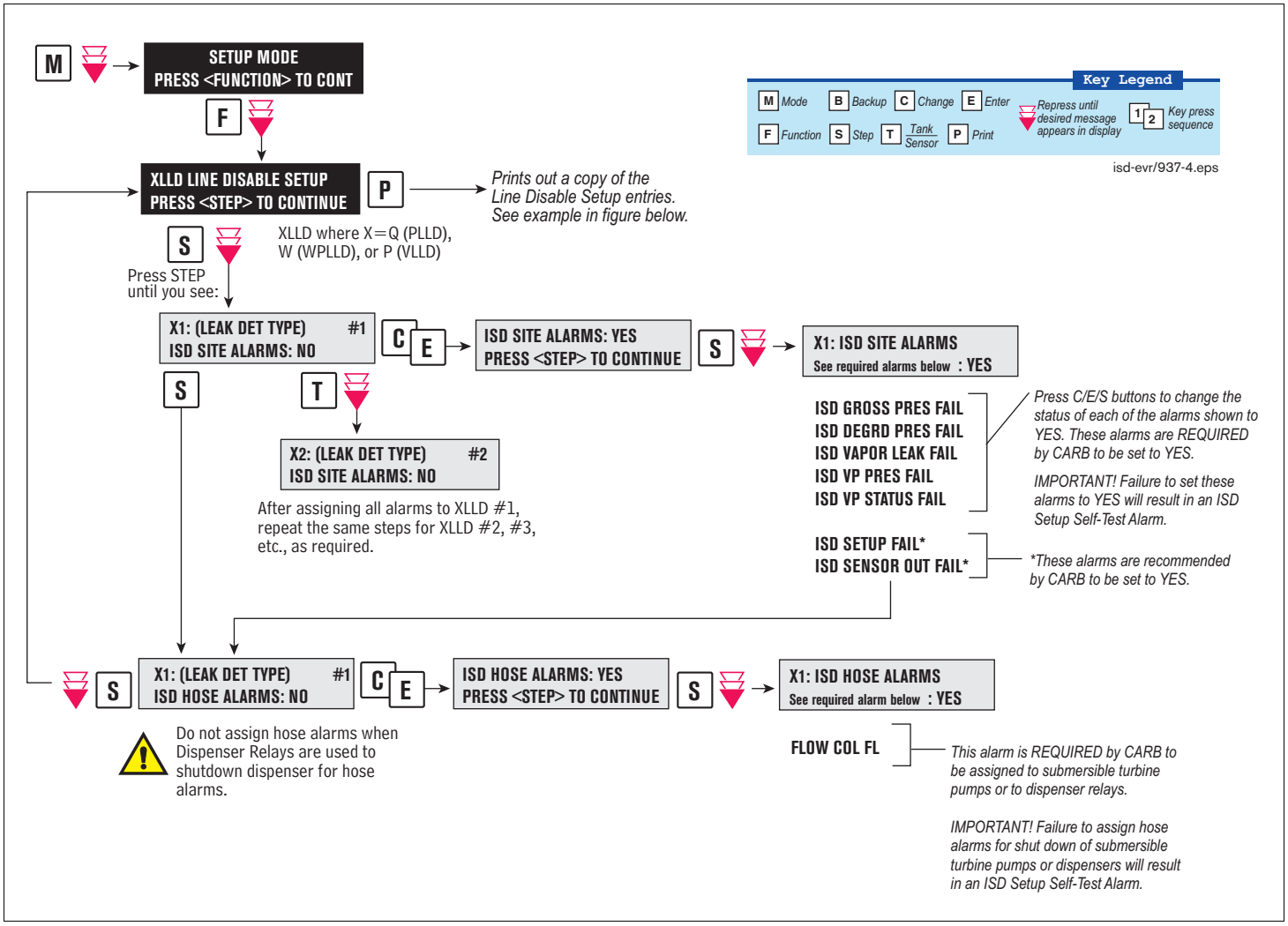


Figure 16. Assigning ISD Shut Down Alarms in Line Leak Disable Setup

Figure 17 shows a resulting printout of the Line Leak Disable setup with ISD alarms assigned when Dispenser Relay modules are not used.

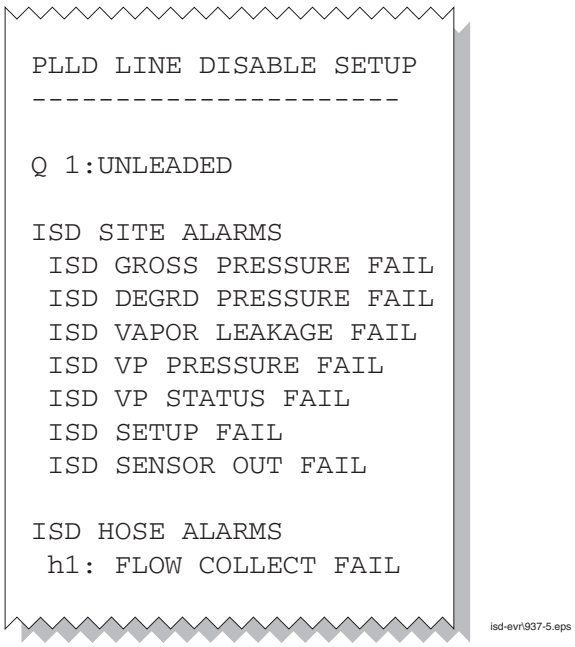


Figure 17. Example Line leak Disable Setup Printout

ALARM SETUP FOR SITES WITHOUT LINE LEAK DETECTION

Figure 18 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.

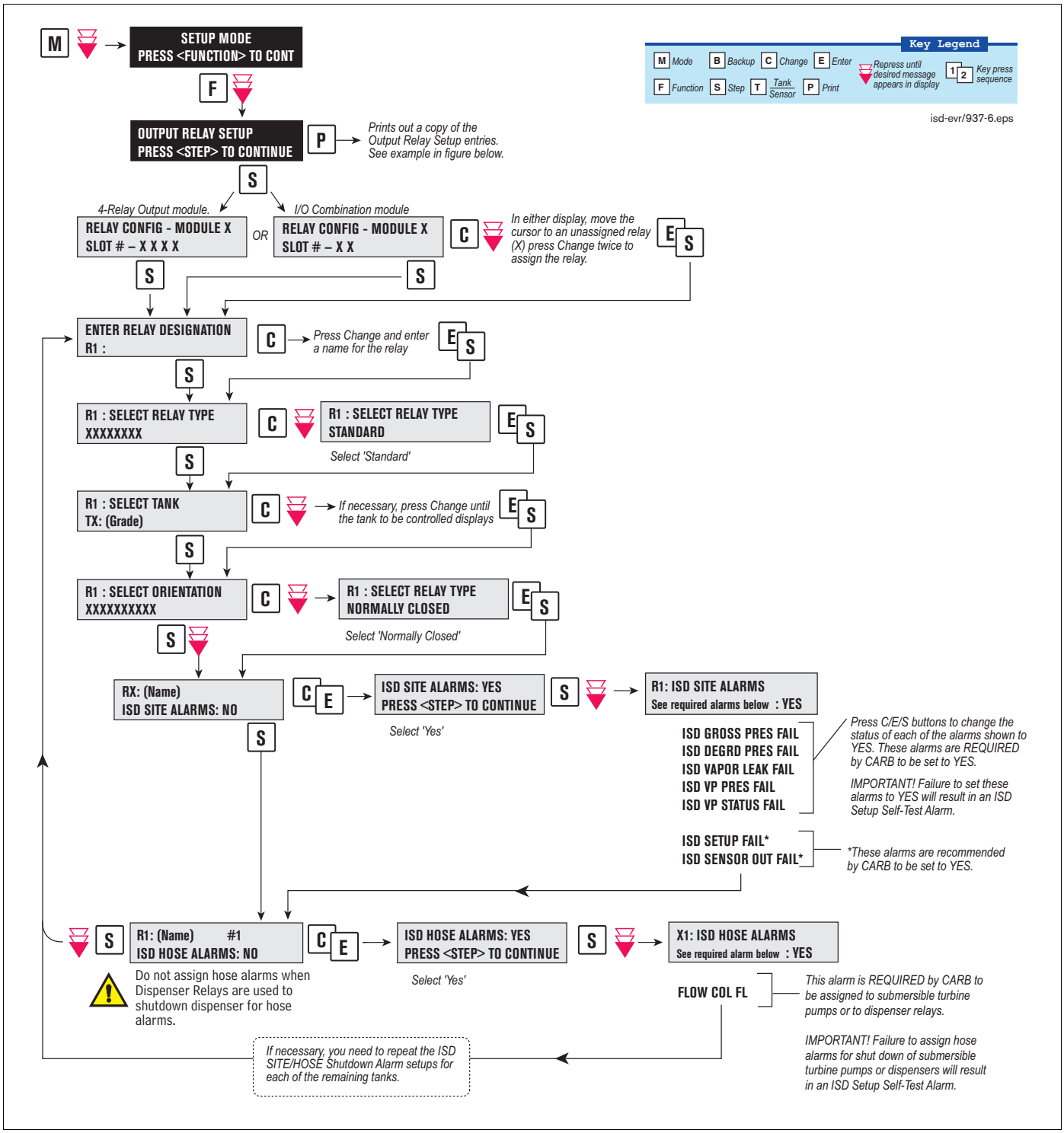


Figure 18. Assigning ISD Shut Down Alarms in Output Relay Setup

Figure 19 shows a resulting printout of the Output Relay setup with ISD alarms assigned when Dispenser Relay modules are not used.

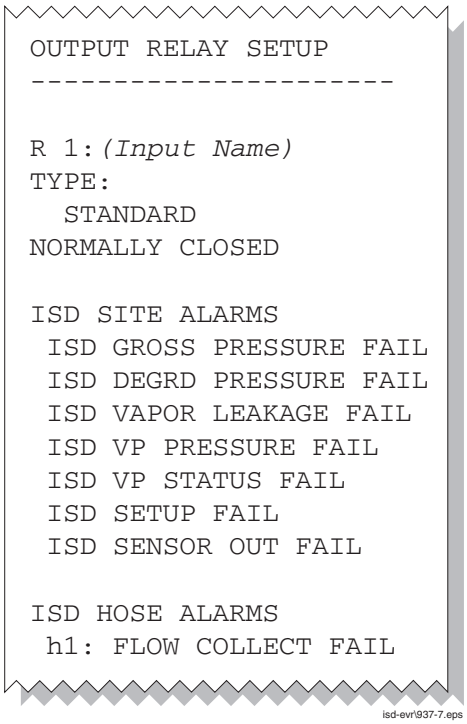


Figure 19. Example printout - ISD Alarms Assignments - Output Relay Setup

ALARM SETUP FOR SITES WITH DISPENSER RELAYS

Figure 20 illustrates the setup steps required to assign ISD Shut Down Alarms to a dispenser using a Dispenser Relay Module.

