State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER VR-203-I

Vapor Systems Technologies, Inc.
Phase II Enhanced Vapor Recovery (EVR) System
Not Including In-Station Diagnostics (ISD)

WHEREAS, the California Air Resources Board (ARB) has established, pursuant to California Health and Safety Code sections 25290.1.2, 39600, 39601 and 41954, certification procedures for systems designed for the control of gasoline vapor emissions during motor vehicle fueling operations (Phase II EVR vapor recovery systems) in its CP-201, ***Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities*** (Certification Procedure) as last amended May 25, 2006, incorporated by reference in title 17, California Code of Regulations, section 94011;

WHEREAS, ARB has established, pursuant to California Health and Safety Code sections 39600, 39601, 39607, and 41954, test procedures for determining the compliance of Phase II vapor recovery systems with emission standards;

WHEREAS, Vapor Systems Technologies, Inc. (VST) requested certification of the VST Phase II EVR System not Including ISD (VST Phase II EVR System) pursuant to the Certification Procedure by Executive Order VR-203-A issued on November 5, 2007, and last modified on July 13, 2010, by Executive Order VR-203-H;

WHEREAS, EMCO Wheaton Retail (EMCO) requested certification of the EMCO EVR nozzle and EMCO EVR safe break valve as alternate components for use with the Veeder-Root Vapor Polisher and Hirt Thermal Oxidizer;

WHEREAS, the Certification Procedure provides that ARB Executive Officer shall issue an Executive Order if he or she determines that the vapor recovery system conforms to all of the applicable requirements set forth in the Certification Procedure;

WHEREAS, G-01-032 delegates to the Chief of the Monitoring and Laboratory Division the authority to certify or approve modifications to certified Phase I and Phase II vapor recovery systems for gasoline dispensing facilities; and

WHEREAS, I, Alberto Ayala, Chief of the Monitoring and Laboratory Division, find that the VST Phase II EVR System, including Veeder-Root PMC software version 1.03 conforms with all requirements set forth in the Certification Procedure, including compatibility when fueling vehicles equipped with onboard refueling vapor recovery systems, and results in a vapor recovery system which is at least 95 percent efficient and shall not exceed 0.38 pounds of hydrocarbons per 1,000 gallons of gasoline transferred when tested pursuant to TP-201.2, ***Efficiency and Emission Factor for Phase II Systems*** (October 8, 2003).

NOW, THEREFORE, IT IS HEREBY ORDERED that VST Phase II EVR System including Veeder-Root PMC software version 1.03 is certified to be at least 95 percent efficient and does not exceed 0.38 pounds of hydrocarbon per 1,000 gallons of gasoline transferred in attended and/or self-service mode when used with an ARB-certified Phase I vapor recovery system and installed, operated, and maintained as specified herein and in the following exhibits. Exhibit 1 contains a list of the equipment certified for use with VST Phase II EVR System. Exhibit 2 contains the performance standards, specifications, and typical installation drawings applicable to VST Phase II EVR System as installed in a gasoline dispensing facility (GDF). Exhibit 3 contains the manufacturing performance specifications and warranties. Exhibit 4 provides items required in conducting TP-201.3. Exhibit 5 is the liquid removal test procedure. Exhibit 6 provides items required in conducting TP-201.4. Exhibit 7 is the nozzle bag test procedure. Exhibit 8 is the VST ECS hydrocarbon sensor verification test procedure. Exhibit 9 is the test procedure for determining VST ECS vapor processor activation pressure. Exhibit 10 is the VST ECS / Veeder-Root Vapor Polisher vapor pressure sensor verification test procedure. Exhibit 11 is the Veeder-Root vapor polisher operability test procedure. Exhibit 12 is the Veeder-Root vapor polisher hydrocarbon emissions verification test procedure. Exhibit 13 is the Hirt VCS 100 processor operability test procedure. Exhibit 14 is the Franklin Fueling Systems Clean Air Separator static pressure performance test procedure.

IT IS FURTHER ORDERED that compliance with the applicable certification requirements, rules and regulations of the Division of Measurement Standards of the Department of Food and Agriculture, the Office of the State Fire Marshal of the Department of Forestry and Fire Protection, the Division of Occupational Safety and Health of the Department of Industrial Relations, and the Division of Water Quality of the State Water Resources Control Board are made conditions of this certification.

IT IS FURTHER ORDERED that each component manufacturer listed in Exhibit 1 shall provide a warranty for the vapor recovery component(s) to the initial purchaser. The warranty shall be passed on to each subsequent purchaser within the warranty period. The warranty shall include the ongoing compliance with all applicable performance standards and specifications and shall comply with all warranty requirements in Section 16.5 of the Certification Procedure. Manufacturers may specify that the warranty is contingent upon the use of trained installers.

IT IS FURTHER ORDERED that every certified component manufactured by VST, EMCO, Goodyear, Veeder-Root, Hirt, and Franklin Fueling Systems shall be performance tested by the manufacturer as provided in Exhibit 3.

IT IS FURTHER ORDERED that the certified VST Phase II EVR System shall be installed, operated, and maintained in accordance with the ***ARB Approved Installation, Operation, and Maintenance Manual***. Equipment shall be inspected daily, weekly, quarterly, and annually per the procedures identified in the ***ARB Approved Installation, Operation, and Maintenance Manual***. These inspections shall also apply to systems certified by Executive Orders VR-203-A to H, Executive Order VR-205-A to B, and Executive Order VR-209-A. A copy of this Executive Order and the ***ARB Approved Installation, Operation and***

Maintenance Manual shall be maintained at each GDF where a certified VST Phase II EVR System is installed.

IT IS FURTHER ORDERED that equipment listed in Exhibit 1, unless exempted, shall be clearly identified by a permanent identification showing the manufacturer's name, model number, and serial number.

IT IS FURTHER ORDERED that any alteration in the equipment parts, design, installation, or operation of the system certified hereby is prohibited and deemed inconsistent with this certification, unless the alteration has been submitted in writing and approved in writing by the Executive Officer or Executive Officer delegate.

IT IS FURTHER ORDERED that the following requirements are made a condition of certification. The owner or operator of the VST Phase II EVR System shall conduct and pass the following tests no later than 60 days after startup and at least once in each twelve month period, using the following test procedures:

- TP-201.3, ***Determination of 2 Inch WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities*** (March 17, 1999);
- TP-201.4, ***Dynamic Back Pressure*** (July 3, 2002) in accordance with the condition listed in item 1 of the Vapor Collection section of Exhibit 2;
- Exhibit 4, ***Required Items in Conducting TP-201.3***;
- Exhibit 5, ***Liquid Removal Test Procedure***;
- Exhibit 6, ***Required Items for Conducting TP-201.4.***
- Exhibit 8, ***VST ECS Hydrocarbon Sensor Verification Test Procedure*** (if a VST ECS membrane processor is installed);
- Exhibit 9, ***Determination of VST ECS Processor Activation Pressure*** (if a VST ECS membrane processor is installed);
- Exhibit 10, ***VST ECS / Veeder-Root Vapor Polisher Vapor Pressure Sensor Verification Test Procedure*** (if a VST ECS membrane processor or Veeder-Root Vapor Polisher is installed);
- Exhibit 11, ***Veeder-Root Vapor Polisher Operability Test Procedure*** (if a Veeder-Root Vapor Polisher is installed);
- Exhibit 12, ***Veeder-Root Vapor Polisher Hydrocarbon Emissions Verification Test Procedure*** (if a Veeder-Root Vapor Polisher is installed);
- Exhibit 13, ***Hirt VCS 100 Processor Operability Test Procedure*****;** (if a Hirt VCS 100 is installed); and,
- Exhibit 14, ***Franklin Fueling Systems Clean Air Separator Static Pressure Performance Test Procedure*** *(if a Clean Air Separator is installed).*

Local districts at their option may specify the testing frequency and related sequencing of the above tests. Notification of testing, and submittal of test results, shall be done in accordance with local district requirements and pursuant to policies established by that district. Local districts may require the use of alternate test form(s), provided they include the same minimum parameters identified in the datasheet referenced in the test procedure(s). Alternative test procedures, including most recent versions of the test

procedures listed above, may be used if determined by the ARB Executive Officer or Executive Officer delegate, in writing, to yield equivalent results.

IT IS FURTHER ORDERED that the following requirements are made a condition of certification. The owner or operator of the VST Phase II EVR System shall conduct, and pass, the following test no later than 60 days after startup using the following test procedure: Exhibit 7, ***Nozzle Bag Test Procedure***. Notification of testing, and submittal of test results, shall be done in accordance with local district requirements and pursuant to the policies established by that district. Alternative test procedures, including most recent versions of the test procedures listed above, may be used if determined by ARB Executive Officer or Executive Officer delegate, in writing, to yield equivalent results.

IT IS FURTHER ORDERED that, except as provided above, local districts at their option will specify the testing, related sequencing, and testing frequency of the nozzle vapor valves. If the district requires the nozzle vapor valve be tested, the test shall be conducted in accordance with Exhibit 7, ***Nozzle Bag Test Procedure***.

IT IS FURTHER ORDERED that the VST Phase II EVR System shall be compatible with gasoline in common use in California at the time of certification. The VST Phase II EVR System is not compatible with gasoline that has a methanol content greater than 5 percent or an ethanol content greater than 10 percent. Any modifications to comply with future California gasoline requirements shall be approved in writing by the Executive Officer or Executive Officer delegate.

IT IS FURTHER ORDERED that the certification of the VST Phase II EVR System is valid through April 1, 2012.

IT IS FURTHER ORDERED that Executive Order VR-203-H issued on July 13, 2010, is hereby superseded by this Executive Order. VST Phase II EVR Systems certified under Executive Order VR-203-A through H may remain in use at existing installations up to four years after the expiration date of this Executive Order.

IT IS FURTHER ORDERED that Executive Order VR-205-B issued on July 2, 2009, is hereby superseded by this Executive Order. VST Phase II EVR Systems certified under Executive Order VR-205-A through B may remain in use at existing installations up to four years after the expiration date of the Executive Order.

IT IS FURTHER ORDERED that Executive Order VR-209-A issued on November 4, 2009, is hereby superseded by this Executive Order. VST Phase II EVR Systems certified under Executive Order VR-209-A may remain in use at existing installations up to four years after the expiration date of the Executive Order.

IT IS FURTHER ORDERED that this Executive Order shall apply to new installations or major modification of Phase II Systems with a throughput of less than or equal to 600,000 gallons per year. Use of this Executive Order for new installations or major modifications at a GDF with a throughput of more than 600,000 gallons per year is not authorized.

Executed at Sacramento, California, this 12th day of November 2010.

Alberto Ayala, Ph.D., M.S.E.
Chief, Monitoring and Laboratory Division

Attachments: Next Page

General Requirements

Exhibit 1 Equipment List
- Hanging Hardware
- Processors

Exhibit 2 System Specifications
- Hanging Hardware
- Processors
- Pressure/Vacuum Vent Valves for Storage Tank Vents
- Vapor Recovery Piping Configurations
- Dispensers
- Phase I Systems
- Maintenance Records
- Vapor Recovery Equipment Defects

Exhibit 3 Manufacturing Performance Specifications and Warranties
- Vapor Systems Technologies
- Veeder-Root
- Goodyear
- Hirt
- Franklin Fueling Systems
- EMCO Wheaton Retail

General Compliance Procedures

Exhibit 4 Required Items in Conducting TP-201.3
Exhibit 5 Liquid Removal Test Procedure
Exhibit 6 Required Items for Conducting TP-201.4
Exhibit 7 Nozzle Bag Test Procedure

Processor Specific Compliance Procedures

Exhibit 8 **VST ECS**; Hydrocarbon Sensor Verification Test Procedure
Exhibit 9 **VST ECS**; Determination of Processor Activation Pressure
Exhibit 10 **VST ECS / Veeder-Root Vapor Polisher**; Vapor Pressure Sensor Verification Test Procedure
Exhibit 11 **Veeder-Root Vapor Polisher**; Operability Test Procedure
Exhibit 12 **Veeder-Root Vapor Polisher**; Hydrocarbon Emissions Verification Test Procedure
Exhibit 13 **Hirt VCS 100 Processor;** Operability Test Procedure
Exhibit 14 **Franklin Fueling Systems CAS**; Static Pressure Performance Test Procedure

Executive Order VR-203-I
VST Phase II EVR System

Exhibit 1[1]

Hanging Hardware
Equipment List

Component	Manufacturer / Model
Nozzle	VST Model VST-EVR-NB, VST-EVR-NB-R (Rebuilt) Or EMCO Models A4005EVR, RA4005EVR (Rebuilt)[2] (Figure 1A-1)
Coaxial Curb Hose	VST Model VDV-EVR Series Or Goodyear Maxxim Premier Plus (Figure 1A-2)
Coaxial Whip Hose	VST Model VSTA-EVR Series Or Goodyear Maxxim Premier Plus (Figure 1A-2)
Breakaway Coupling	VST Model VSTA-EVR-SBK Or EMCO Model A4119EVR[2] (Figure 1A-2)

[1] The local air district may require a permit application when changing between alternate components.
[2] Alternate component for use with the Veeder-Root Vapor Polisher or Hirt Thermal Oxidizer processors.

ONLY ONE OF THE FOLLOWING FOUR (4) PROCESSOR GROUPS IS REQUIRED

VST Membrane
Processor Equipment List #1

Component	Manufacturer / Model
Veeder-Root TLS-350 Series, including but not limited to TLS-350, TLS-350 Plus, TLS-350R, Red Jacket ProMax, Gilbarco EMC consoles	Veeder-Root 8482XX-XXX, 8470XX-XXX, Promax 847097-XXX EMC PAO2620X000X X = Any digit
RS232 Interface Module	Veeder-Root RS232 Interface Module Series (Figure 1A-3)
VST Membrane Processor	VST Model VST-ECS-CS3-XXX (Figure 1A-4) where XXX represents motor phase and HC Sensor 110 =Single-Phase with HC Sensor 310=Three-Phase with HC Sensor
Pressure Management Control (PMC) Software Version Number	1.03
Vapor Pressure Sensor (1 per GDF)	Veeder-Root 331946-001 (Figure 1A-5)
Multiport Card	Veeder-Root 330586-018

Veeder-Root Vapor Polisher
Processor Equipment List #2

Component	Manufacturer / Model
Veeder-Root TLS-350 Series, including but not limited to TLS-350, TLS-350 Plus, TLS-350R, Red Jacket ProMax, Gilbarco EMC consoles	Veeder-Root 8482XX-XXX, 8470XX-XXX, Promax 847097-XXX EMC PAO2620X000X X = Any digit
RS232 Interface Module	Veeder-Root RS232 Interface Module Series (Figure 1A-3)
Veeder-Root Vapor Polisher	Veeder Root Vapor Polisher 332761-002 (Figure 1A-6)
PMC Software Version Number	1.03
Vapor Pressure Sensor (1 per GDF)	Veeder-Root 331946-001 (Figure 1A-5)
Smart Sensor Interface Module (1 per GDF) With Atmospheric Sensor	Veeder-Root 329356-004 (Figure 1A-7) Veeder-Root 332250-001

Hirt Thermal Oxidizer
Processor Equipment List #3

Component	Manufacturer / Model
Hirt Thermal Oxidizer With Indicator Panel	Hirt Model VCS 100 (Figure 1A-8) Leg Attachments: 5” – M39 48”- M40
Hirt 1/4" Check Valve (optional component)	Hirt P65

Franklin Fueling Systems
Healy Clean Air Separator
Processor Equipment List #4

Component	Manufacturer / Model
Franklin Fueling Systems Clean Air Separator	Healy Model 9961 Clean Air Separator (Figures 1A-9 and 1A-10) Healy Model 9961H Clean Air Separator (Figures 1A-11 and 1A-12)

Figure 1A-1
Model VST-EVR- NB Nozzle

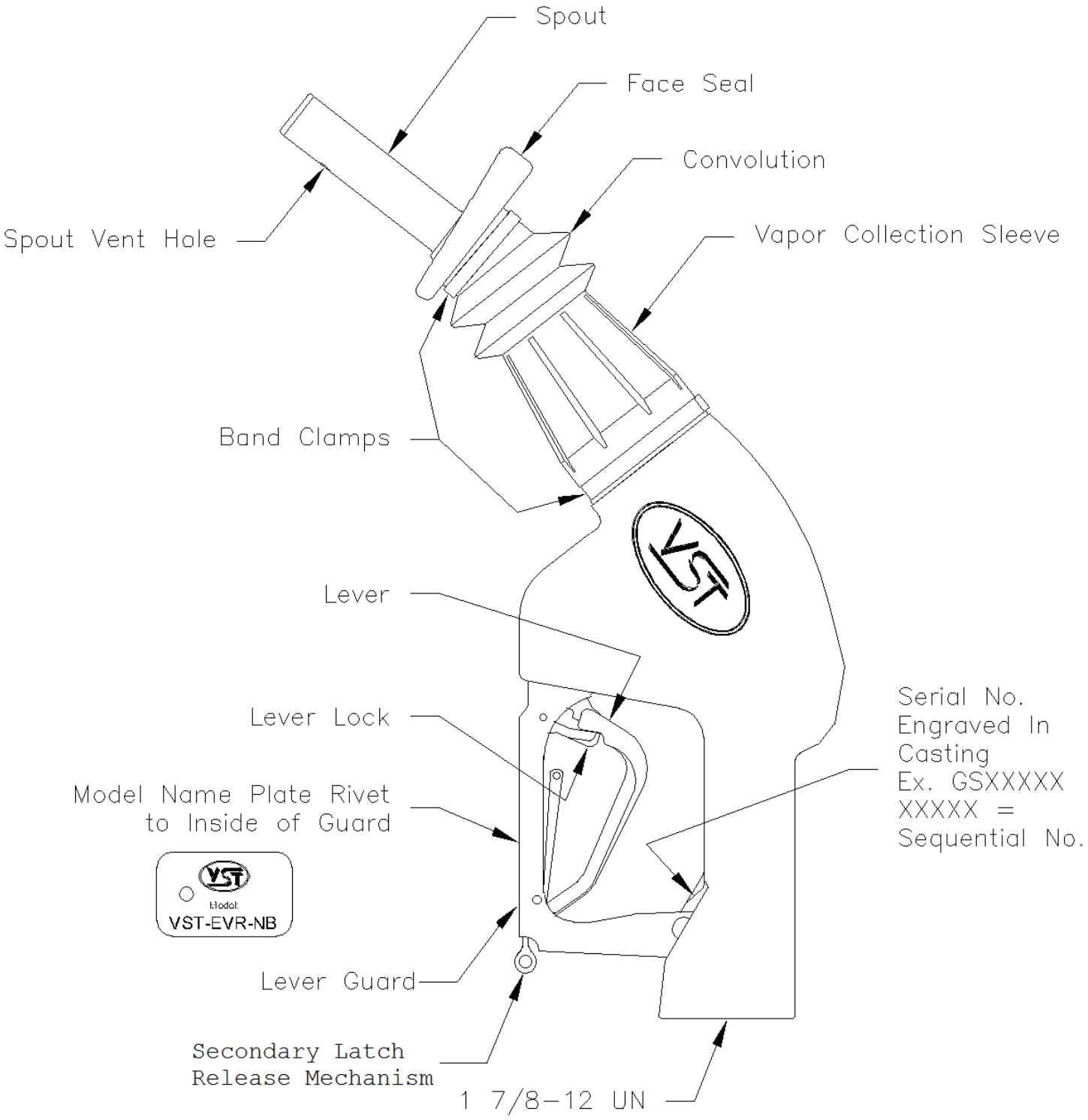


Figure 1A-1 (continued)
EMCO Model A4005EVR Nozzle

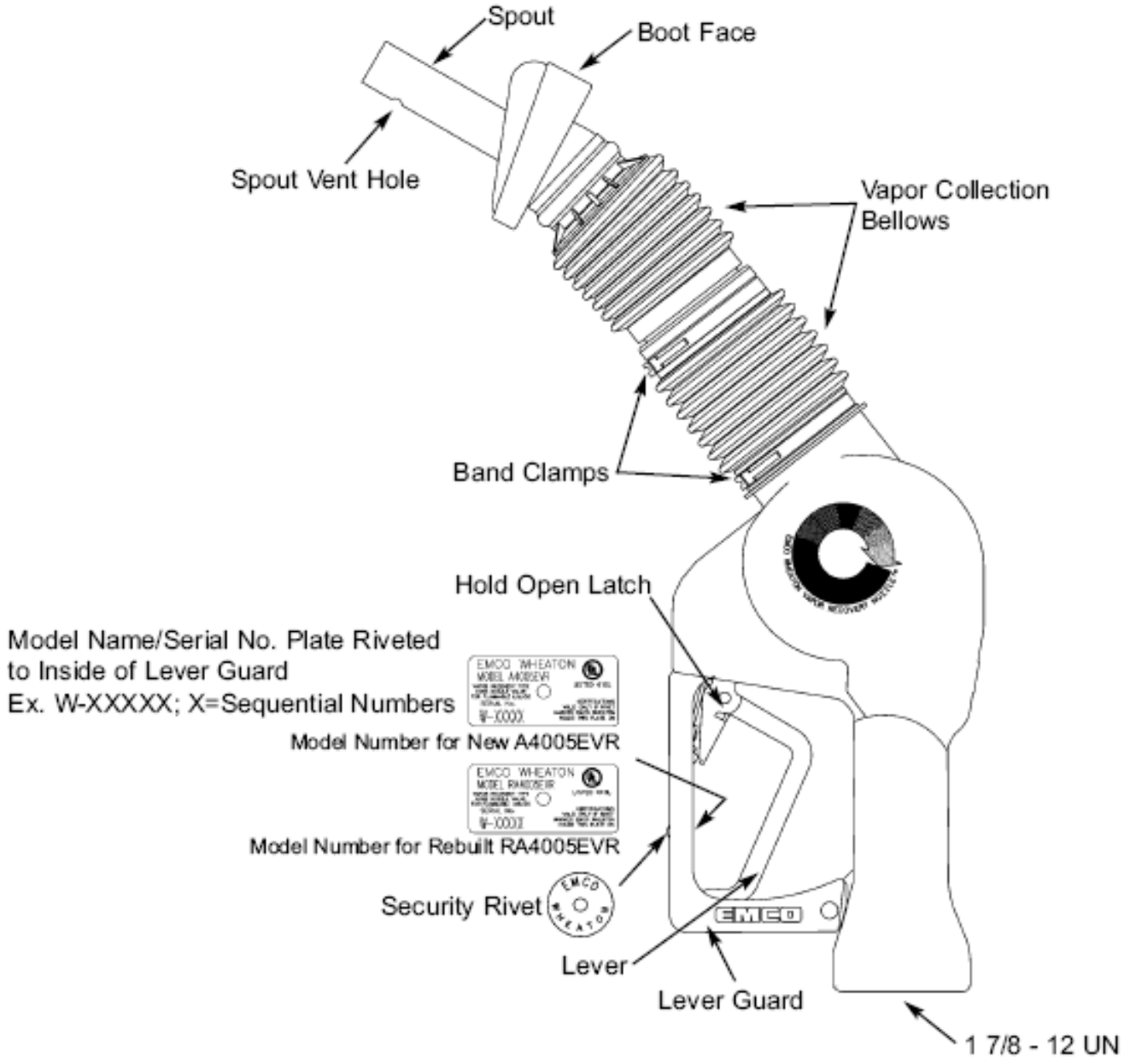
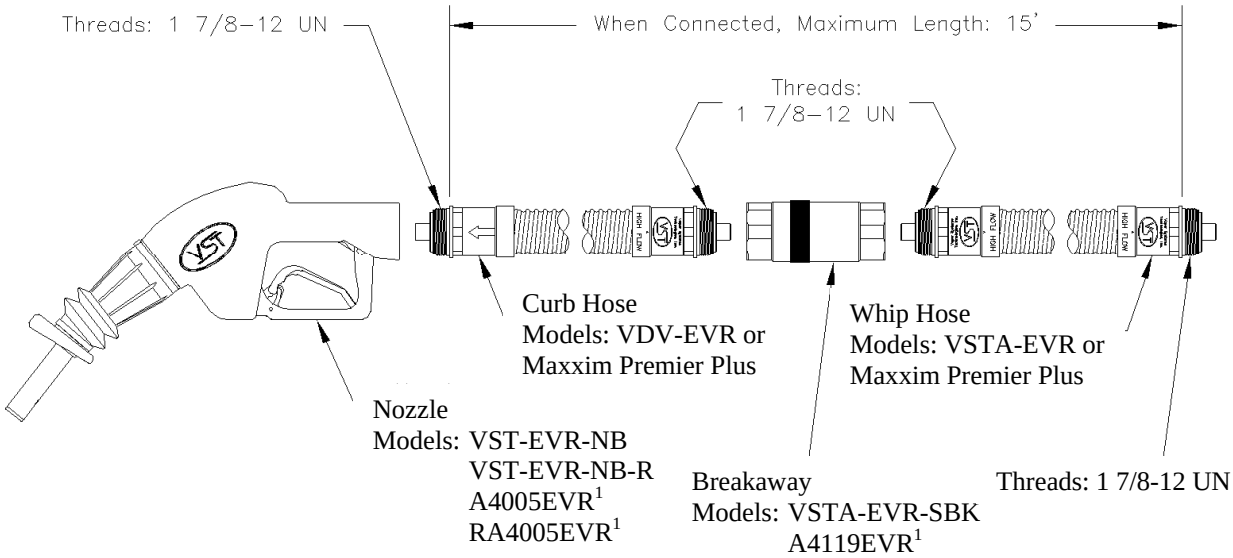


Figure 1A-2
Hanging Hardware
(Nozzle, Coaxial Curb Hose, Breakaway, and Coaxial Whip Hose)



[1] Alternate component for use with the Veeder-Root Vapor Polisher or Hirt Thermal Oxidizer processors

Figure 1A-2 (continued)
VST Hanging Hardware
(Nozzle, Coaxial Curb Hose, Breakaway, and Coaxial Whip Hose)

Figure 1A-2 (continued)
EMCO Hanging Hardware
(Nozzle and Safe Break Valve)