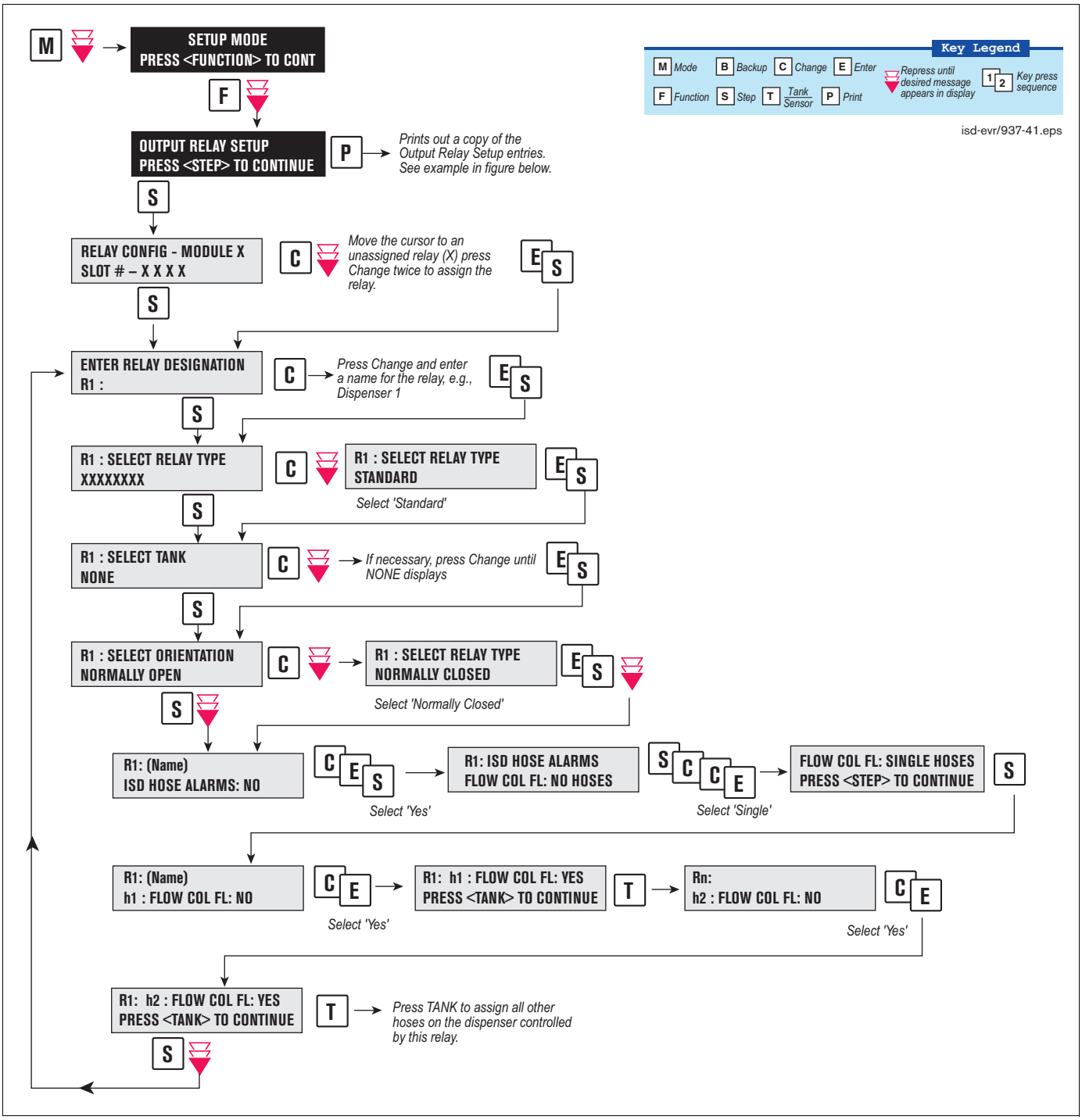


Figure 20. Assigning ISD Shut Down Alarms in Dispenser Relay Setup

Figure 21 shows a resulting printout of the Dispensor Relay setup with ISD hose alarms assigned..

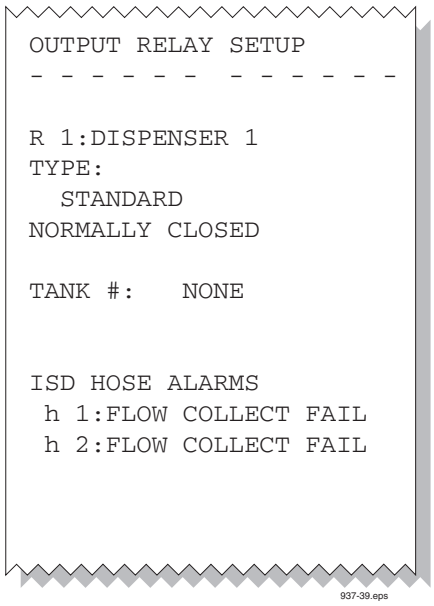


Figure 21. Example printout - ISD Hose Alarm Assignments - Dispenser Relay Setup

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 22 and Figure 23. 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 25. 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 22 (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 22. 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 23). 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 23).
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 23).
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 24 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 25).
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 24 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 25).
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.

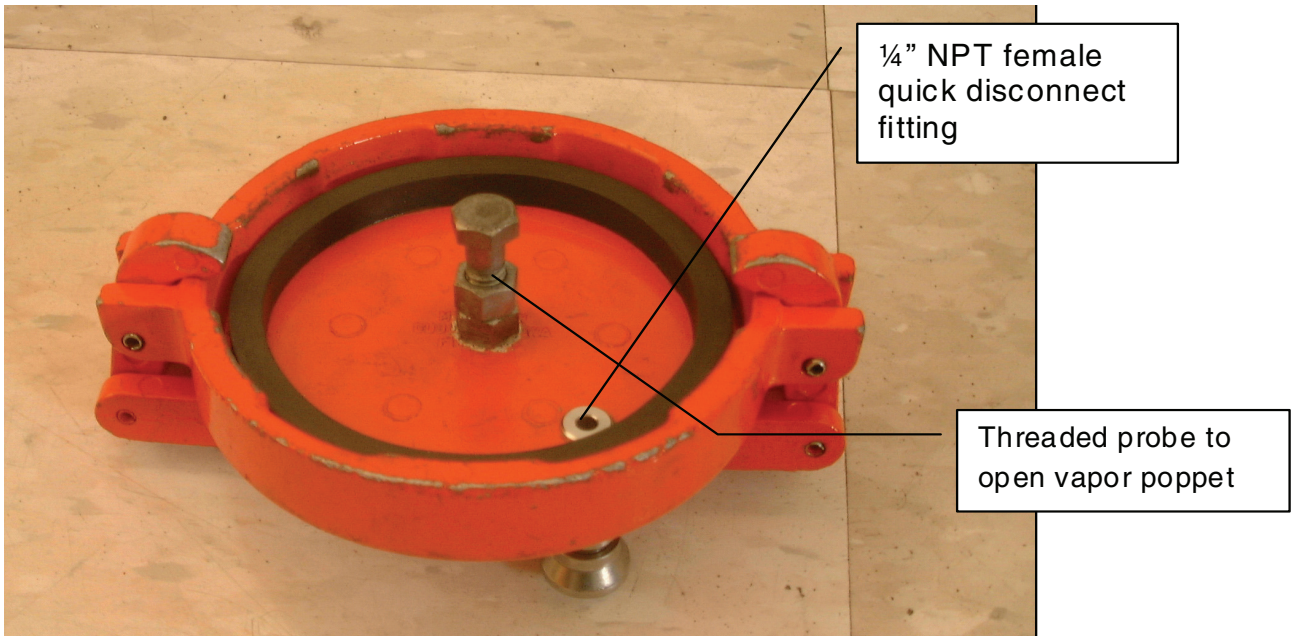


Figure 22. Typical modified vapor adaptor dust cap (bottom view)

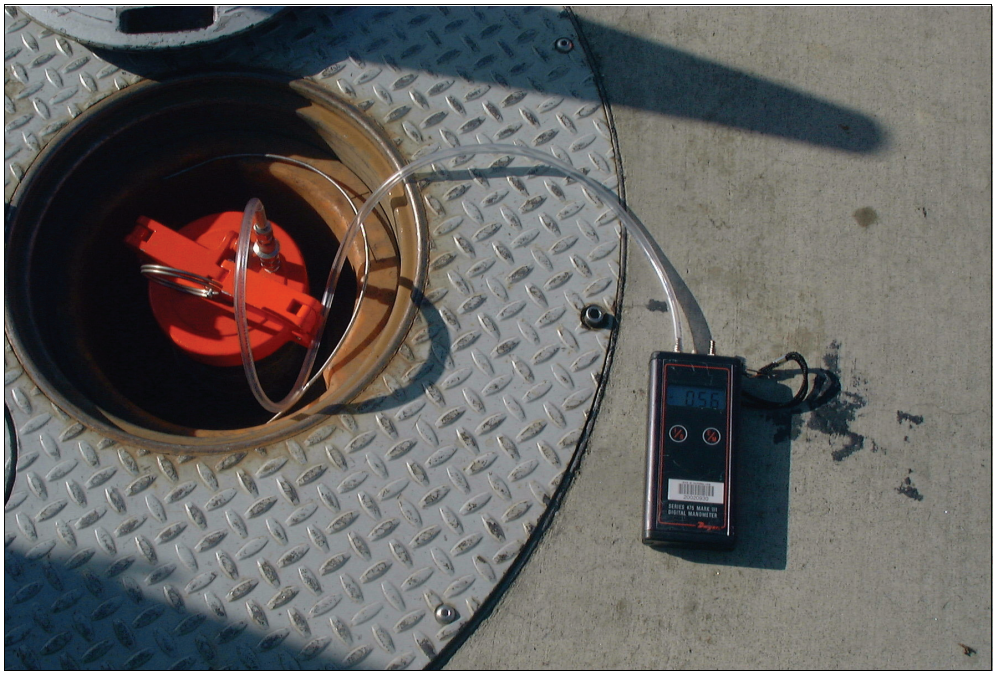


Figure 23. Typical field installation of UST Pressure Measurement Assembly

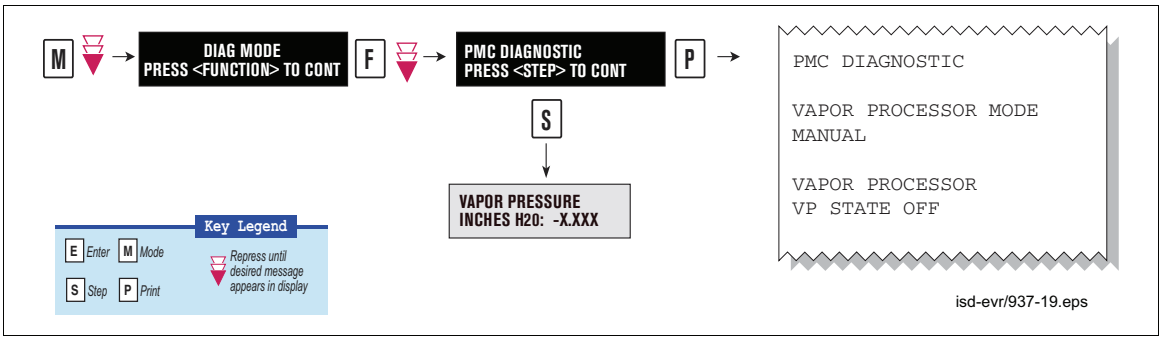


Figure 24. Accessing the vapor pressure sensor reading

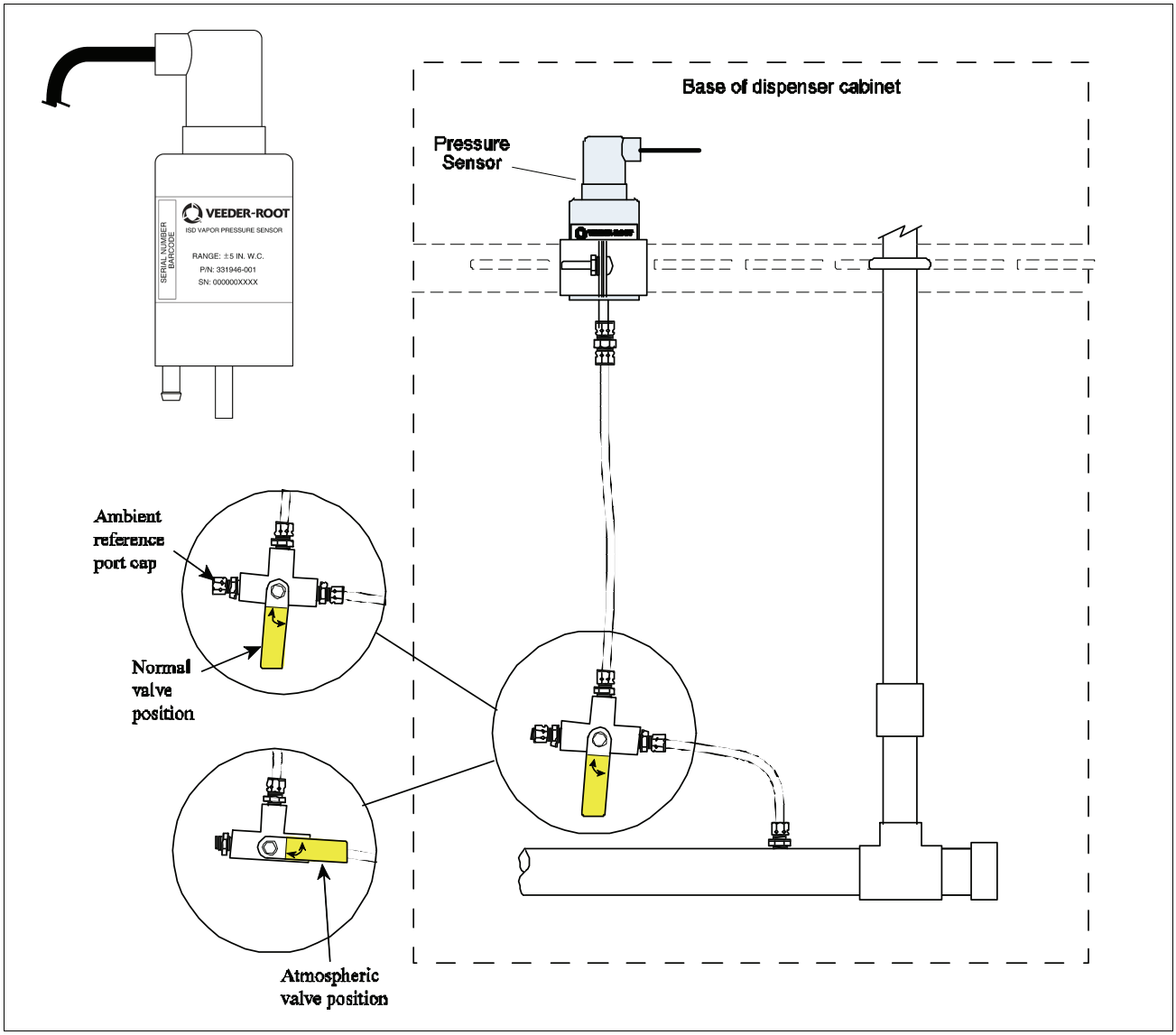


Figure 25. Vapor pressure sensor valve positions

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 26 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.

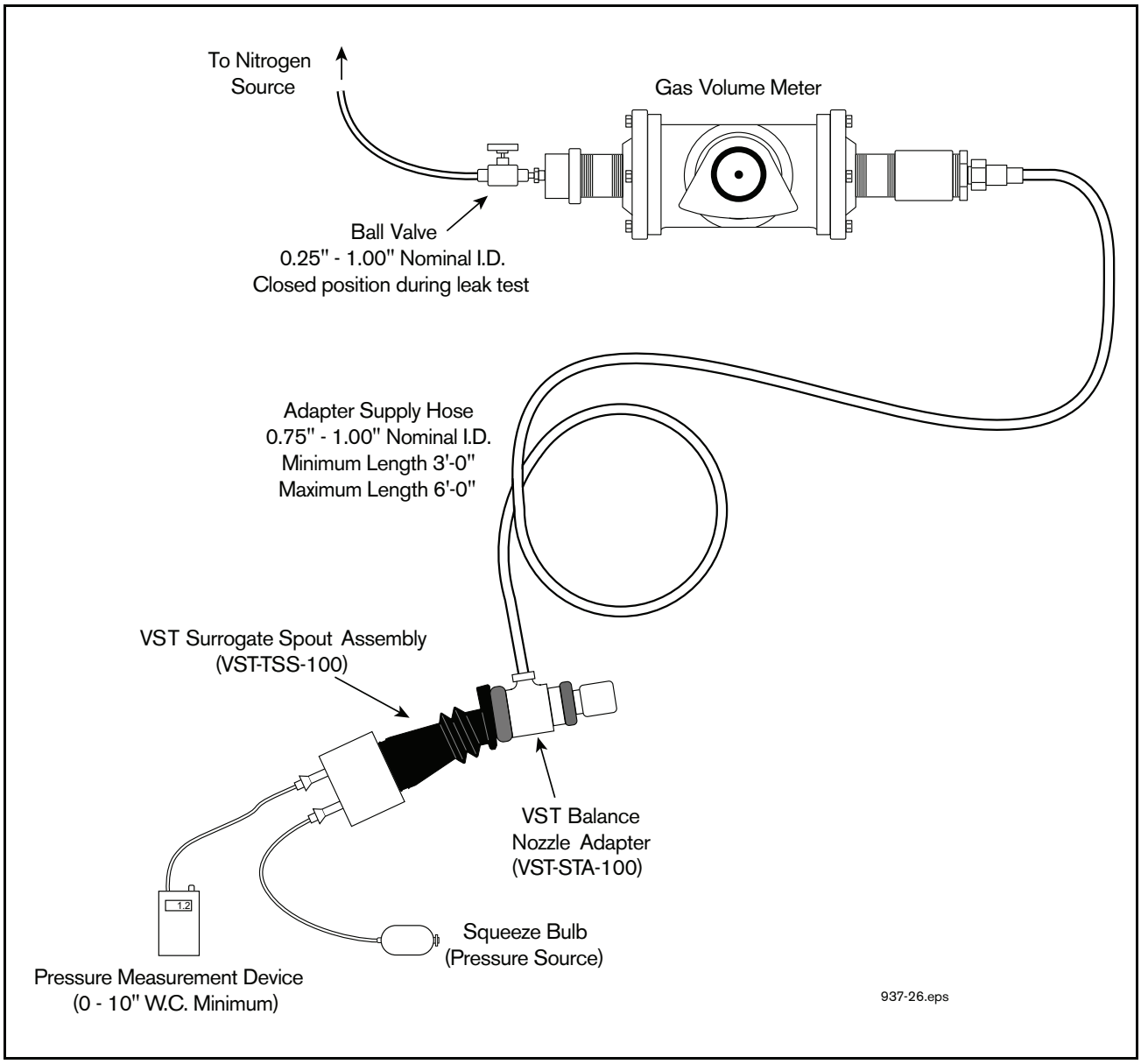


Figure 26. VST Surrogate Spout Assembly

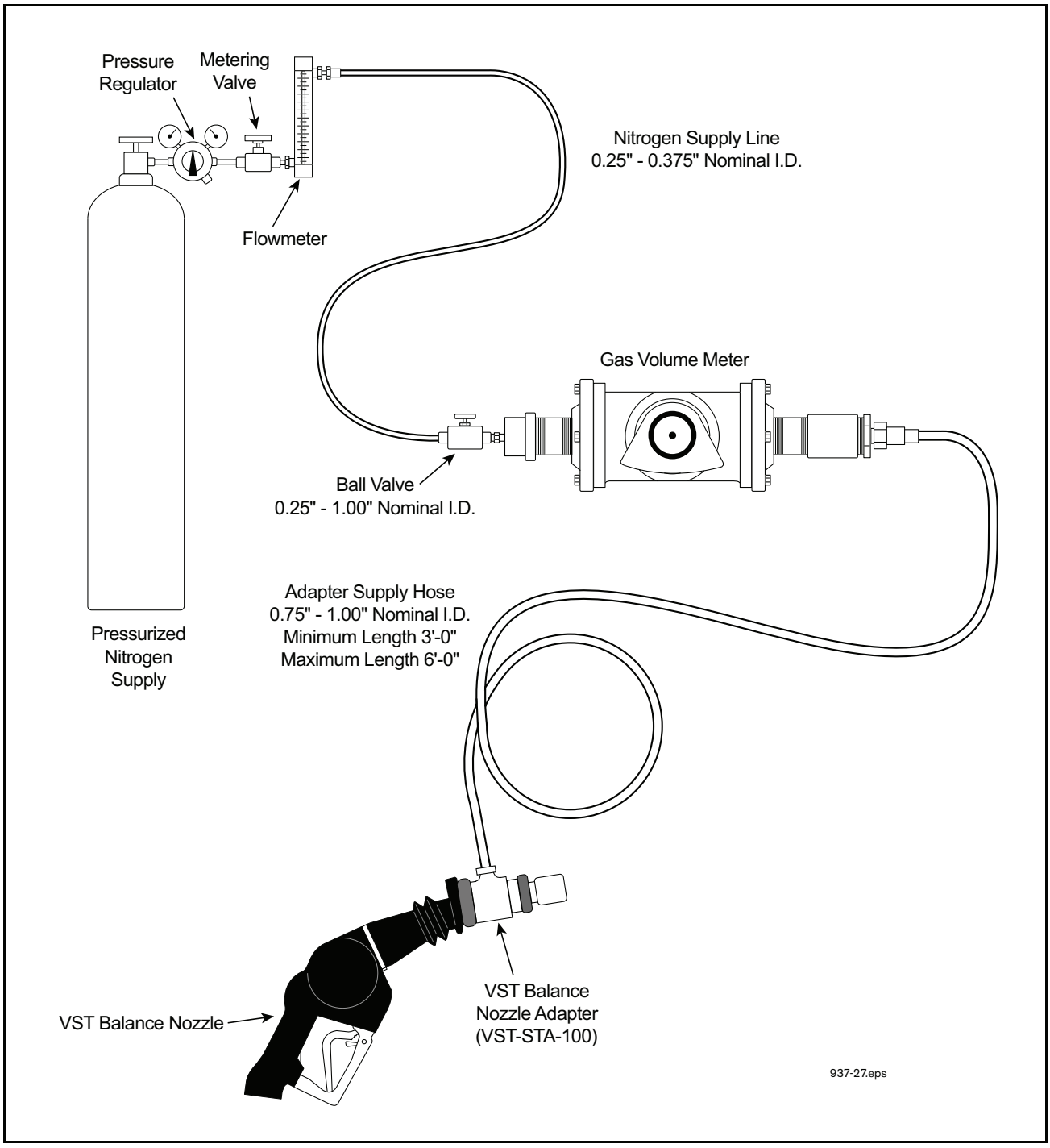


Figure 27. Vapor Flow Meter Test Assembly

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
```

937-16.eps

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. Refer to Veeder-Root Serial Interface Manual, Manual No. 576013-635 for alternate command syntax.

   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
```

937-17.eps

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 26. Turn the ball valve in the Figure 26 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 27, 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.

5 Operation

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 28).