EMCO Wheaton Retail

Nozzle
EMCO Model A4005EVR

EMCO Wheaton Retail

Safe Break Valve
EMCO Model A4119EVR

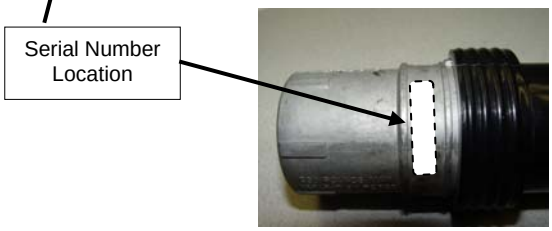


Figure 1A-2 (continued)
Goodyear Hanging Hardware
(Curb and Whip Hoses**)**

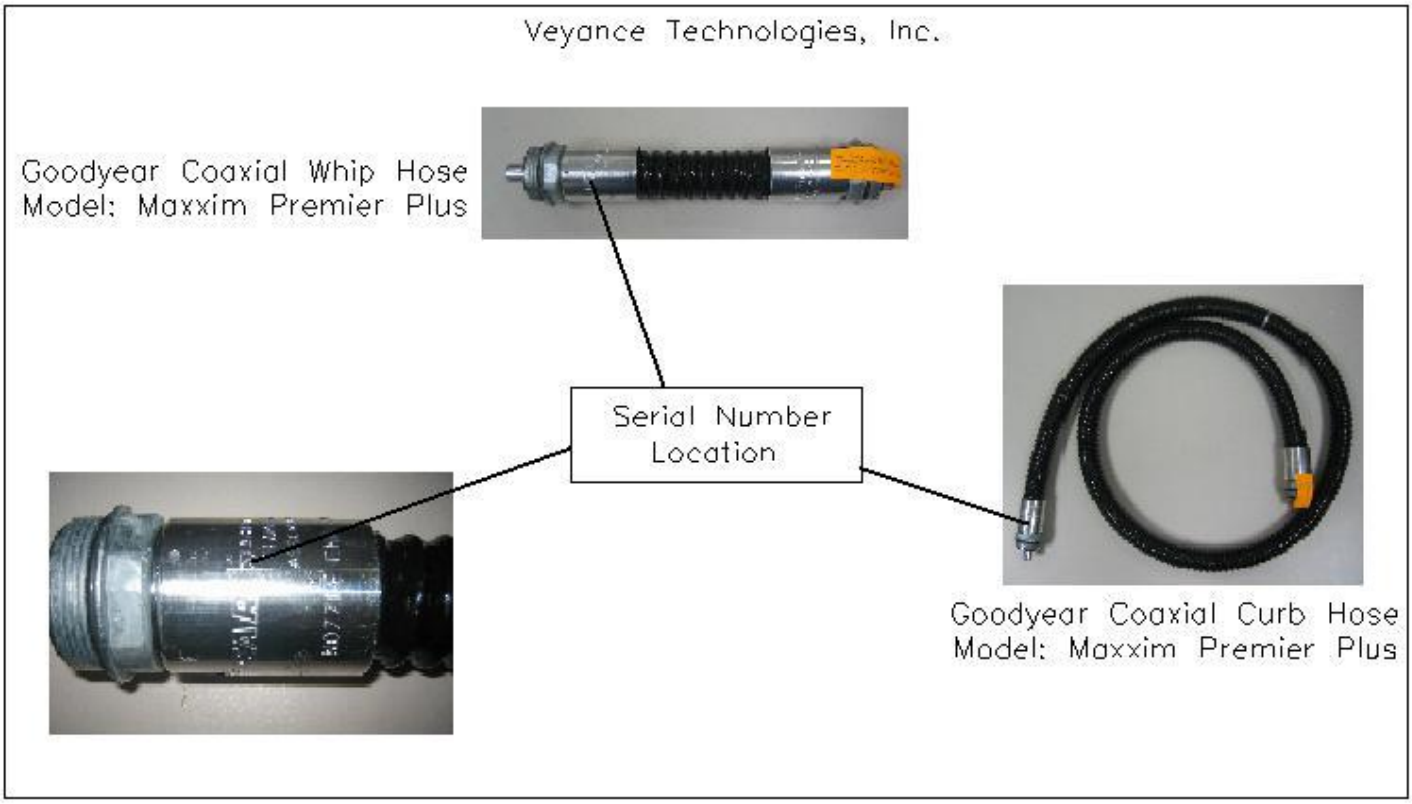


Figure 1A-3
Veeder-Root RS232 Interface Module Series
RS232 Interface Module

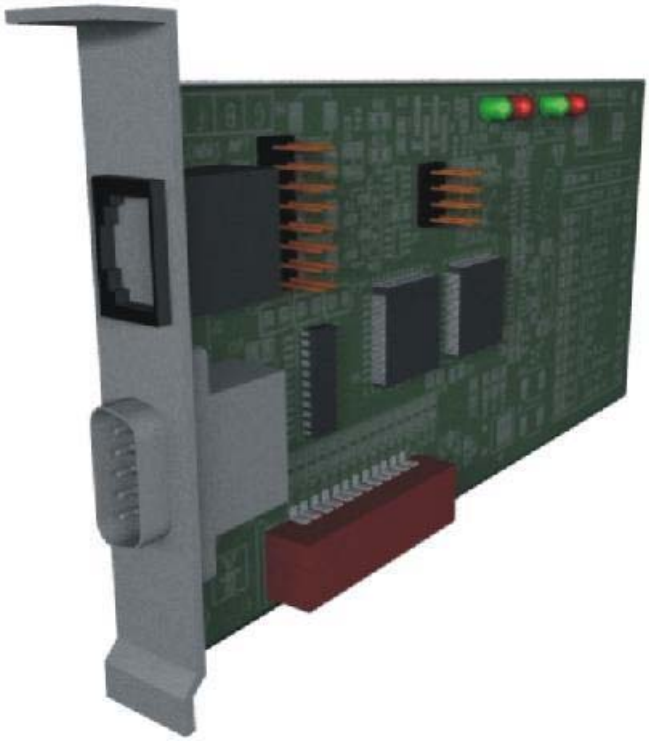


Figure 1A-4

Typical VST-ECS-CS3 Membrane Processor

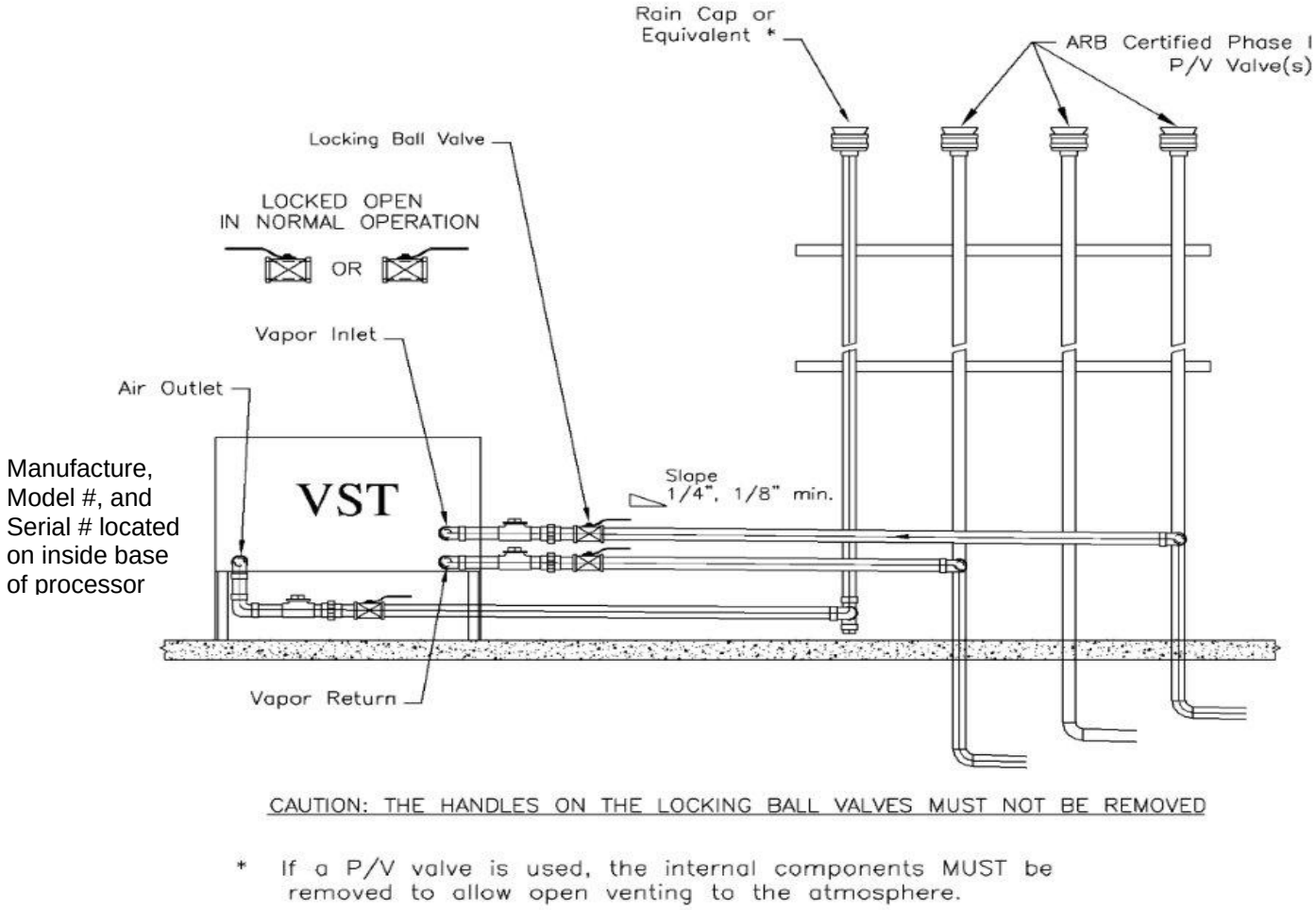


Figure 1A-5

Veeder-Root 331946-001
Vapor Pressure Sensor

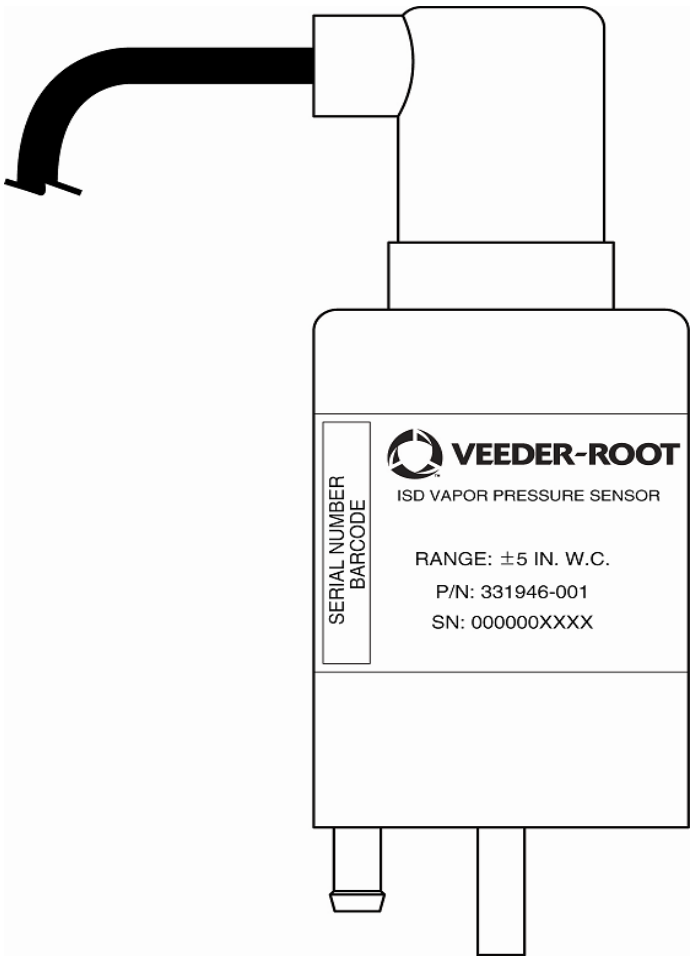


Figure 1A-6
Typical Veeder-Root Vapor Polisher

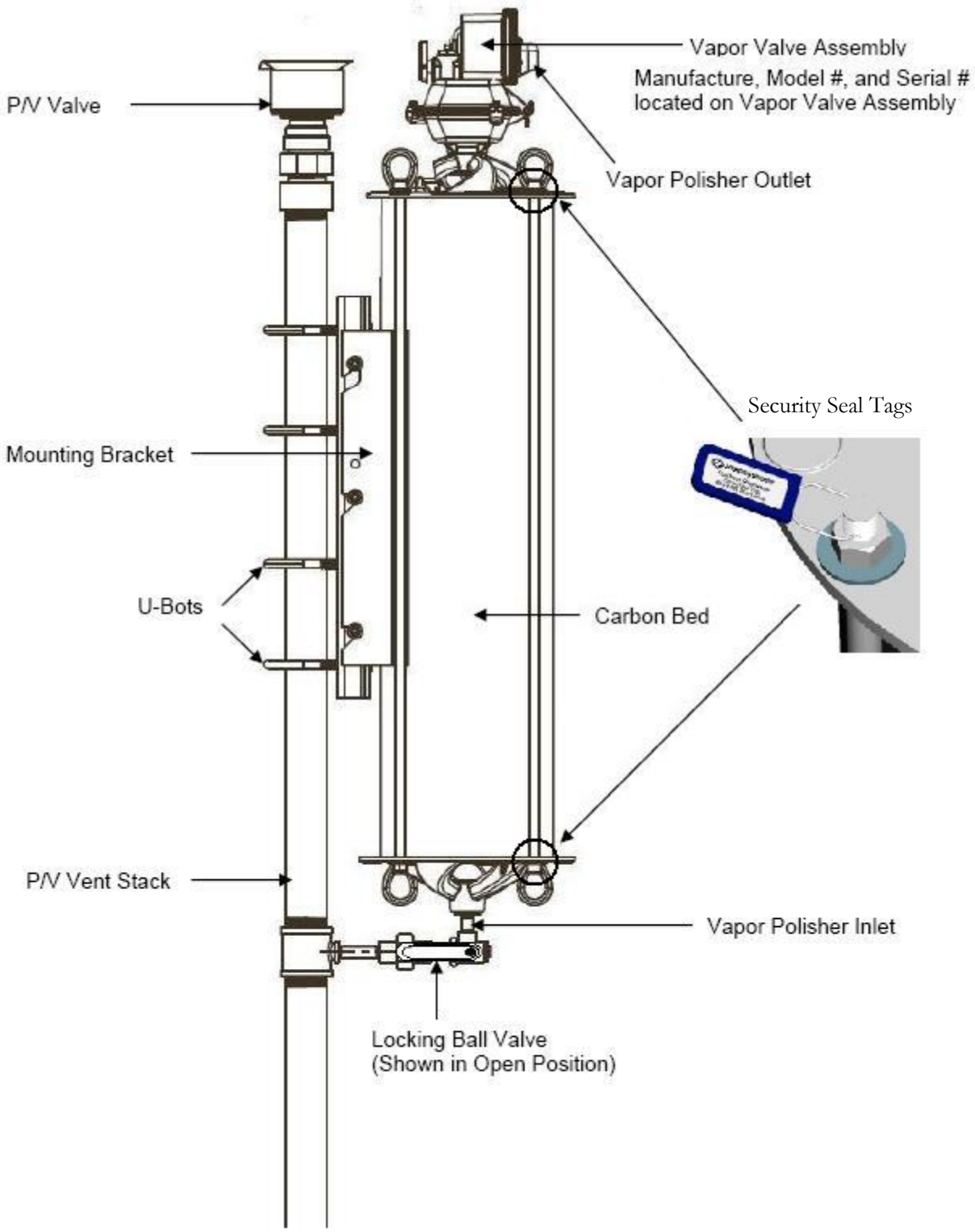
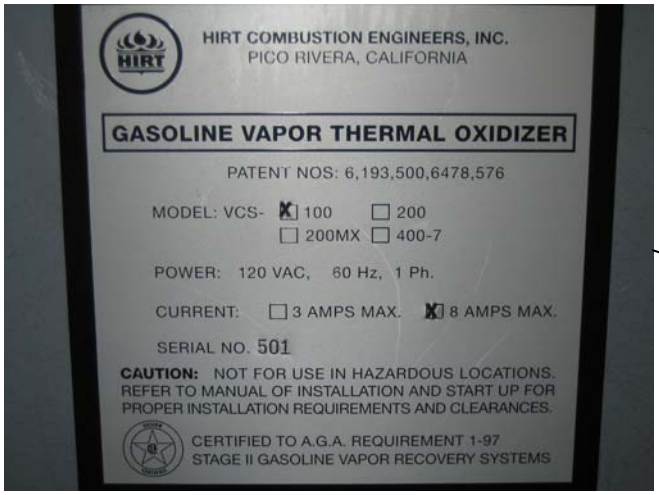


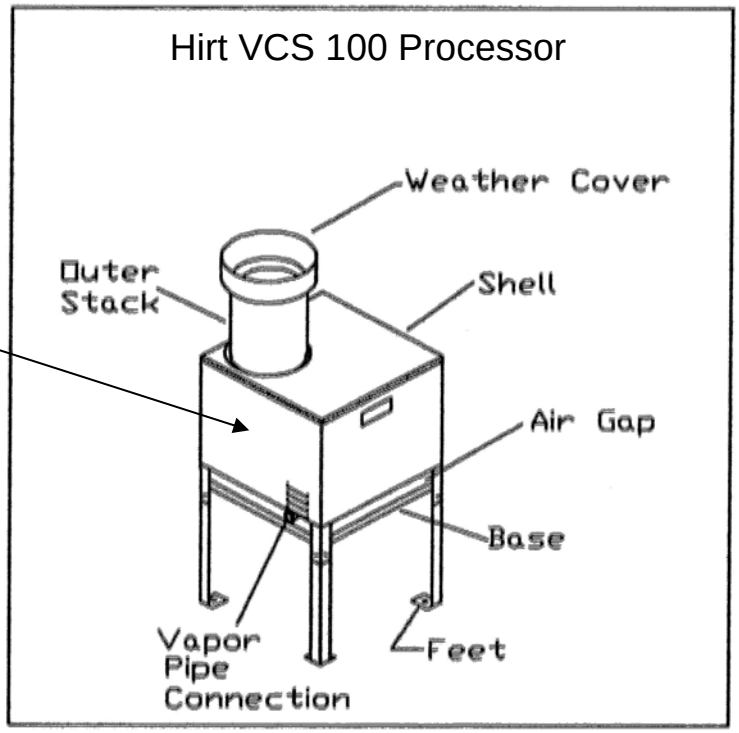
Figure 1A-7
Veeder-Root 329356-004, 332250-001
Smart Sensor Interface Module