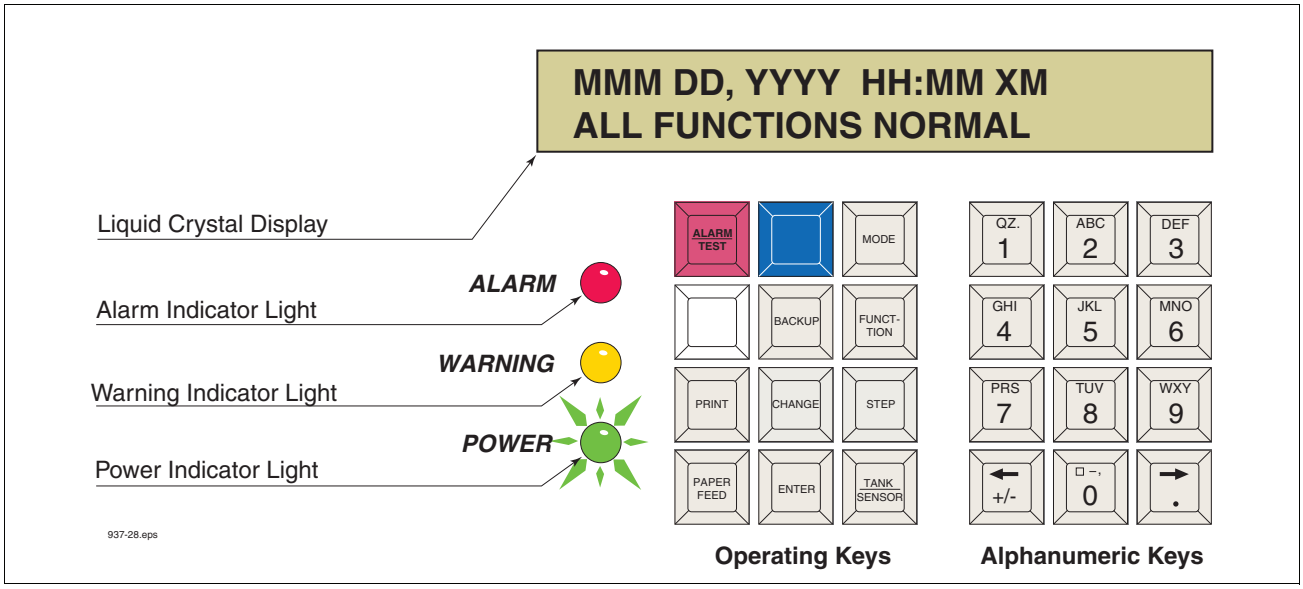


Figure 28. TLS console alarm interface

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 29, 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.

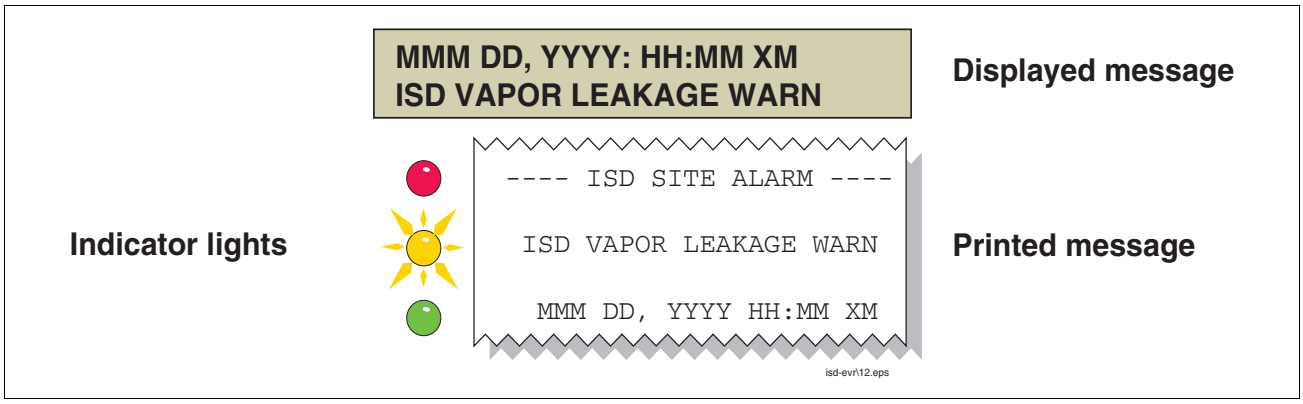


Figure 29. Example Warning posting

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 30 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.)

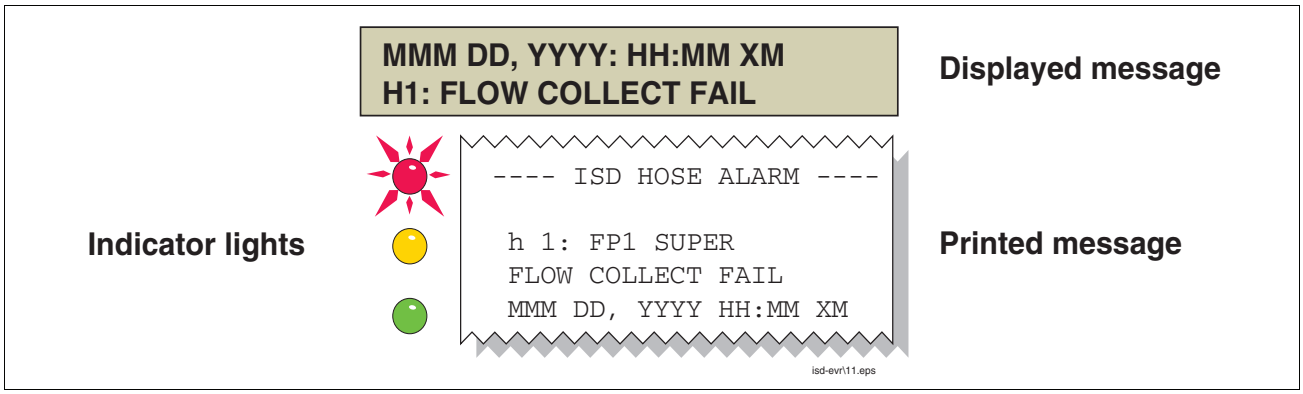


Figure 30. Example Alarm posting

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 31 illustrates the ISD alarm override procedure.