Figure 1A-8
Hirt VCS 100 Thermal Oxidizer and Indicator Panel

VCS 100 Identification Plate



Hirt VCS 100 Processor



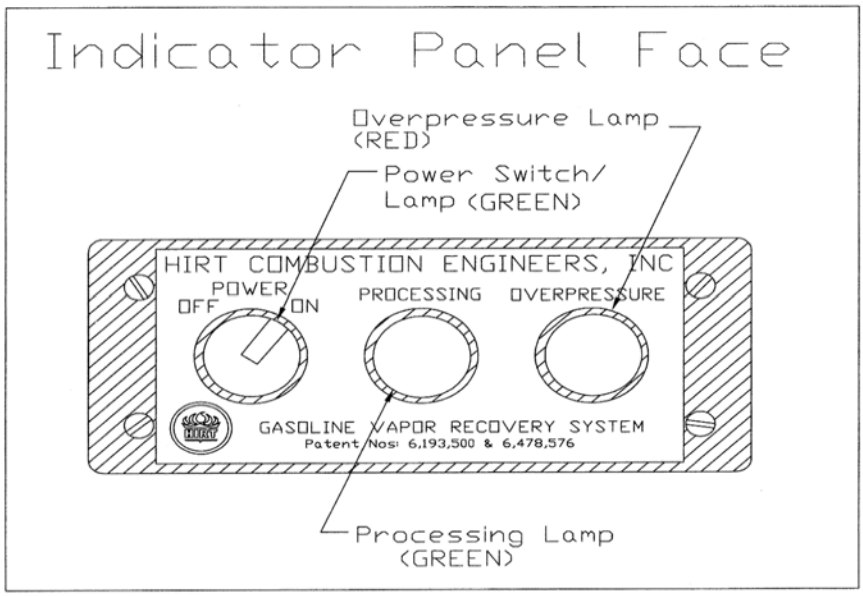
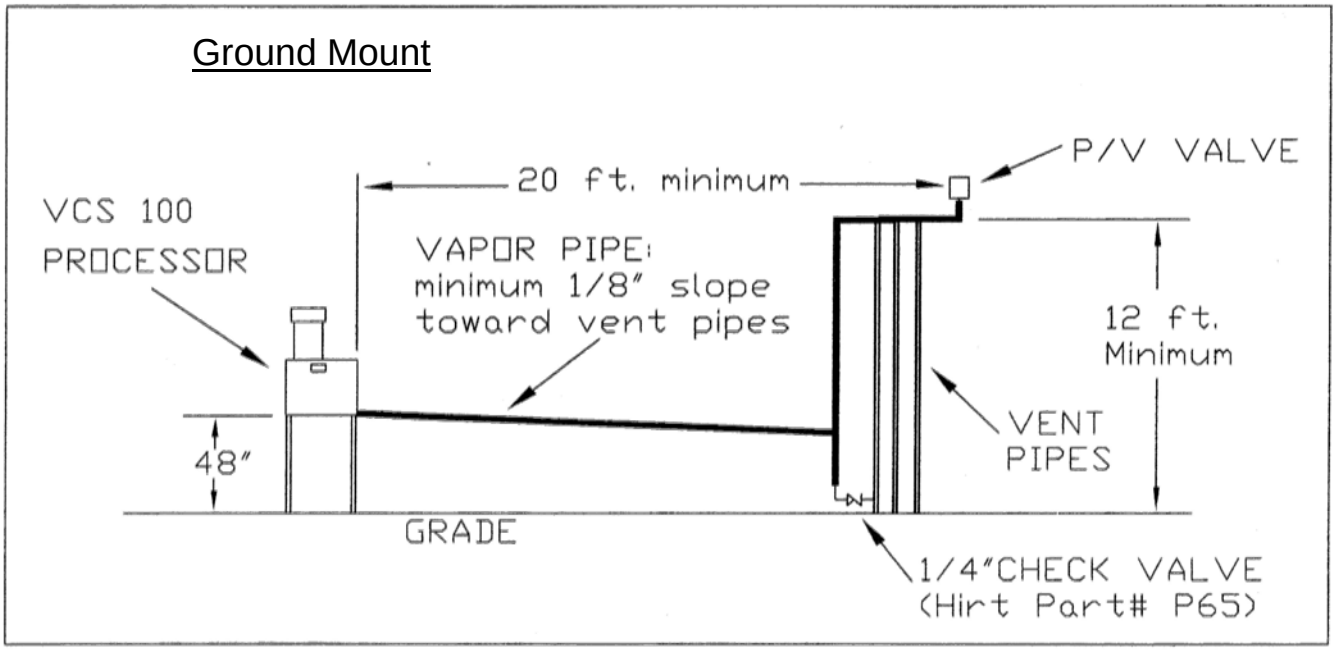


Figure 1A-8 (continued)
Typical Hirt VCS100 Thermal Oxidizer Processor



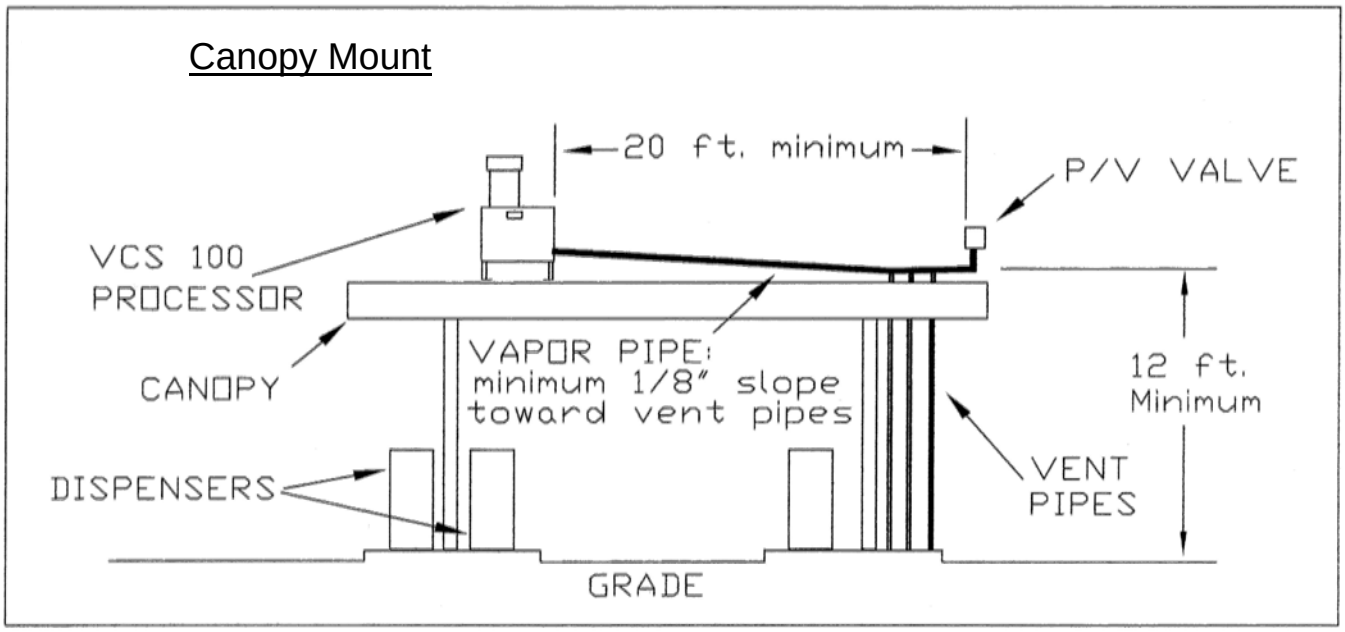


Figure 1A-9
Healy Model 9961 Clean Air Separator

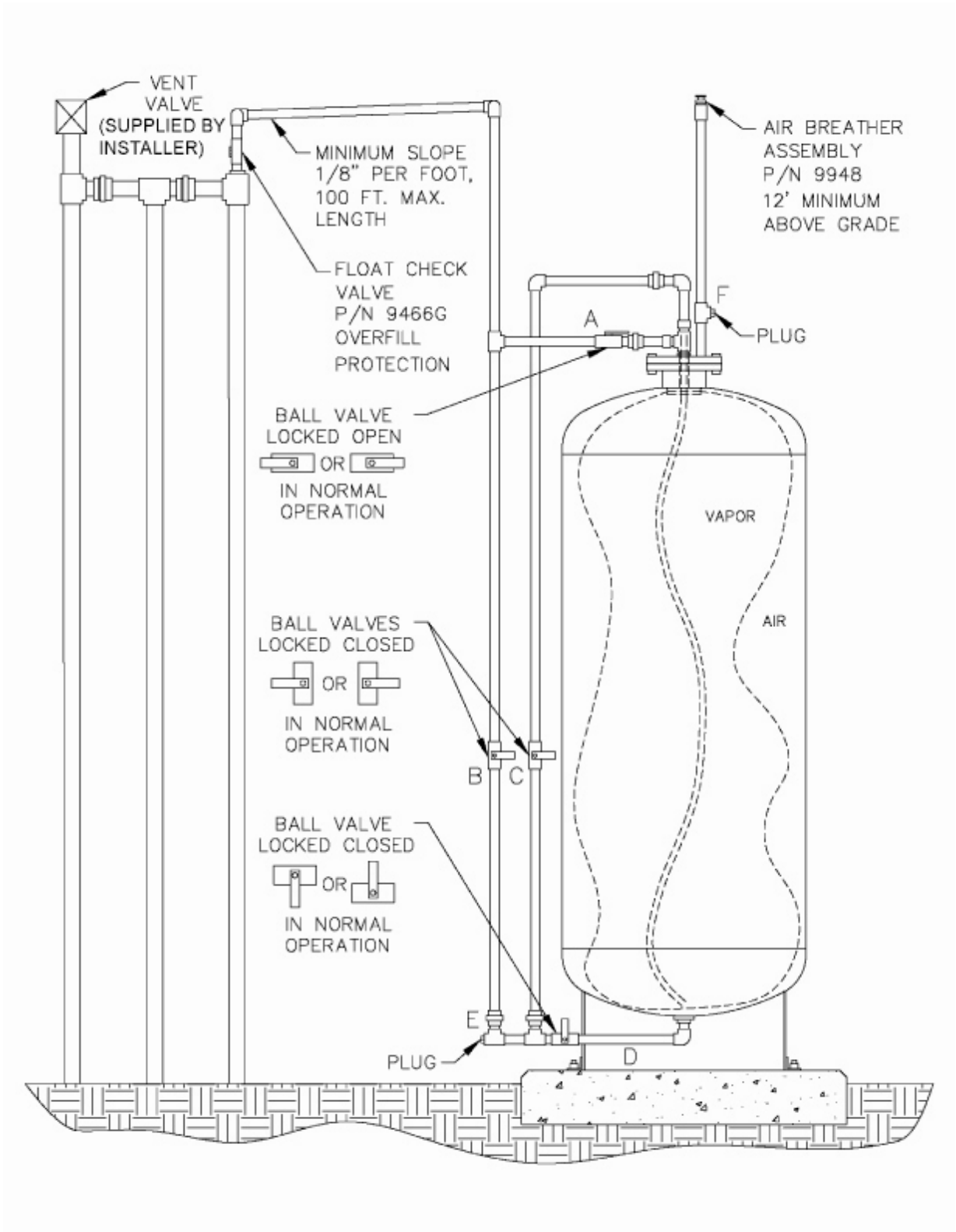


Figure 1A-10
Healy Model 9961 Clean Air Separator

Figure 1A-11
Healy Model 9961H Clean Air Separator

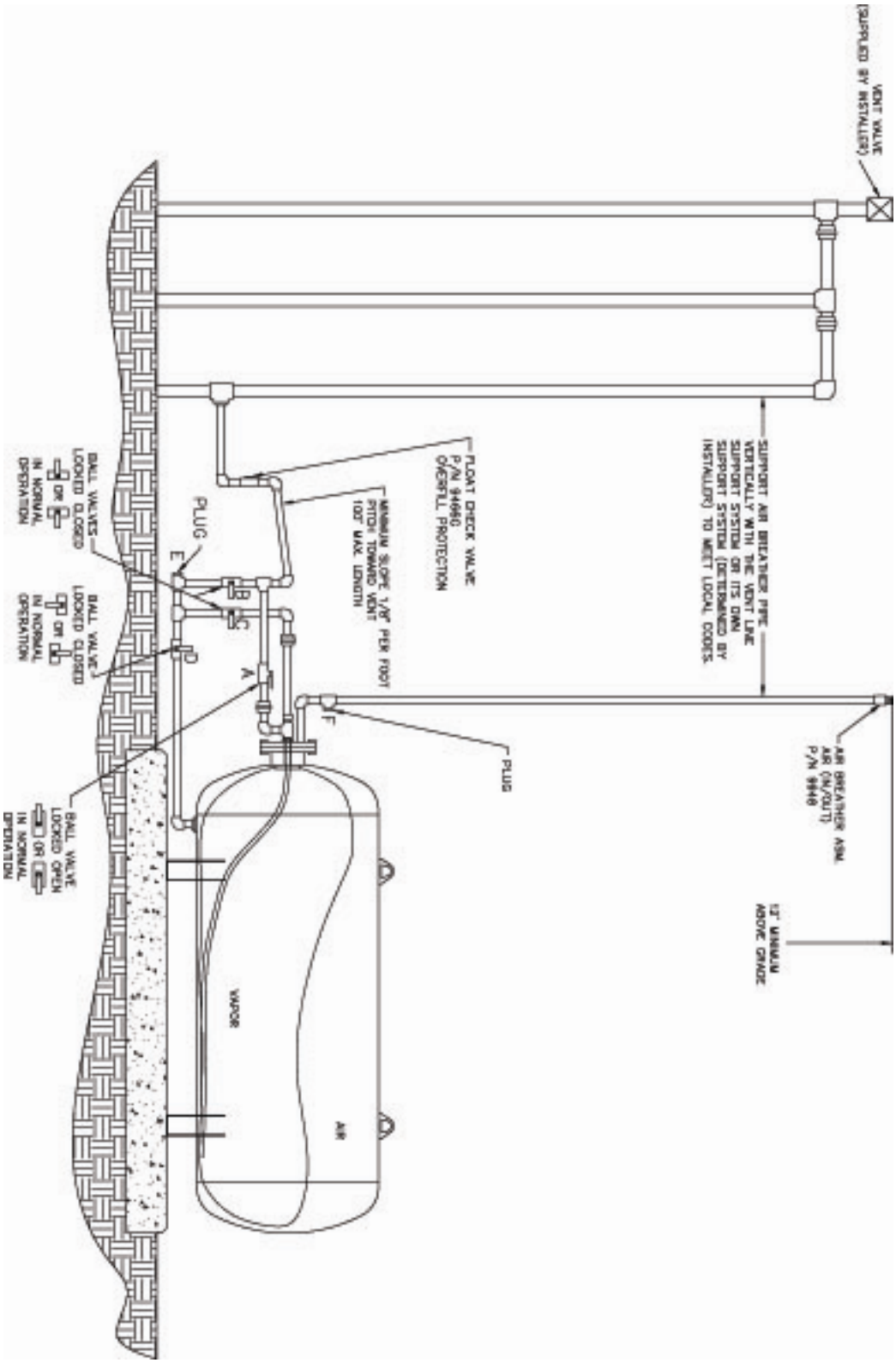


Figure 1A-12
Healy Model 9961H Clean Air Separator

Executive Order VR-203-I
VST Phase II EVR System

Exhibit 2
System Specifications

This exhibit contains the installation, maintenance and compliance standards and specifications that apply to the VST Phase II EVR System installed at a gasoline dispensing facility (GDF). All components must be installed, maintained, and operated in accordance with the specifications in the **ARB Approved Installation, Operation and Maintenance Manual** (IOM). Installation, maintenance and repair of system components, including removal and installation of such components in the course of any required tests, shall be performed by technicians certified by the appropriate manufacturer. Additional certifications may be required in accordance with local district requirements. Provided that there are no other local district requirements, a GDF owner/operator can remove and install nozzles, curb hoses, breakaways, and whip hoses without a manufacturer certification.

Nozzle

1. A vapor collection sleeve shall be installed on the nozzle at the base of the spout, as shown in **Figure 2B-1**. A vapor collection bellows shall be installed on the EMCO nozzle at the base of the spout, as shown in Figure 2B-2.

2. The VST Model VST–EVR-NB and EMCO Model A4005EVR nozzles have an integral vapor valve which prevents the loss of vapor from the underground storage tanks, ensures proper operation of the system and prevents the ingestion of air into the system. The performance of the nozzle vapor valve can be determined by items 2.1 or 2.2.

   2.1. The maximum allowable leak rate for the nozzle vapor path, as determined by TP-201.2B, shall not exceed 0.07 cubic feet per hour (CFH) at a pressure of two inches water column (2.00” WC)

   2.2. Verification of the integrity of the vapor valve can be performed on installed nozzles using the nozzle bag test procedure in Exhibit 7.

3. The gasoline flow rate of the nozzle shall be between six (6.0) and ten (10.0) gallons per minute as determined by the applicable provisions of section 6 or 7 of Exhibit 5 or by direct observation for 30 seconds minimum at the maximum hand held position.

Vapor Collection

1. The system pressure drop from the nozzle to the UST, as determined by TP-201.4 (Methodology 1) and Exhibit 6, shall not exceed the following:

   0.35 inches WC at a flow rate of 60 CFH of Nitrogen; and
   0.62 inches WC at a flow rate of 80 CFH of Nitrogen.

Coaxial Hoses

1. The maximum length of the curb hose, breakaway, and whip hose combined shall not exceed fifteen feet as measured from the base of the nozzle to the end of dispenser adapter or dispenser, as appropriate (Reference Exhibit 1, Figure 1A-2).

2. The liquid removal rate shall not be less than five milliliters per gallon (5 ml/gal) as determined by Exhibit 5 when tested with a gasoline flow rate between six (6.0) and ten (10.0) gallons per minute. Liquid removal requirement is applicable to all grades of gasoline.

3, All hoses shall have a permanent marking indicating the liquid pick-up location.

4. Any hose configuration is allowed when installed in accordance with IOM section 8.

Breakaway Couplings

1. The VST breakaway and EMCO safe break couplings are non-reconnecting and shall be replaced following a drive-off.

Flow Limiter

1. No flow limiter is allowed for this system.

VST ECS Membrane Processor

1. The processor vapor integrity shall demonstrate compliance with the static pressure decay criteria of TP-201.3 and Exhibit 4.

2. Unless there is maintenance or testing being conducted on the processor, the processor shall be on and in the automatic vapor processor mode and the three ball valves shall be locked in the open positions shown in **Figure 2B-3** for normal processor operation. The handles of the ball valves shall not be removed.

3. Piping to and from the processor shall be sloped 1/8” per foot minimum toward the vent line(s).

4. The hydrocarbon concentration of the ECS membrane processor taken from the Hydrocarbon Diagnostic Report shall be between ± one percent (±1%) for the zero and mid-range gas and ± two percent (±2%) for the high-range gas, when tested in accordance with Exhibit 8.

5. The processor shall activate when the pressure of the underground storage tank is less than or equal to 0.4 inches WC (≤0.4 inches WC) as determined by Exhibit 9.

6. The Vapor Pressure Sensor shall be between +0.2 and –0.2 inches WC when tested in accordance with section 9 of Exhibit 10.

7. The pressure reading from the TLS console shall be within ±0.2 inches WC of the measured ullage UST pressure as determined by section 8 of Exhibit 10.

8. The TLS-350 audible alarm shall be installed at a location that is most likely to be occupied by the station attendant during normal station operation (e.g., cash register).

9. The TLS console controlling the membrane shall have an RS232 port which shall be installed in a location that allows the RS232 port to be easily accessible, and if applicable per district requirements, for use at anytime. A vacant RS232 serial port shall always be available to electronically download reports.

10. The hydrocarbon concentration of the VST ECS Processor shall not exceed twelve percent (12%) as determined by accessing the Vapor Processor Status Report.

Veeder-Root Vapor Polisher

1. The carbon type shall be BAX G1500 manufactured by MeadWestvaco.

2. Unless there is maintenance or testing being conducted on the processor, the vapor polisher shall be on and in the automatic vapor processor mode and the inlet ball valve shall be locked in the open position shown in **Figure 2B-4** for normal polisher operation. The handle of the ball valve shall not be removed.

3. The pressure reading from the TLS console shall be within ±0.2 inches WC of the measured ullage UST pressure as determined by section 8 of Exhibit 10.

4. The Vapor Pressure Sensor shall be between +0.2 and –0.2 inches WC when tested in accordance with section 9 of Exhibit 10.

5. The Vapor Polisher pressure decrease between starting and ending pressures shall be less than 0.5 inches WC loss when tested in accordance with Exhibit 11. The ending pressure must be greater than 7.0 inches WC. Pressure drop across the Vapor Polisher at 18.0 standard cubic feet per hour flow shall be between 1.69 inches WC and 2.25 inches WC when tested in accordance with Exhibit 11. Differences in temperature readings shall not exceed 10 ºF when tested in accordance with Exhibit 11. The atmospheric pressure sensor reading shall be within 10% of the atmospheric pressure obtained from a local independent source when tested in accordance with Exhibit 11.

6. The hydrocarbon concentration from the vapor polisher outlet shall not exceed 9000 ppm iso-butane (0.9% by volume iso-butane) when tested in accordance with Exhibit 12.

7. The TLS console controlling the vapor polisher shall have an RS232 port which shall be installed in a location that allows the RS232 port to be easily accessible, and if applicable per district requirements, for use at anytime. A vacant RS232 serial port shall always be available to electronically download reports.

8. Security seal tags must be installed on the vapor polisher. If for any reason the seal tags are damaged or missing, the district may require that Exhibit 11 and Exhibit 12 be conducted and pass prior to installing new security seal tags.

Hirt VCS 100 Thermal Oxidizer

1. The processor vapor integrity shall demonstrate compliance with the static pressure decay criteria of TP-201.3 and Exhibit 4.

2. Unless there is maintenance or testing being conducted on the processor, the processor shall be on (power lamp is lit). The ball valve on the inlet of the processor shall be locked in the open position shown in **Figure 2B-5** and the 3-Way Valve handle shall be pointing down in the Normal Operating Position (Opened to UST Ullage) shown in **Figure 2B-6** during normal processor operation. The handles of the ball valves shall not be removed.

3. Piping to the processor shall be sloped 1/8" per foot minimum toward the vent line(s).

4. The VCS 100 Indicator Panel shall be installed at a location that is most likely to be occupied by the station attendant during normal station operation (e.g., cash register).

5. The processor shall activate when the processor is exposed to an atmospheric pressure input and the Processing lamp at the Indicator Panel shall light within three (3) minutes as determined by Exhibit 13.

6. When the processor is exposed to an atmospheric pressure input, the OVERPRESSURE lamp at the Indicator Panel shall light within sixty two (62) minutes as determined by Exhibit 13.

7. If the OVERPRESSURE lamp lights, the system is not in proper working order. The GDF owner/operator shall immediately take the following actions:

    a. record the date and time the OVERPRESSURE lamp lit in the station's maintenance and alarm records;
    b. investigate the cause of the OVERPRESSURE light as provided by section 16 of the Installation, Operations, and Maintenance Manual. Record results of inspections, maintenance, and/or testing conducted in the station's maintenance and alarm records; and if necessary,
    c. record the date and time when the GDF owner/operator called the maintenance contractor for service.

Franklin Fueling Systems Clean Air Separator Pressure Management System

1. The Franklin Fueling Systems Clean Air Separator (CAS) is a passive gasoline storage tank ullage pressure management system, with no electrical requirements. The Clean Air Separator vapor integrity shall be evaluated using the test procedure outlined in Exhibit 14 of the Executive Order.

2. The Franklin Fueling Systems Clean Air Separator shall be installed within 100 feet from the vent line(s), and the associated piping shall be sloped 1/8” per foot minimum toward the vent line(s).

Pressure/Vacuum Vent Valves for Storage Tank Vents

1. All P/V vent valves shall be an ARB certified P/V valve for a Phase I system.

2. At least one pressure/vacuum (P/V) vent valve shall be installed on each tank vent. The maximum number of P/V vent valves allowed and P/V vent valve performance specifications are listed in the applicable Phase I EVR Executive Order. Vent lines may be manifold to minimize the number of P/V vent valves and potential leak sources, provided the manifold conforms to all applicable fire regulations. However, the vents connecting the vapor inlet and vapor outlet to the VST ECS Membrane Processor cannot be manifold together.

Vapor Recovery Piping Configurations

NOTE: Vapor Return Piping shall meet the requirements specified in section 4.11 of CP-201.

1. Vapor Return and Vent Lines

   For facilities installed on or after April 1, 2003, all vapor return and vent lines shall be a minimum nominal internal diameter of 2 inches from the dispensers or the vent stacks to the first manifold. All lines after the first manifold and back to the underground storage tank shall have a minimum nominal internal diameter of 3 inches.

   Note: Facilities permitted by a local district prior to April 1, 2003 shall be required to meet the three inch diameter standard only upon facility modification which involves the addition, replacement, or removal of 50 percent or more of the buried vapor piping.

2. All vapor return lines shall have a minimum slope of 1/8 inch per foot from the dispenser riser to the riser of the UST. A slope of 1/4 inch or more per foot is recommended wherever feasible.

3. The dispenser shall be connected to the riser with either flexible or rigid material that is listed for use with gasoline. The dispenser-to-riser connection shall be installed so that any liquid in the lines will drain toward the storage tank. The internal diameter of the connector, including all fittings, shall not be less than one inch (1").

   Note: The dispenser-to-riser connection is defined as the piping connection between the dispenser piping and the inlet of the dispenser riser. A vapor shear valve may also be part of the riser connection.

4. There is no length restriction for the vapor return piping of the system as long as the system complies with the maximum pressure drop requirement, item 1 of the Vapor Collection section.

5. No product shall be dispensed from any fueling point at a GDF installed with the VST Phase II EVR System if there is a vapor line that is disconnected and open to the atmosphere.

6. No liquid condensate traps or Bulk Plant Operations are allowed with this system.

Dispensers

1. The dispenser vapor piping must be sized adequately to meet the maximum pressure drop requirement, item 1 of the Vapor Collection section.

2. Dispenser vapor piping shall be installed so that any liquid in the lines will drain toward the dispenser riser.

Phase I System

1. The Phase I system shall be an ARB-certified system that demonstrates compliance with the static pressure decay test criteria contained in TP-201.3 and Exhibit 4.

Maintenance Records

1. Each GDF operator owner shall keep records of alarms and maintenance performed at the facility. Such records shall be maintained on site in accordance with district requirements or policies. The records shall include alarm date and time, nature of the alarm, troubleshooting, maintenance or repair performed to validate and/or correct alarms, component, or system failures, date when maintenance or repair was conducted, name and Certified Technician Identification Number of individual conducting maintenance or test, affiliation, and telephone number. Additional information may be required in accordance with local district requirements. An example of a GDF maintenance and alarm record is shown in Figure 2B-8.

2. Maintenance shall be conducted in accordance with the Scheduled Maintenance section of the ARB approved Installation, Operation, and Maintenance Manual.

Vapor Recovery Equipment Defects

The following is deemed a defect for the affected grade point(s) or system.

Grade Points – VST Nozzles

1. The grade point shall be removed from service when more than 30% of a nozzle face seal is missing (e.g., a triangular or similar shape in which greater than 2.5 inches of the faceplate circumference is missing (accumulated)).

2. The grade point shall be removed from service when more than 0.375 square inches of a nozzle vapor collection sleeve is missing (e.g., a rectangular shape of greater than nine/sixteenth (9/16) inches or more on each side, a circular shape of eleven/sixteenth (11/16) inches or more in diameter, or a triangular shape of seven/eighth (7/8) inches on the side.

3. The grade point shall be removed from service when the total slit length in the convolutions exceeds 18 inches as determined by direct measurements.

Grade Points – EMCO Nozzles

4. The grade point shall be removed from service when more than 0.38 square inches of a nozzle boot face material is missing (e.g., a triangular or similar shape in which greater than 7/16 inches of the boot face circumference is missing (accumulated)).

5. The grade point shall be removed from service when there is slit across seven (7) consecutive bellows convolutions as determined by direct measurements.

6. The grade point shall be removed from service when there is a 360 degree cut around the bellows convolution.

Grade Points – General

7. The grade point shall be removed from service when the dispensing rate is greater than ten (10) gallons per minute (gpm) or less than five (5) gpm as determined by the applicable provisions of section 6 or 7 of Exhibit 5 or by direct observation for 30 seconds minimum at the maximum hand held position.

8. The grade point shall be removed from service when a hose is found to have greater than 150 ml of gasoline in the vapor side as determined by sections 6.1 to 6.5 of Exhibit 5. Note: Prior to draining gasoline from the vapor side of the hose, use Emco tool P/N 494635EVR (for EMCO EVR nozzle) or VST tool P/N VST STP 100 (for VST EVR nozzle) and plug the fuel spout. **Do not activate dispenser when draining gasoline from the vapor side of the hose.**

9. The grade point shall be removed from service when any hose has a visible opening as determined by direct observation.

10. The grade point shall be removed from service when the insertion interlock mechanism allows dispensing when the bellows is uncompressed as determined by direct observation or GDF-09 (see Vapor Recovery Equipment Defects List).

11. The grade point shall be removed from service when the nozzle automatic liquid shut-off mechanisms malfunction in any manner as determined by EPO No. 26-F (See Vapor Recovery Equipment Defects List) or direct observation.

12. The grade point shall be removed from service when any nozzle has a defective vapor valve as determined by Exhibit 7 or when the vapor valve has a leak rate that exceeds 0.07 cubic feet per minute at a pressure of two (2) inches WC as determined by TP-201.2B.

13. The grade point or system shall be removed from service when any component required by this Executive Order is absent, installed improperly or disconnected as determined by direct observation.

System with VST ECS Processor

1. Unless there is maintenance or testing being conducted on the VST ECS processor, the system shall be removed from service when the three ball valves on the VST ECS processor are not locked in the proper operating configuration (Figure 2B-3) as determined by direct observation.

2. Unless there is maintenance or testing being conducted on the VST ECS processor, the system shall be removed from service when the ECS membrane processor is not on or in the automatic vapor processor mode as determined by the Diagnostic section of the Pressure Measurement Control (Section 12) of IOM.