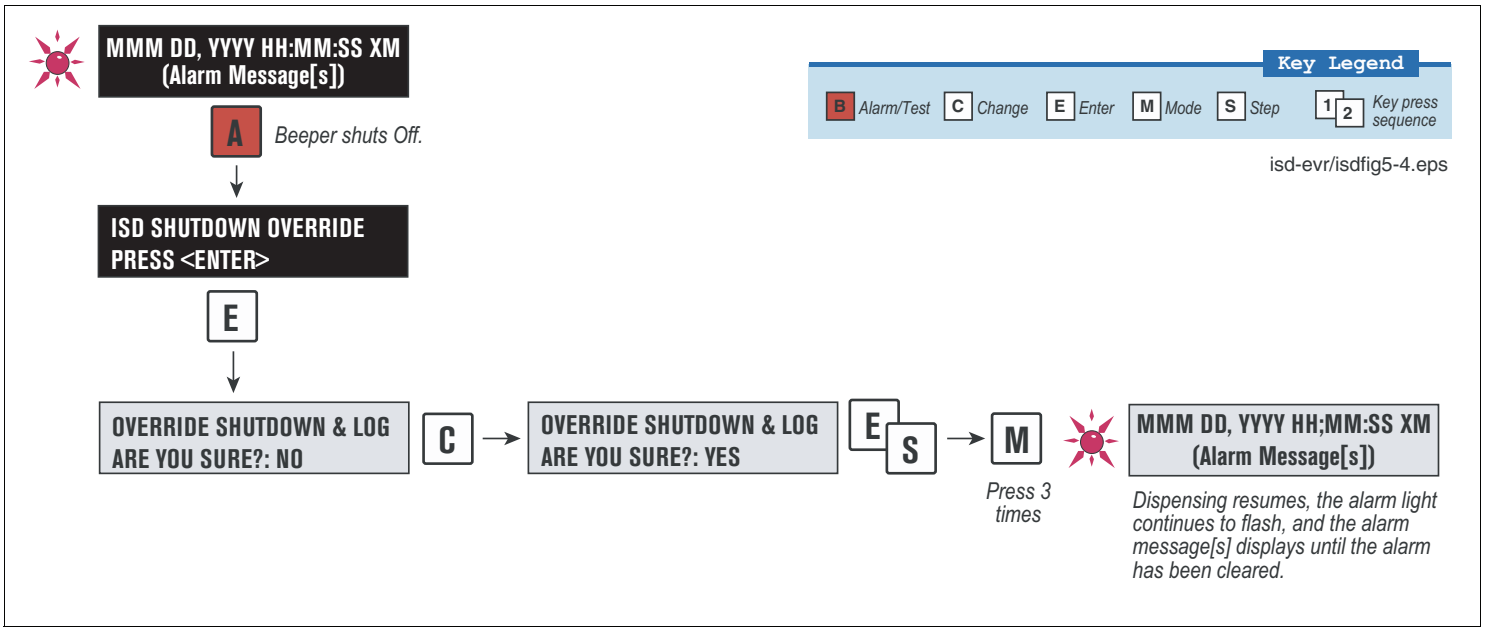


Figure 31. ISD Alarm Override Procedure

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
```

937-21.eps

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 • Exhibit 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 16-39.

[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 32.

- 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 32.

.

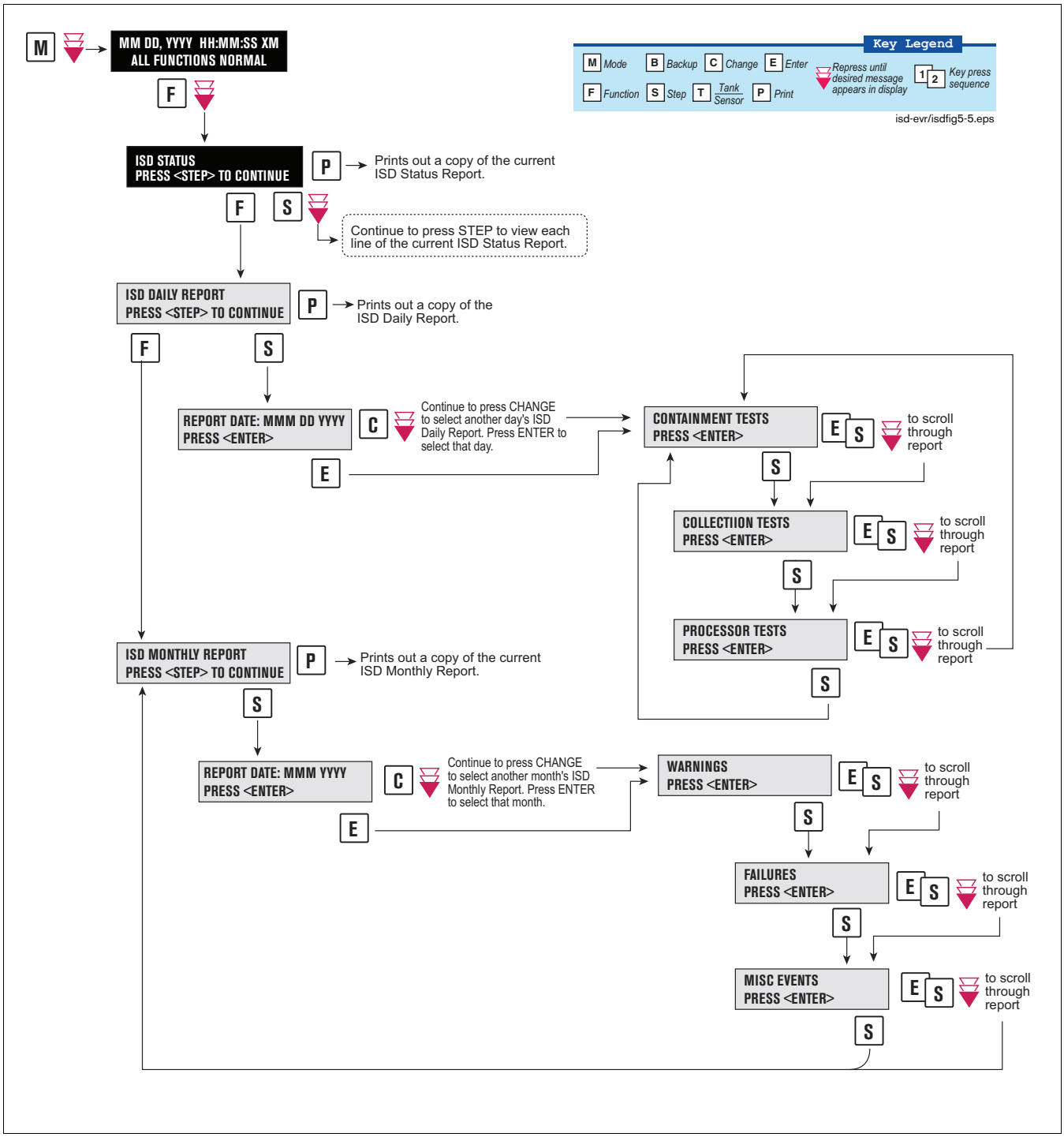


Figure 32. Printing ISD Reports on Console Printer

Figure 33 shows an example ISD Status Report.

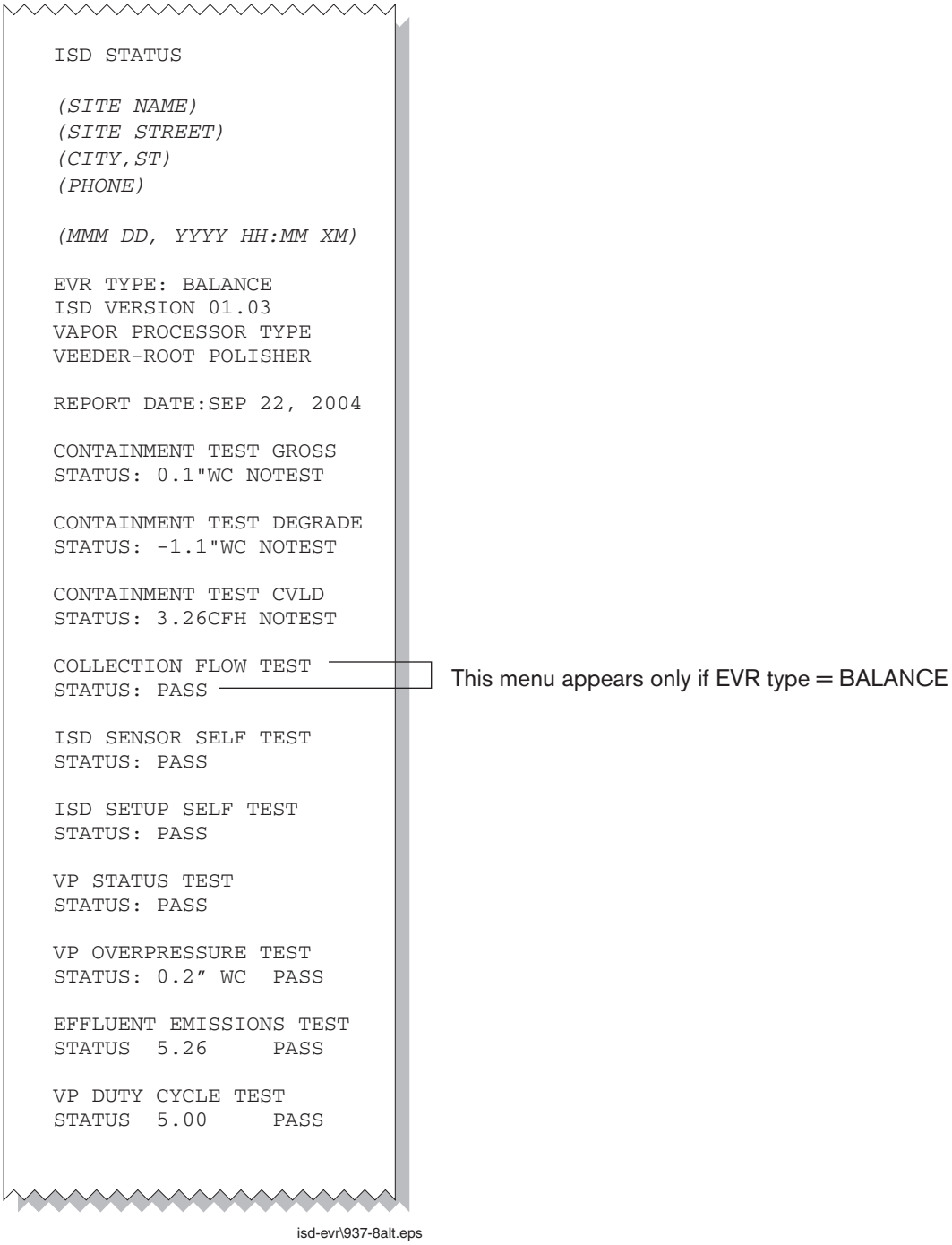


Figure 33. ISD Status Report Example - TLS console printout

Figure 34 shows an example ISD Daily Report.

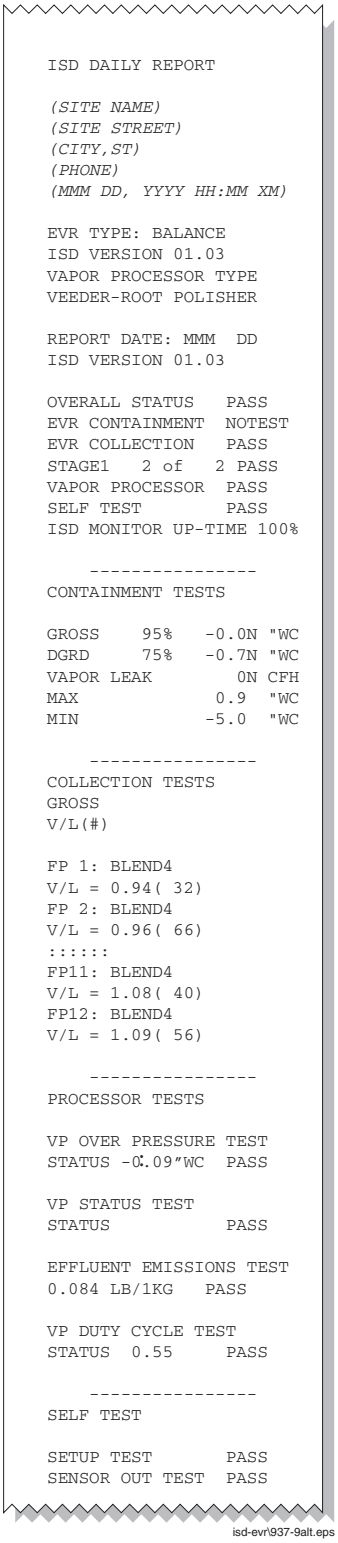


Figure 34. ISD Daily Report Example - TLS console printout

Figure 35 shows an example ISD Monthly Report.

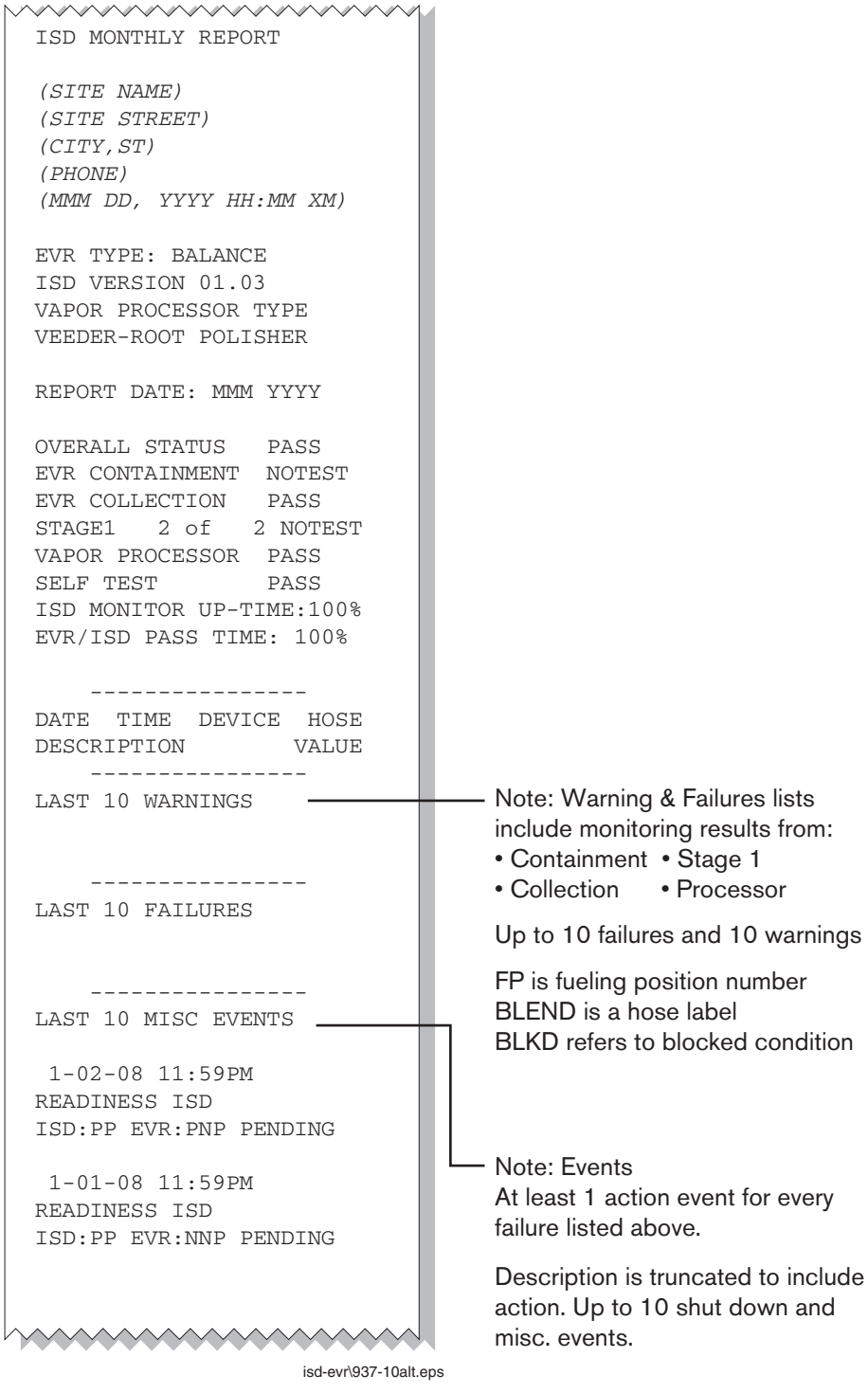
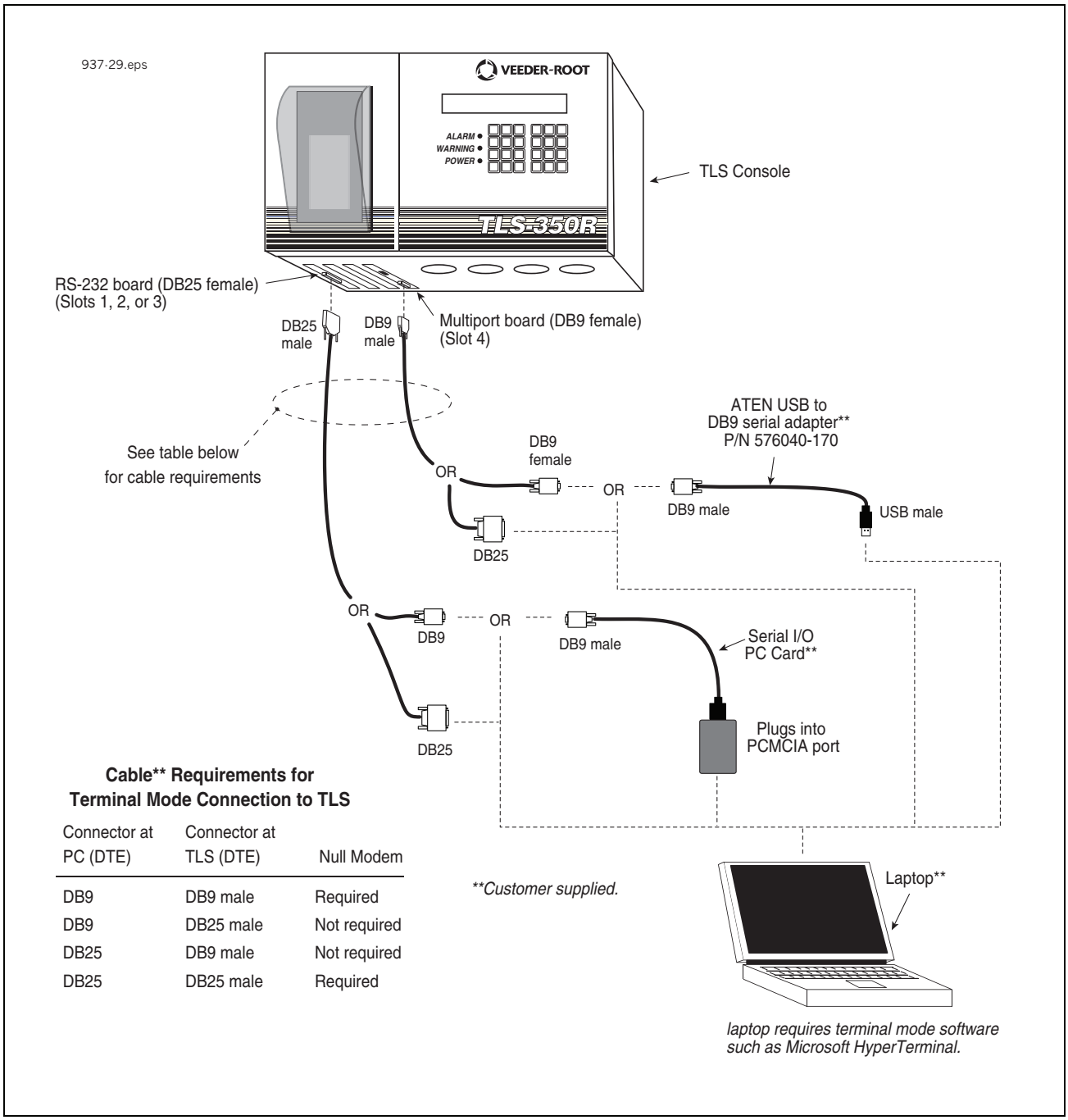


Figure 35. ISD Monthly Report Example - TLS console printout

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 36 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

Figure 36. 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 37), enter a connection name, e.g., TLSDIRECT, and click the OK button.

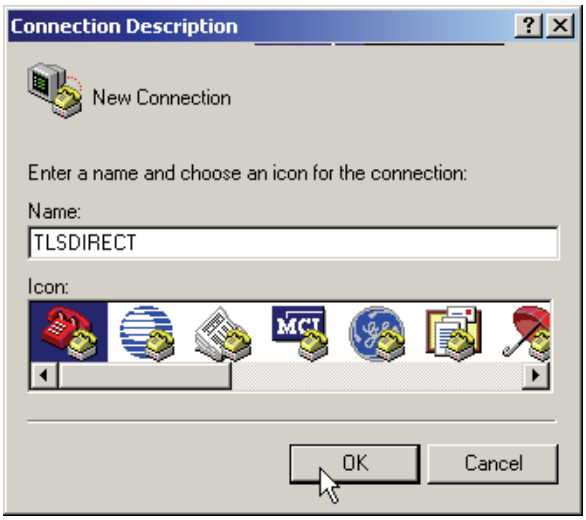


Figure 37. Connection Description window

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 38), 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 38. 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 39 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.

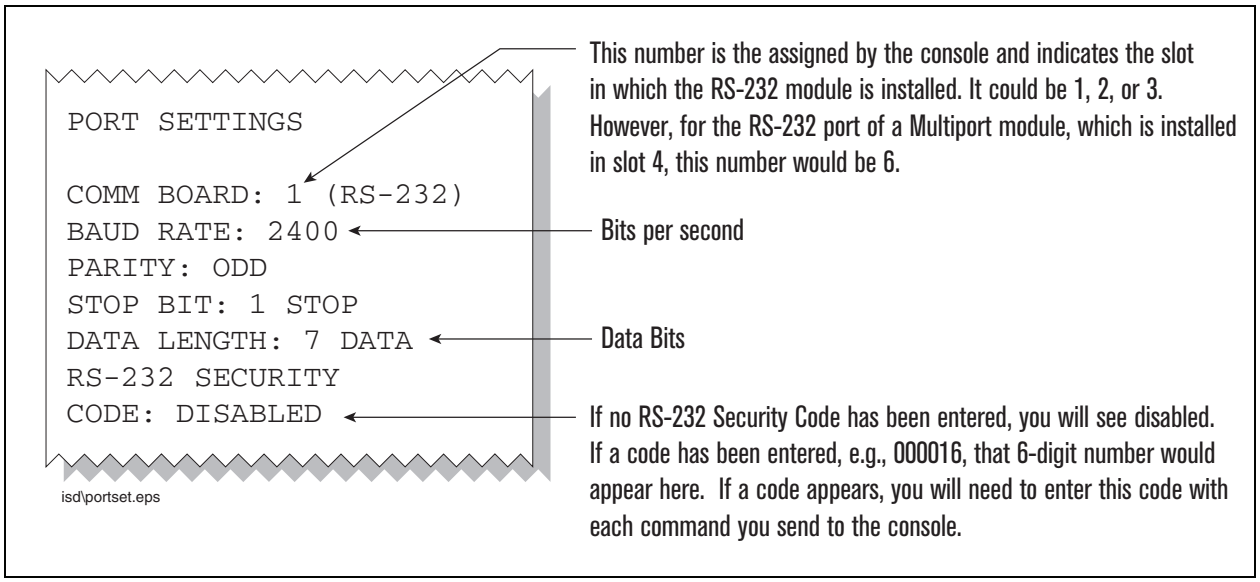


Figure 39. Console comm port settings prinout example

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 40).

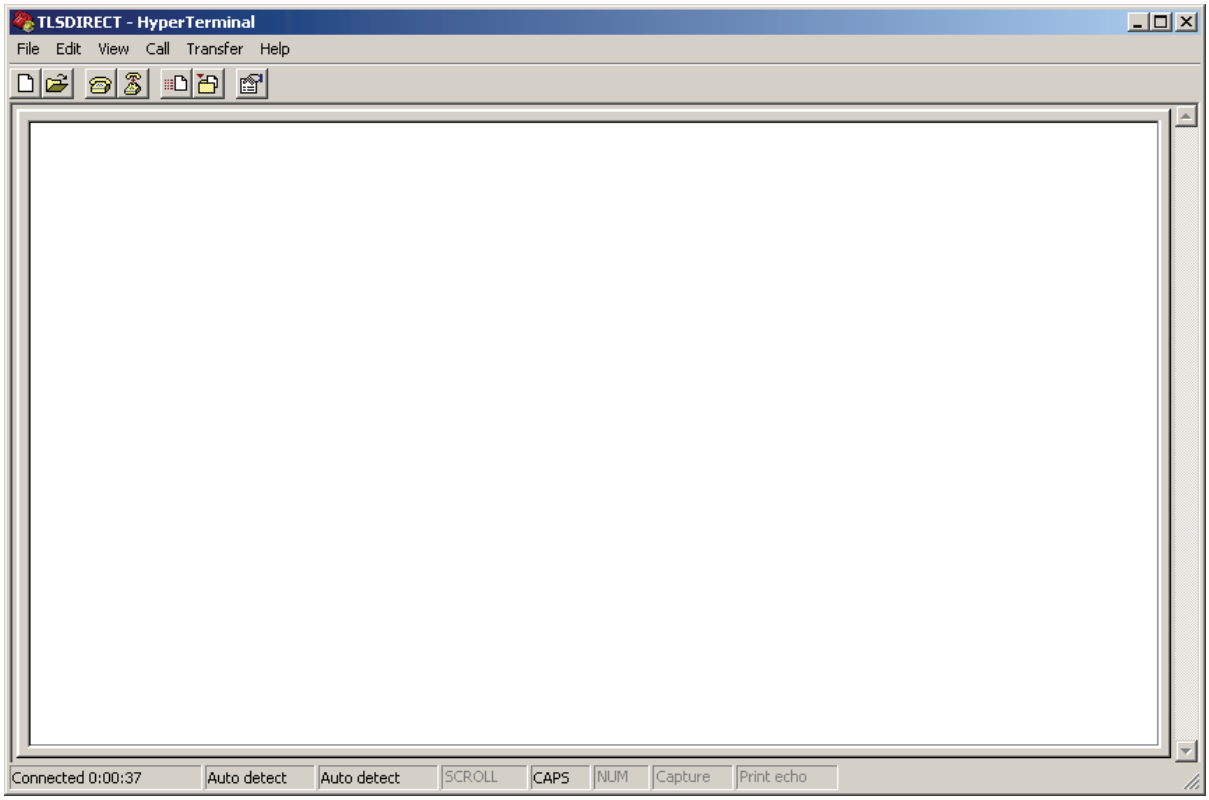


Figure 40. HyperTerminal main window

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 41)	<SOH>IV0500ddd Where ddd = number of days, 001 = yesterday and today, 002 = two days ago, etc.
Monthly Status Report (See example Figure 42)	<SOH>IV0200yyyymm Where yyyy = year number, e.g. 2003, mm = month number, 01 = January, 02 = February, etc.
Alarm Status (See example Figure 43)	<SOH>IV0100
V80 Vapor Processor Runtime Diagnostic Report (See examples Figure 44 and Figure 45)	<SOH>IV8000
Vapor Valve Status Report (See example Figure 46)	<SOH>IB6100
Daily Vapor Polisher Diagnostic Report (See example Figure 48)	<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\937-11alt.eps

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

ISD DAILY REPORT DETAILS

EVR TYPE: BALANCE
ISD TYPE: 01.03
VAPOR PROCESSOR TYPE: VEEDER-ROOT POLISHE

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 41. ISD Daily Report Details - Serial to PC Format

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

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

ISD MONTHLY STATUS REPORT

EVR TYPE: BALANCE
ISD TYPE: 01.03
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
07-12-26 00:02:40 VAPOR PRESSURE OVER PRESSURE   DAILY 95%         1.25
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 PRESSURE                TEST MANUALLY CLEARED
07-12-11 00:02:18 FLOW PERFORMANCE BLK          DISABLED FP 08
```