System with Veeder-Root Vapor Polisher

1. Unless there is maintenance or testing being conducted on the Veeder-Root Vapor Polisher, the system shall be removed from service when the ball valve on the Vapor Polisher is not locked in the proper operating configuration (Figure 2B-4) as determined by direct observation.

2. Unless there is maintenance or testing being conducted on the Veeder-Root Vapor Polisher, the system shall be removed from service when the Vapor Polisher is not in the automatic mode as determined by the Diagnostic section of the Pressure Measurement Control (Section 15) of IOM.

System with Hirt Thermal Oxidizer

1. Unless there is maintenance or testing being conducted on the Hirt Thermal Oxidizer, the system shall be removed from service when the ball valve on the Thermal Oxidizer is not locked in the proper operating configuration (Figure 2B-5) as determined by direct observation.

2. Unless there is maintenance or testing being conducted on the Hirt Thermal Oxidizer, the system shall be removed from service when the Thermal Oxidizer Indicator Panel is not in the “power on” position (power lamp is lit).

System with Franklin Fueling Systems Clean Air Separator

1. The system shall be removed from service when the Franklin Fueling Systems Clean Air Separator fails the leak decay test outlined in Exhibit 4.

2. Unless there is maintenance or testing being conducted on the Franklin Fueling Systems Clean Air Separator, the system shall be removed from service when the four ball valves are not locked in the positions shown in **Figure 2B-7** or **2B-7H** for normal Clean Air Separator operation. Figure 2B-7 applies to vertical CAS installations and Figure 2B-7H applies to horizontal CAS installations.

Figure 2B-1
Model VST-EVR- NB Nozzle

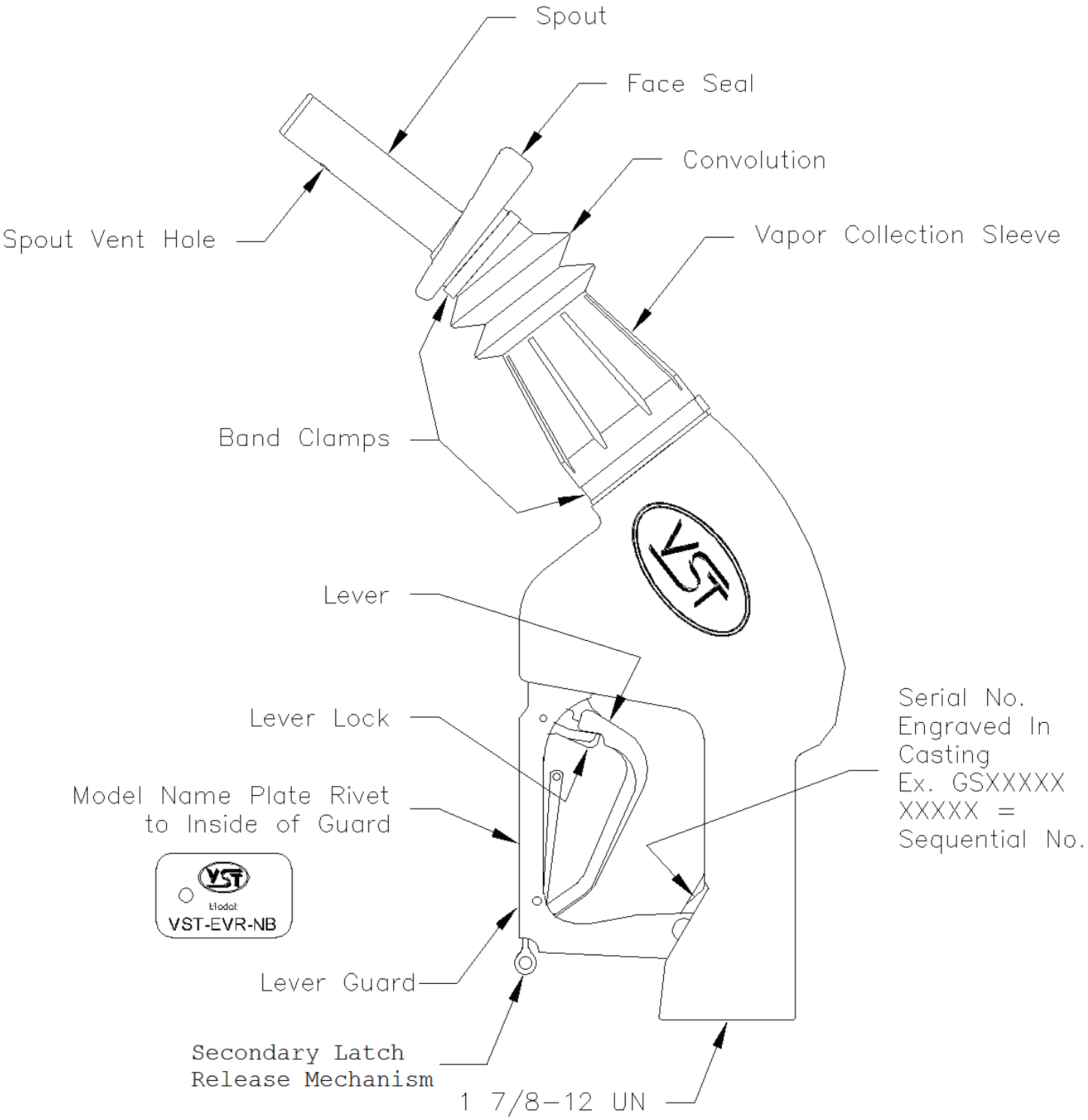


Figure 2B-2
EMCO Model A4005EVR Nozzle

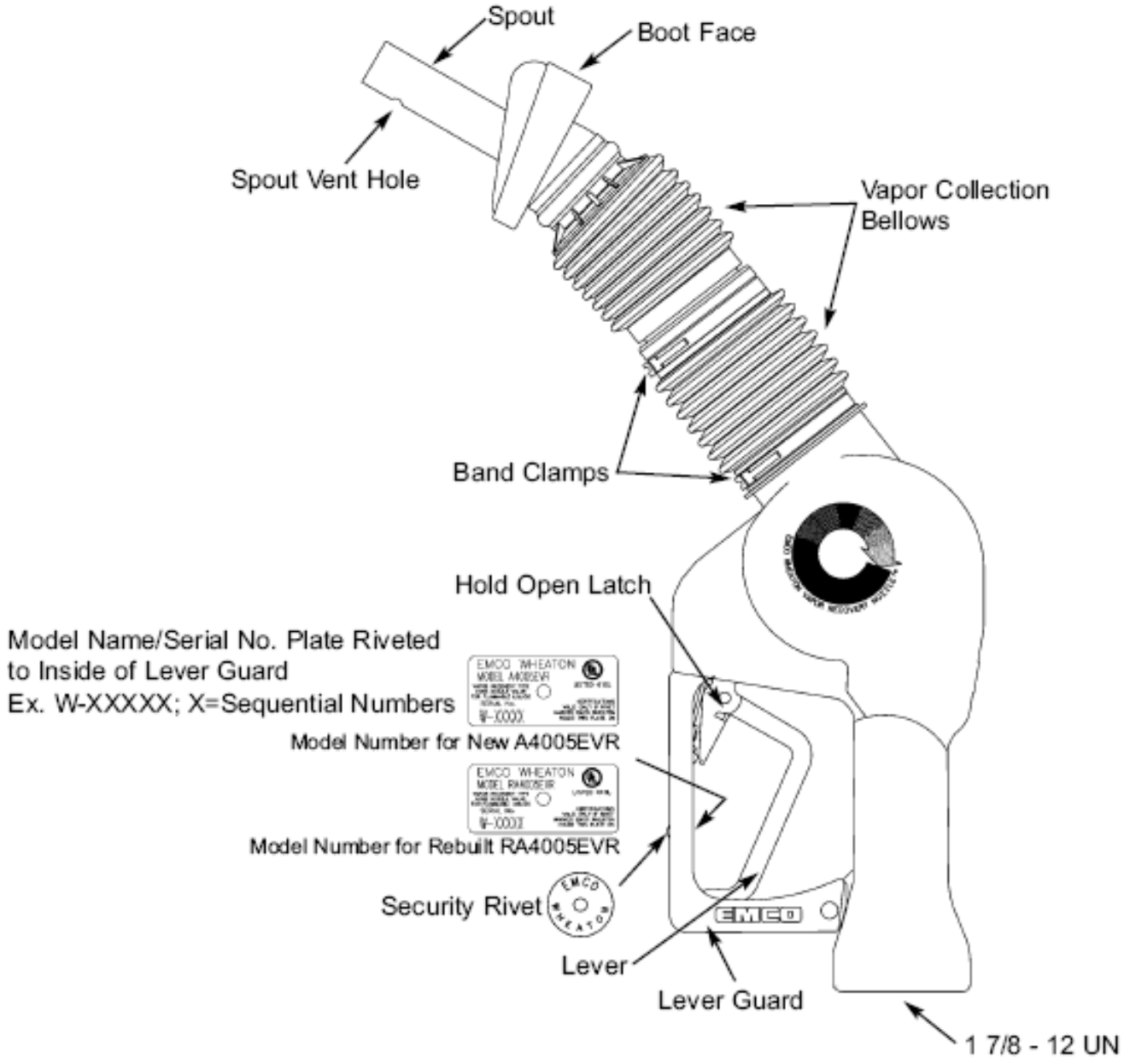
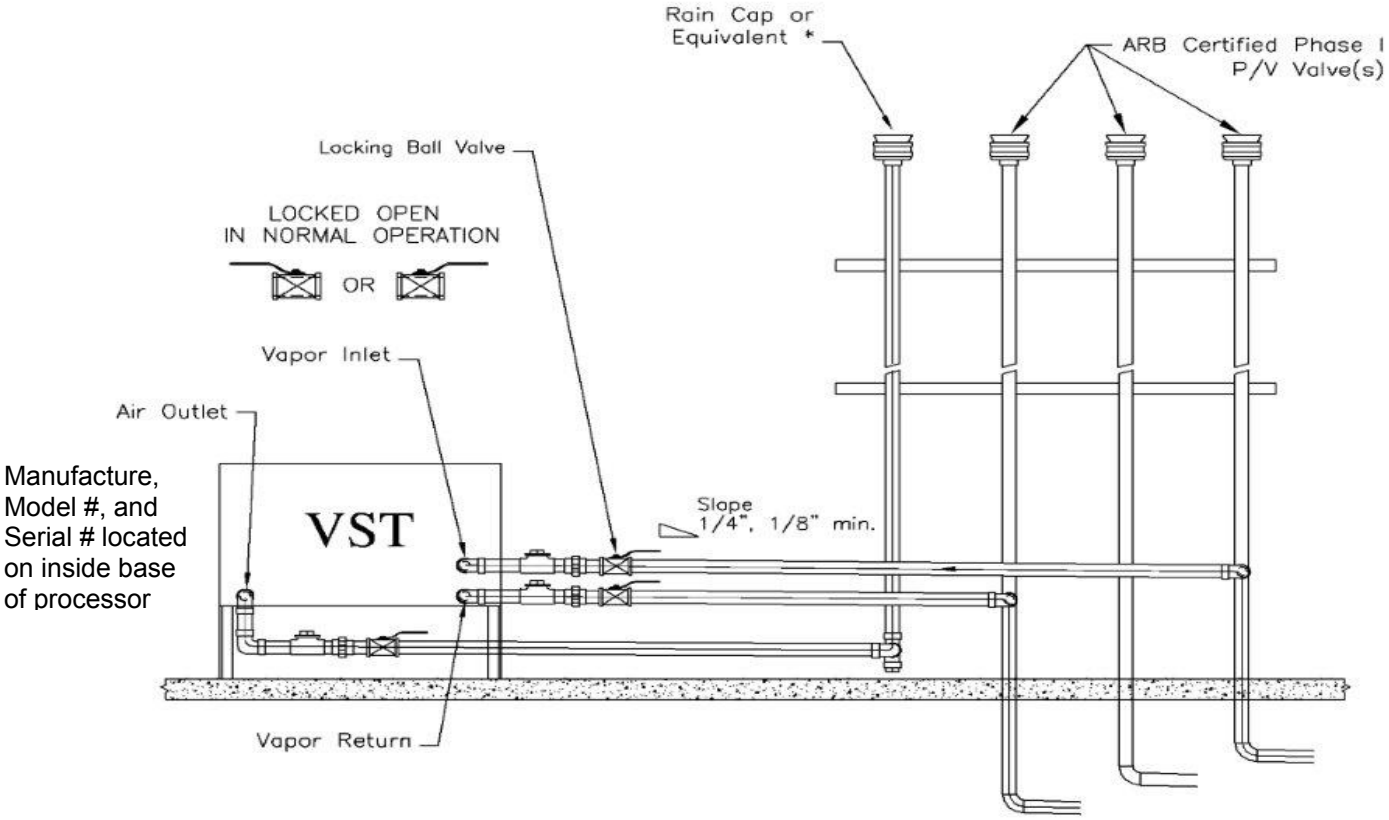


Figure 2B-3
Typical VST-ECS-CS3 Membrane Processor



CAUTION: THE HANDLES ON THE LOCKING BALL VALVES MUST NOT BE REMOVED

* If a P/V valve is used, the internal components MUST be removed to allow open venting to the atmosphere.

Figure 2B-4
Typical Veeder-Root Vapor Polisher

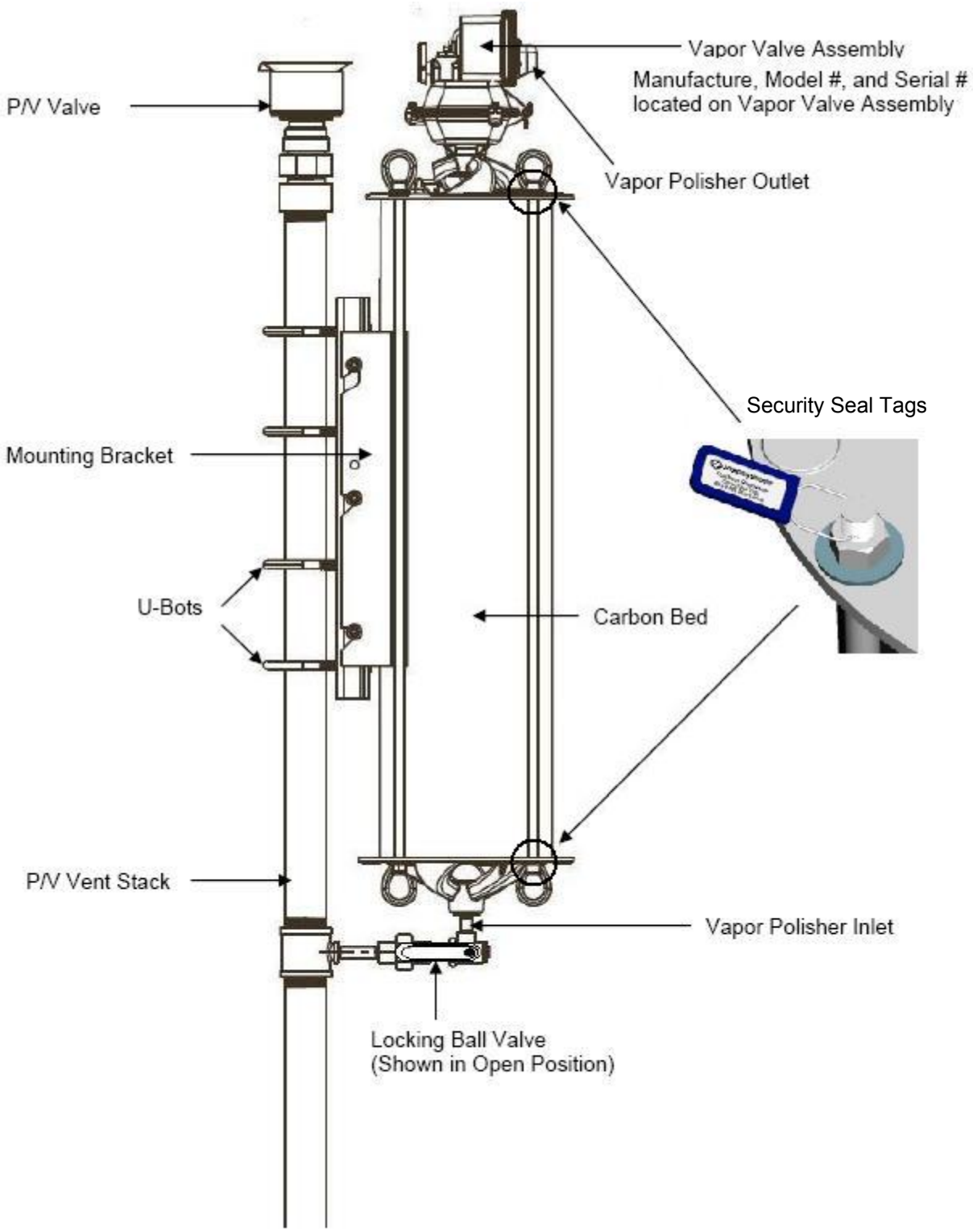


Figure 2B-5
Hirt VCS 100 Thermal Oxidizer
(shown in normal operation)

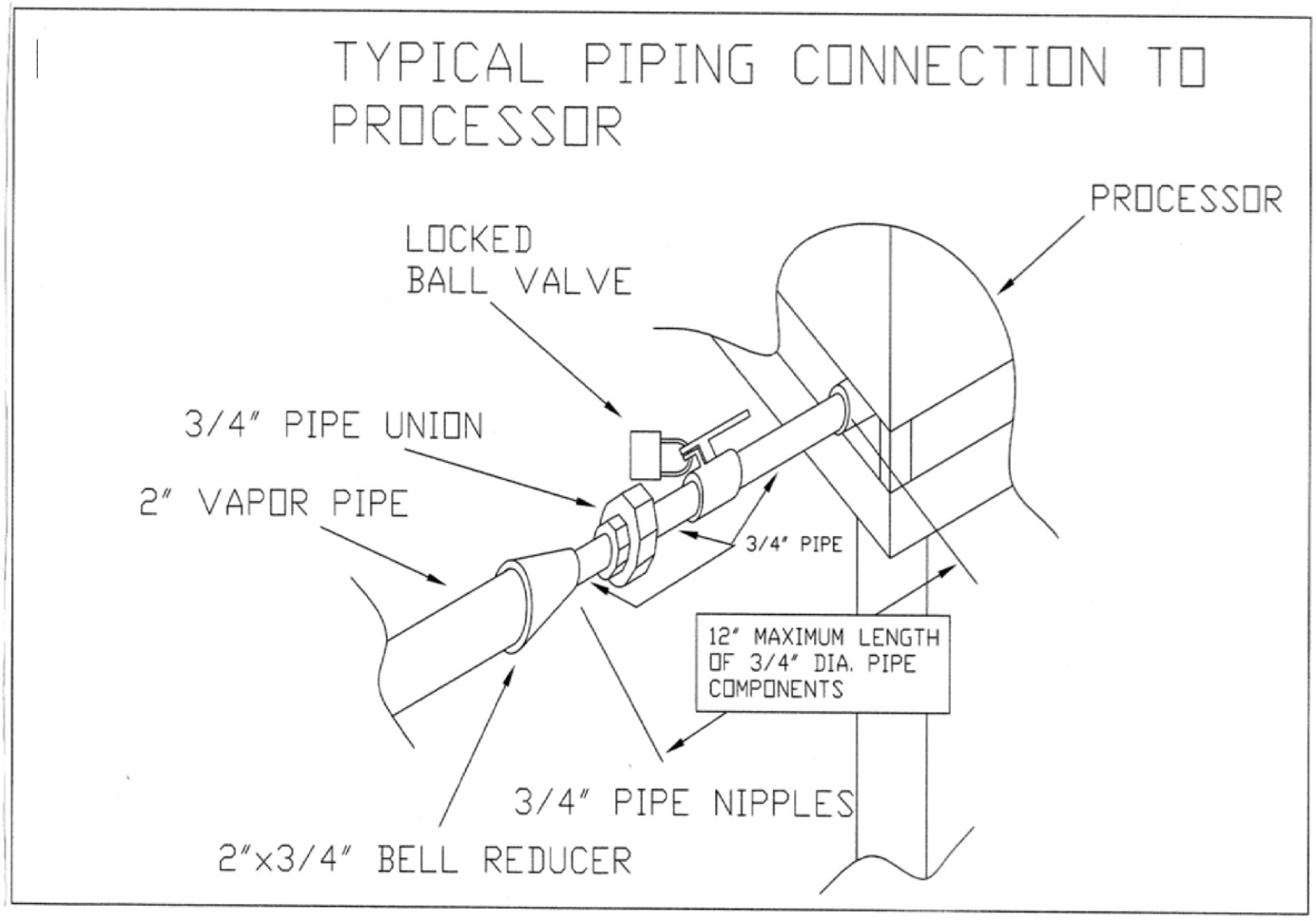


Figure 2B-6
Hirt VCS 100 Thermal Oxidizer
(3-Way Valve shown in normal operation)