Figure 42. ISD Monthly Status Report - Serial to PC Format

```
IV0100
JAN  8, 2008  3:53 PM                                          937-13alt.eps

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

ISD ALARM STATUS REPORT

EVR TYPE: BALANCE
ISD TYPE: 01.03
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
07-12-26 00:02:40 VAPOR PRESSURE OVER PRESSURE     DAILY 95%          1.25
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 95%          5.00
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 95%          4.89
07-10-19 00:01:27 VAPOR PROCESSOR OVER PRESSURE    DAILY 95%          5.00
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 43. ISD Alarm Status Report - Serial to PC Format

Figure 44 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

DATE-TIME ON	ELAPSED MINUTES	PRESSURE INCHES H2O ON	OFF	RUNTIME 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

937-35.eps

Figure 44. VST Vapor Processor Runtime Diagnostics Report - Serial to PC Format

Figure 45 shows an example V-R Vapor Polisher Runtime Diagnostic Report and Table 4 explains the `IV8000` report's event codes.

IV8000 937-30.eps
FEB 4, 2008 1:01 PM

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

VAPOR POLISHER

VALVE EVENT DATE-TIME	PRESSURE "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 45. 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.	CLOSE CVLD TEST	Valve was closed to collect data for ISD contamination leak test.

Figure 46 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
```

937-31.eps

Figure 46. 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 46) command only provides active Sensor Fault conditions. Use the IB6200 command to see archived fault conditions (Figure 47).

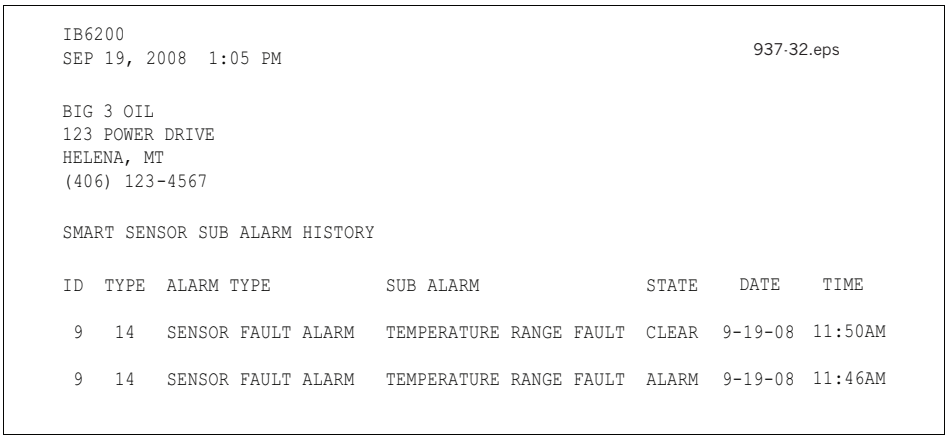


Figure 47. Smart Sensor Sub Alarm History Report - Serial to PC Format

Figure 48 shows an example PMC Daily Vapor Polisher Diagnostic Report.

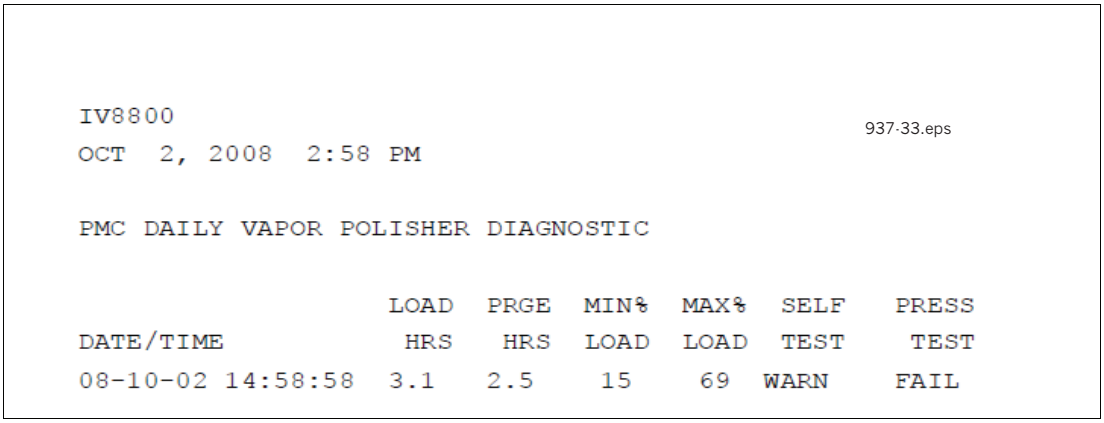


Figure 48. PMC Daily Vapor Polisher Diagnostic Report - Serial to PC Format

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.

Station operation is responsible to ensure console printer paper is serviced and front panel LEDs are operational.

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.

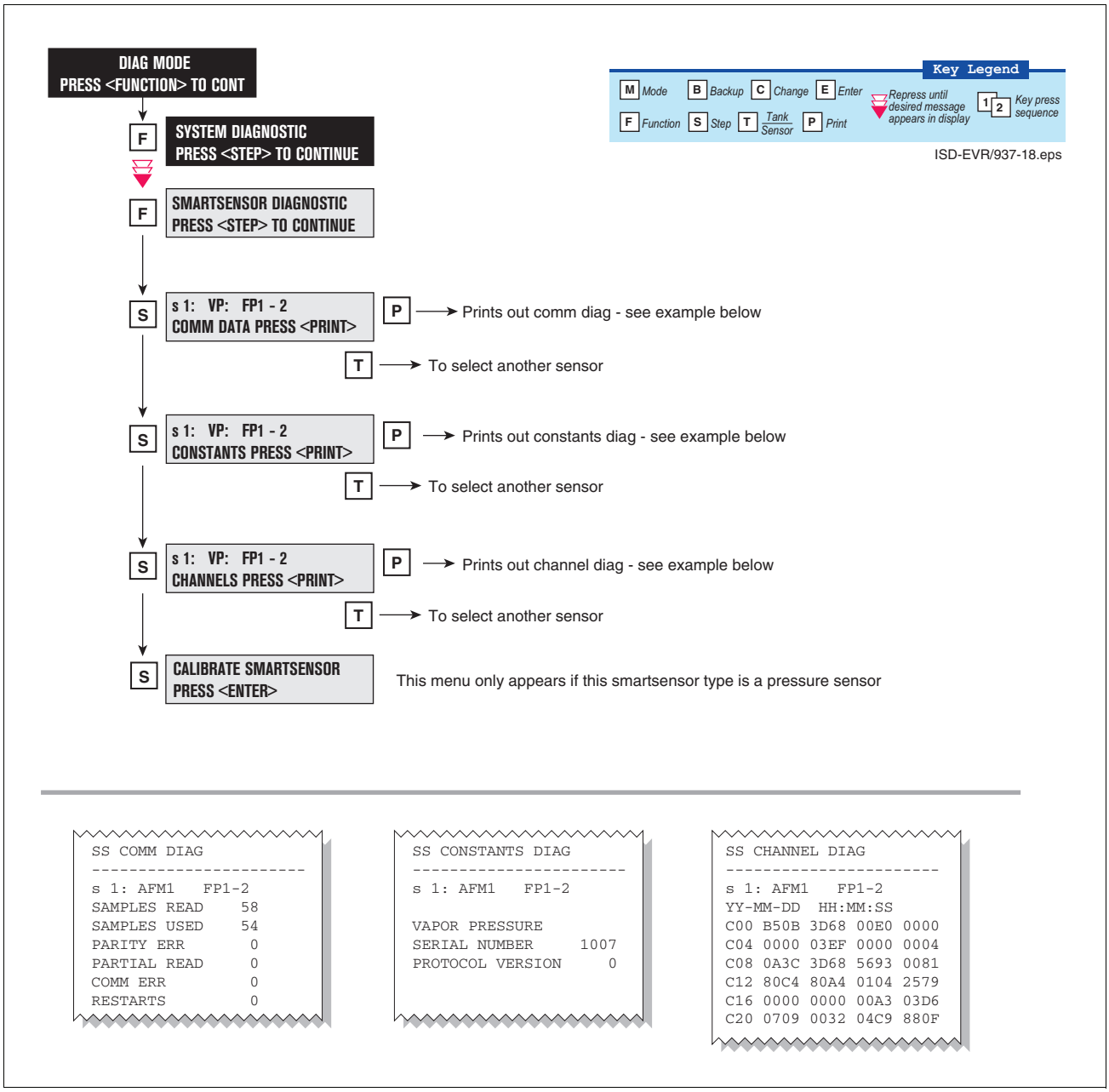
Vapor Pressure Sensor

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 49. Smart Sensor Diagnostic Menu

Calibrate Smart Sensor Menu

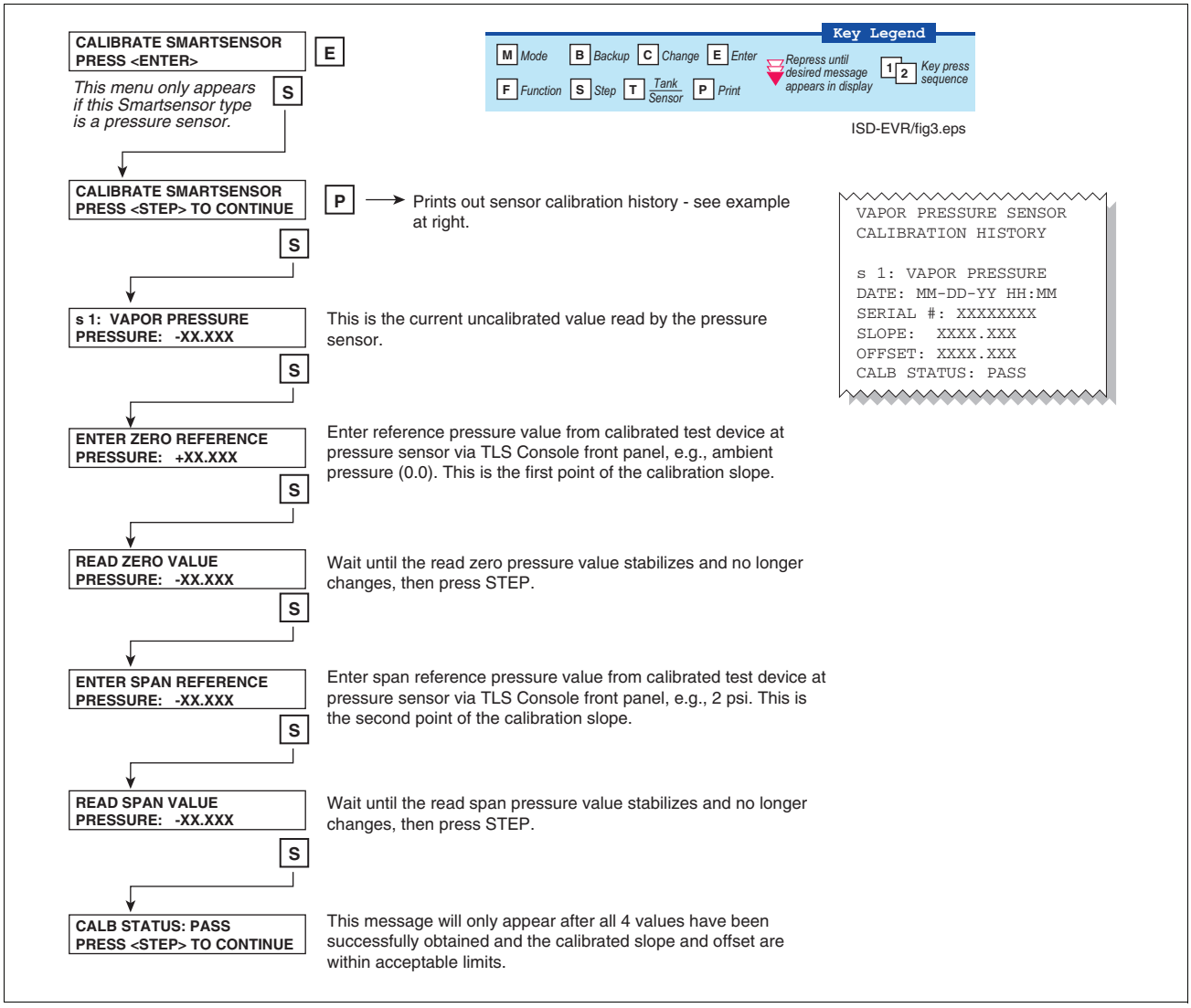
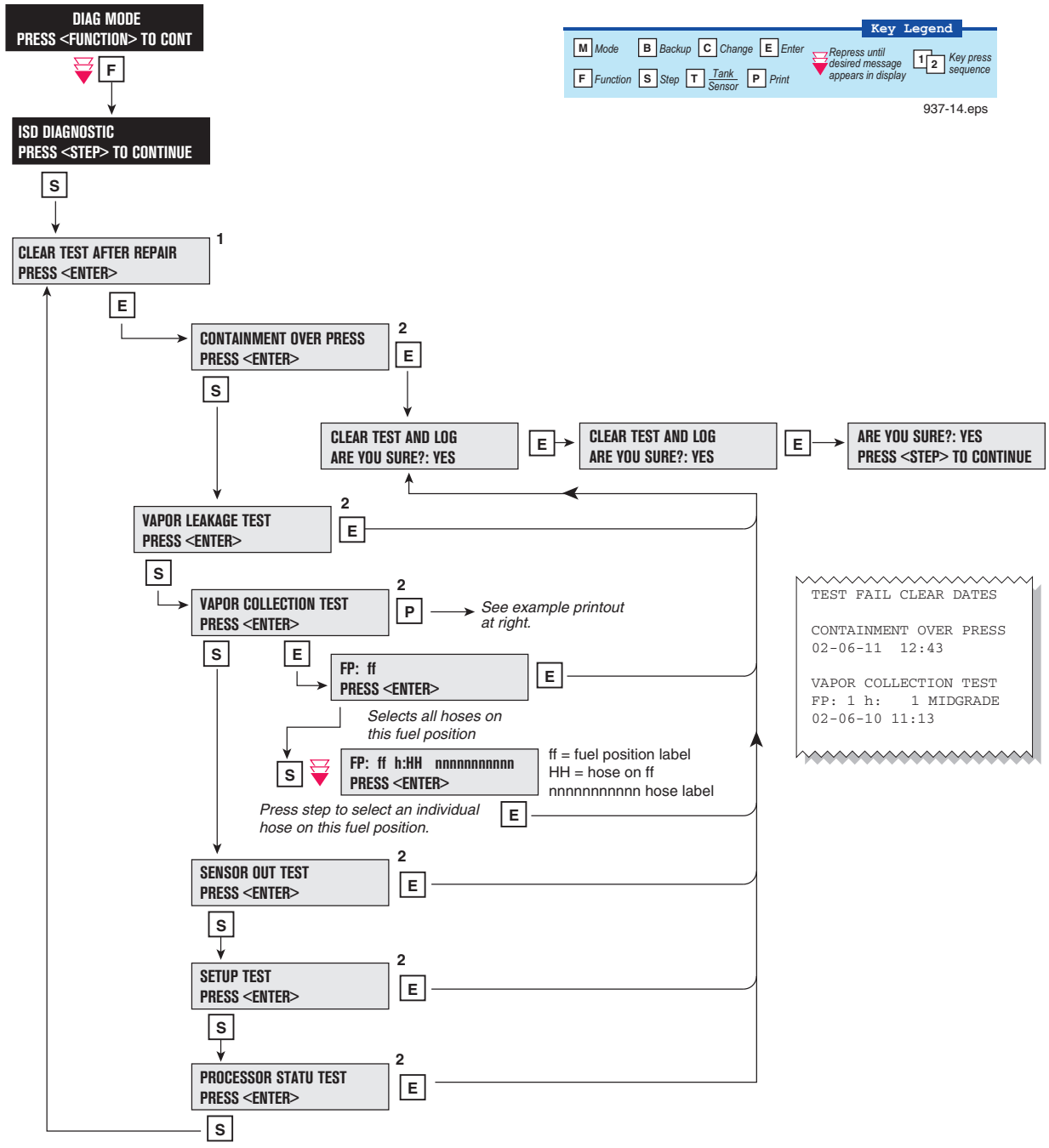


Figure 50. Smart Sensor Calibration Menu

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 51. 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

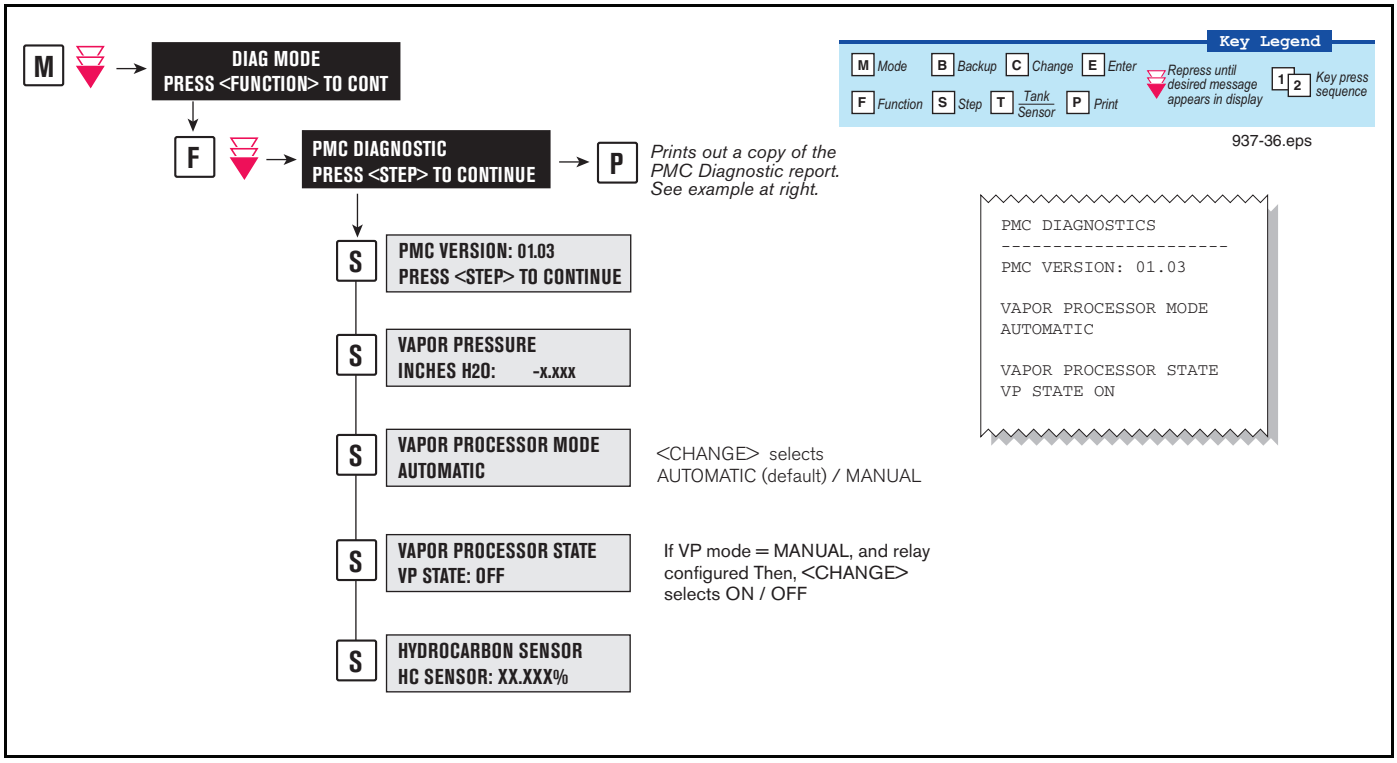


Figure 52. VST ECS Membrane Processor Diagnostic Menu

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.

When set to Manual mode, the system will reset to Automatic mode after 4 hours.

Veeder-Root Vapor Polisher PMC Diagnostic Menu

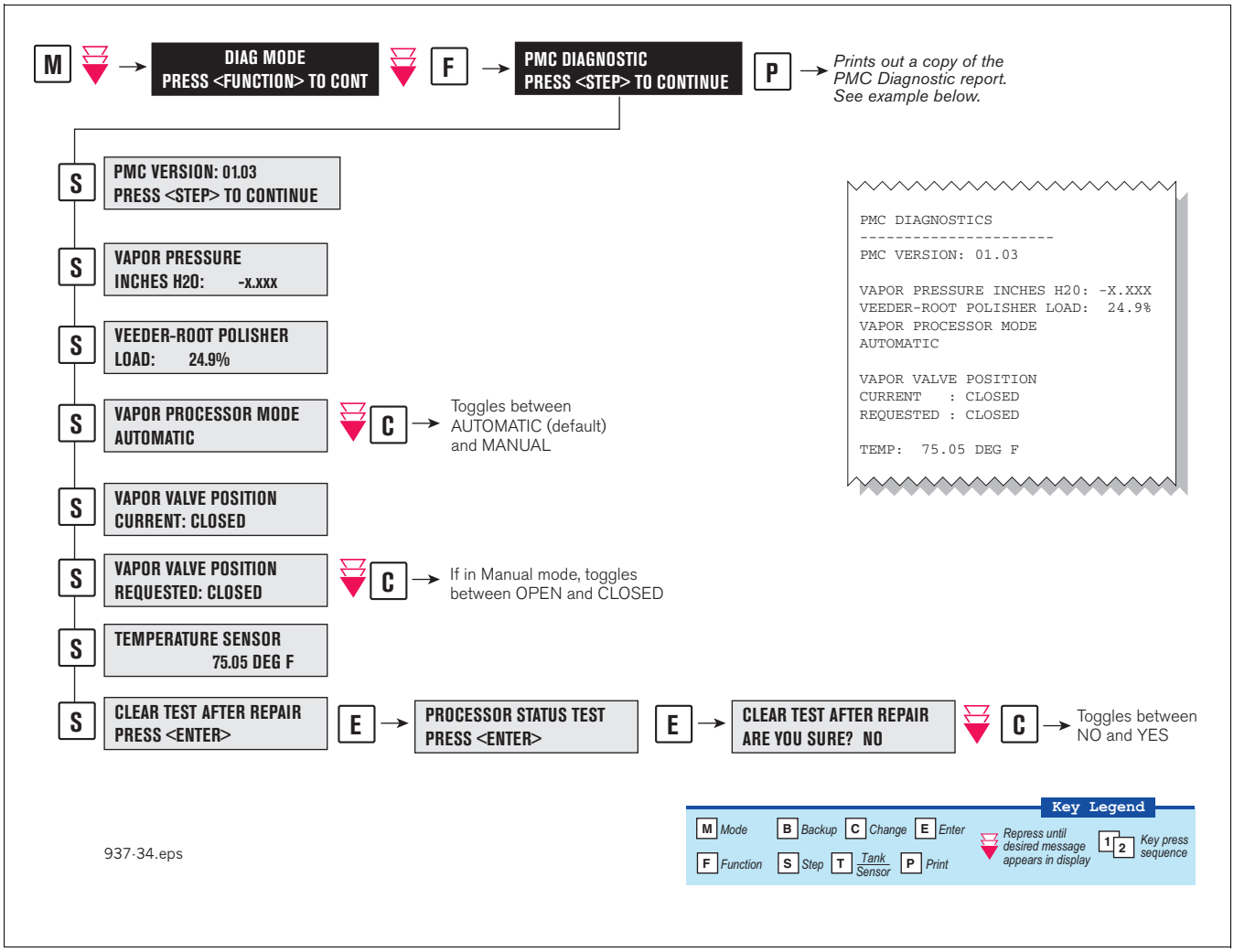


Figure 53. PMC Diagnostic Menus

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						
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		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

Form 1

Data Form for Vapor Pressure Sensor UST Pressure Test

DATE OF TEST _____

SERVICE COMPANY NAME	**SERVICE COMPANY'S TELEPHONE**
SERVICE TECHNICIAN	**HEALY 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		**HEALY 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