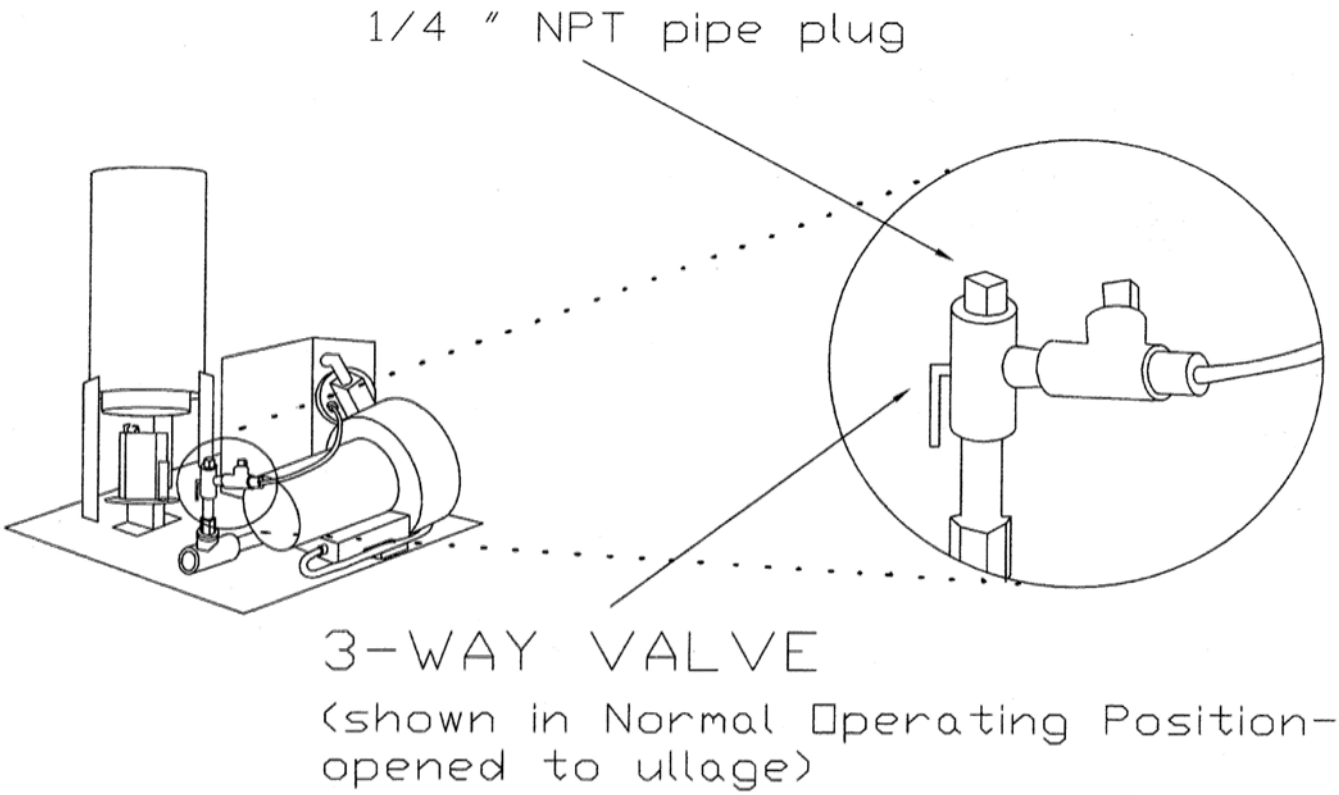


Figure 2B-7
Clean Air Separator Normal Operation Configuration

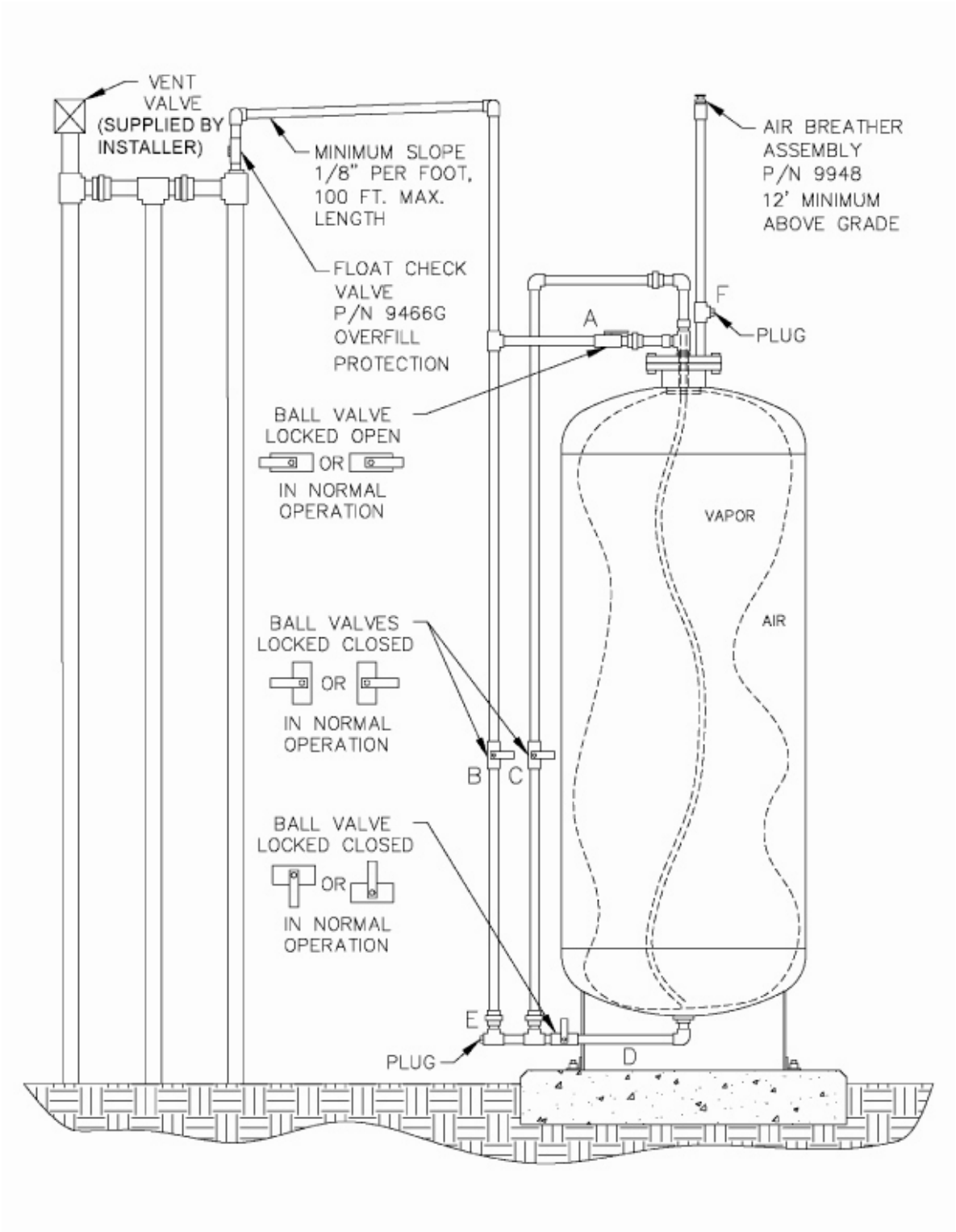


Figure 2B-7H
Clean Air Separator Normal Operation Configuration

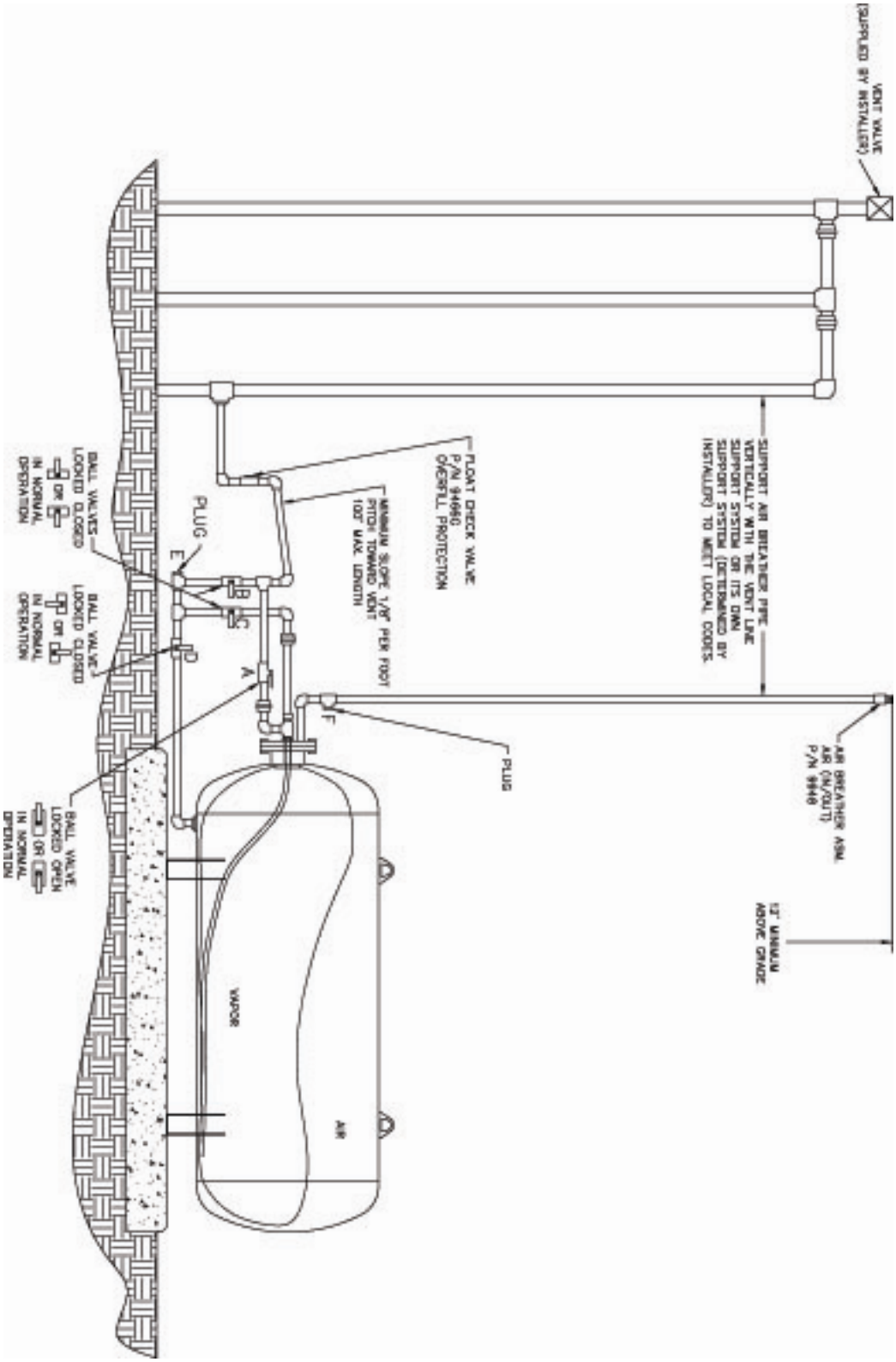


Figure 2B-8
Example of a GDF Maintenance Record and Alarm History Record

Date of Maintenance/ Test/Inspection/Failure/ alarm history (including date and time of maintenance call)	Repair Date To Correct Test Failure	Maintenance/Test/Inspection Performed and Outcome/Action Taken in Response to Alarm	Affiliation	Name and Technician ID Number of Individual Conducting Maintenance or Test	Telephone Number

Executive Order VR-203-I
VST Phase II EVR System

Exhibit 3
Manufacturing Performance Specifications and Warranties

The Phase II EVR Systems and all components shall be manufactured in compliance with the performance standards and specifications in CP-201 (amended May 25, 2006), as well as the requirements specified in this Executive Order. All components (Exhibit 1) shall be manufactured as certified; no change to the equipment, parts, design, materials or manufacturing process shall be made unless approved in writing by the Executive Officer or Executive Officer delegate. Unless specified in Exhibit 2 or in the ***ARB Approved Installation, Operation and Maintenance Manual***, the requirements of this section apply to the manufacturing process and are not appropriate for determining the compliance status of a gasoline dispensing facility.

Part Ia - VST Manufacturing Performance Specifications

1. NOZZLES

a. The vapor valve leak rate of every nozzle shall not exceed 0.07 cubic feet per hour (CFH) at a pressure of +2 inches water column (WC) when tested in accordance with the latest version of TP-201.2B, "Flow and Pressure Measurement of Vapor Recovery Equipment".

b. The automatic shut off feature of every nozzle is tested at all service clip settings as well as handheld in accordance with Underwriters Laboratories (UL) Standard 842.

c. The primary and secondary shut-off mechanism of every nozzle shall be identical to the design that passed the California Department of Food and Agriculture Division of Measurement Standards Article 2 (DMS 6-6-97).

d. Every nozzle is manufactured to the specifications that passed all tests conducted during the ARB certification for the following:

TP-201.2C -	Spillage from Phase II Systems
TP-201.2D -	Post-Fueling Drips from Nozzles
TP-201.2E -	Gasoline Liquid Retention in Nozzles and Hoses
TP-201.2J -	Pressure Drop Bench Testing of Vapor Recovery Components

e. Every nozzle vapor collection boot is manufactured such that the force necessary to compress the nozzle bellows 0.5 inches is in the range of 10-16 pounds force.

f. The terminal end of every nozzle shall be manufactured in accordance with the specifications referenced in Section 4.7.3 of CP-201.

2. COAXIAL HOSES

a. Every coaxial hose is tested for continuity and pressure tests in accordance with UL Standard 330.

b. Every coaxial hose is manufactured to the standards and specifications that passed all tests conducted during the ARB certification for the following:

Exhibit 5 -	Liquid Removal Test Procedure
TP-201.2J -	Pressure Drop Bench Testing of Vapor Recovery Components

3. BREAKAWAY COUPLINGS

a. Every breakaway coupling is tested for continuity and pressure tests in accordance with UL Standard 567.

b. Every breakaway coupling is manufactured to the standard that passed all tests conducted during the ARB certification for the following:

TP-201.2J -	Pressure Drop Bench Testing of Vapor Recovery Components

4. VST ECS MEMBRANE PROCESSOR

a. Every ECS Membrane Processor is subjected to a VST Pressure Decay Test to verify pressure integrity.

b. Every ECS Membrane Processor is subjected to a VST Heat Trace Cable Continuity Test to ensure proper connections.

c. Every ECS Membrane Processor is subjected to a VST operability test to ensure proper rotation and operation of the blower motor and vacuum pump.

Part Ib – VST Warranty

This limited warranty is given by Vapor Systems Technologies, Inc. (hereinafter VST) to the purchaser of systems or products manufactured by it. VST products are warranted to be free from defect in material and workmanship under normal use, service, proper installation, and maintenance practices per manufacturer specifications.

VST warrants the materials and workmanship to be free from defects in accordance with the following provisions:

- This warranty will not apply to any products or systems that have:
  - been subject to misuse, abuse, tampering, negligence, accident, or drive off;
  - been misapplied, improperly installed, or not installed per VST's instructions or specifications;
  - been modified, altered, rebuilt or repaired by unauthorized persons or outside the criteria of VST specifications;
  - not been properly maintained in accordance with the system's or product's periodic maintenance schedule; or
  - been subject to damage resulting from acts of God.

- Use of VST products on non-UL systems or use that falls outside intended field of use voids any stated or implied warranty.
- The warranty for the material and workmanship of the systems or products extends to the purchaser and the duration of this warranty is TWELVE (12) MONTHS from the time of installation up to a maximum of EIGHTEEN (18) MONTHS from date of shipment, provided the Product Warranty Card is returned to VST. If the Product Warranty Card is not returned to VST, the warranty period is TWELVE (12) MONTHS from the date of shipment.
- VST warrants the material and workmanship of spare and/or replacements parts for NINETY (90) DAYS from the date of shipment.
- In the event of a warranty claim, the purchaser/distributor must obtain a copy of a Return Goods Authorization (RGA) from VST prior to returning product so as to insure proper processing. All warranty claim returns must be shipped freight prepaid by the purchaser/distributor.
- Warranty status will be determined upon inspection at VST's facility within THIRTY (30) DAYS of receipt of the warranted products. All returned merchandise deemed *Not Under Warranty*; will be held by VST for SEVEN (7) BUSINESS DAYS prior to disposal. Return of this product to the purchaser/distributor will require purchaser/distributor to issue a call tag within SEVEN (7) BUSINESS DAYS of notification.
- Repair or replacement of the warranted product is the **EXCLUSIVE REMEDY** under the terms of this warranty.
- This warranty does not cover any components exposed to contact with fuels containing greater than 5% methanol, 10% ethanol, or 15% MTBE by volume or any exposure to M85/E85 fuel.
- This warranty does not cover and VST is not liable for, incidental, consequential and/or indirect damages or loss including, but not limited to, personal injury, death, property damage, environmental damage, cost of labor, clean-up, downtime, installation and removal, product damage, and loss of product, revenue or profits.
- VST is not liable for any claims or lawsuits against the purchaser/distributor.
- VST is not responsible for labor or materials necessary to disconnect or connect the warranted product for return to VST.
- Use of non-VST replacement parts, the unauthorized addition of non-VST items to equipment, and the unauthorized alteration of equipment and/or systems voids this warranty.
- VST, as to each defect, shall be relieved of all obligations and liabilities under this Limited Warranty if the vapor recovery system(s) or components have been operated with any accessory, equipment, or a part not specifically approved by VST, and not manufactured by VST to VST design and specification, or parts not specifically approved by CARB to be used with VST products.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES.

VST MAKES NO OTHER WARRANTIES (WHETHER WRITTEN OR ORAL), EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, AND ANY OTHER SUCH WARRANTIES ARE HEREBY DISCLAIMED.

VST NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON OR ENTITY TO ASSUME FOR IT OR BIND IT TO ANY OTHER LIABILITY OR OBLIGATION RELATED TO OR IN CONNECTION WITH THIS LIMITED WARRANTY.

VST products should be used in compliance with applicable federal, state, and local laws and regulations.

VST reserves the right to make changes at any time to prices and designs, or make additions or improvements with respect to its products, without incurring any obligation to modify or install same on previously manufactured products.

Vapor Systems Technologies, Inc.
Phone: (937)-704-9333 • Fax: (937)-704-9443
www.vsthose.com

IMPORTANT
PRODUCT WARRANTY REGISTRATION CARD

12 MONTH WARRANTY BECOMES EFFECTIVE AT TIME OF INSTALLATION. IF THIS CARD IS NOT RETURNED, WARRANTY BECOMES EFFECTIVE FROM DATE OF SHIPMENT FROM VST.

THE MAXIMUM WARRANTY LIFE IS 18 MONTHS FROM DATE OF SHIPMENT.

PLEASE CALL VST IF THIS PRODUCT IS BEING USED AS A REPLACEMENT. REPLACEMENT WITH A NON VST PRODUCT VOIDS ANY WARRANTY.

SERIAL NUMBER:
INSTALLATION DATE:
INSTALLATION SITE:
CITY/STATE/ZIP:
DISTRIBUTOR NAME:
PRODUCT STYLE:
☐ HOSE ☐ SAFETY BREAKAWAY
☐ NOZZLE ☐ ECS PROCESSOR

VST-0006-04/06

Warranty and Testing Stickers for Balance EVR Products

- VST will continue to use individual tracking serial numbers on every product shipped (nozzle, hose, safety breakaway, and membrane processor).
- VST will continue to include a warranty card with every product shipped.
- VST will attach additional **NOTICE** stickers to the EVR balance-style products.

Nozzle

- A florescent colored sticker will be placed over the threaded area of the nozzle where the hose is to be attached.

- This sticker will include the following text:

NOTICE: The nozzle was factory tested to and met all applicable performance standards & specifications to which it was certified: Reference all applicable CARB Executive Orders, CARB Test procedures, Exhibits, and UL Standard 842.

WARRANTY: 12-month warranty becomes effective at time of installation upon VST receipt of warranty card. If the warranty card is not returned to VST, the warranty becomes effective from VST's shipment date. The maximum warranty life is 18 months from date of shipment. Please call VST if this product is being used as a replacement. Replacement with a non-VST product voids any warranty.

Safety Breakaway

- A florescent colored sticker will be placed over one of the threaded ports of the breakaway.
- This sticker will include the following text:

NOTICE: This breakaway was factory tested to and met all applicable performance standards & specifications to which it was certified: Reference all applicable CARB Executive Orders, CARB Test procedures, Exhibits, and UL Standard 567.

WARRANTY: 12-month warranty becomes effective at time of installation upon VST receipt of warranty card. If the warranty card is not returned to VST, the warranty becomes effective from VST's shipment date. The maximum warranty life is 18 months from date of shipment. Please call VST if this product is being used as a replacement. Replacement with a non-VST product voids any warranty.

Hose

- A florescent colored sticker will be placed on the hose.
- This sticker will include the following text:

NOTICE: This hose was factory tested to and met applicable performance standards & specifications to which it was certified: Reference all applicable CARB Executive Orders, CARB Test procedures, Exhibits, and UL Standard 330

WARRANTY: 12-month warranty becomes effective at time of installation upon VST receipt of warranty card. If the warranty card is not returned to VST, the warranty becomes effective from VST's shipment date. The maximum warranty life is 18 months from date of shipment. Please call VST if this product is being used as a replacement. Replacement with a non-VST product voids any warranty.

Processor

- A florescent colored sticker will be placed on the processor.
- This sticker will include the following text:

NOTICE: This processor was factory tested to and met all applicable performance standards & specifications to which it was certified: Reference all applicable CARB Executive Orders, CARB Test procedures, Exhibits, and UL Standard 79

WARRANTY: 12-month warranty becomes effective at time of installation upon VST receipt of warranty card. If the warranty card is not returned to VST, the warranty becomes effective from VST's shipment date. The maximum warranty life is 18 months from date of shipment. Please call VST if this product is being used as a replacement. Replacement with a non-VST product voids any warranty.

Part IIa – EMCO Wheaton Retail Manufacturing Performance Specifications

The Emco Phase II EVR System and all components shall be manufactured in compliance with the performance standards and specifications in CP-201 (amended May 25, 2006), as well as the requirements specified in this Executive Order. All components (Exhibit 1) shall be manufactured as certified; no change to the equipment, parts, design, materials or manufacturing process shall be made unless approved in writing by the Executive Officer or Executive Officer delegate. Unless specified in Exhibit 2 or in the ***ARB Approved Installation, Operation and Maintenance Manual***, the requirements of this section apply to the manufacturing process and are not appropriate for determining the compliance status of a gasoline dispensing facility.

1. NOZZLES

a. The vapor valve leak rate of every nozzle shall not exceed 0.07 cubic feet per hour (CFH) at a pressure of +2 inches water column (WC) when tested in accordance with the latest version of TP-201.2B, “Flow and Pressure Measurement of Vapor Recovery Equipment”.

b. The automatic shut off feature of every nozzle is tested at all service clip settings as well as handheld in accordance with Underwriters Laboratories (UL) Standard 842.

c. The primary and secondary shut-off mechanism of every nozzle shall be identical to the design that passed the California Department of Food and Agriculture Division of Measurement Standards Article 2 (DMS 6-6-97).

d. Every nozzle is manufactured to the specifications that passed all tests conducted during the ARB certification for the following:

TP-201.2C -	Spillage from Phase II Systems
TP-201.2D -	Post-Fueling Drips from Nozzles
TP-201.2E -	Gasoline Liquid Retention in Nozzles and Hoses
TP-201.2J -	Pressure Drop Bench Testing of Vapor Recovery Components

e. Every nozzle bellows is manufactured such that the force necessary to compress the nozzle bellows 0.883 inches is 5.95 pounds-force.

f. The terminal end of every nozzle shall be manufactured in accordance with the specifications referenced in Section 4.7.3 of CP-201.

2. SAFE BREAK VALVES

a. Every safe break valve is tested for continuity and pressure tests in accordance with UL Standard 567.

b. Every safe break valve is manufactured to the standard that passed all tests conducted during the ARB certification for the following:

TP-201.2J -	Pressure Drop Bench Testing of Vapor Recovery Components

Part IIb – EMCO Wheaton Retail Warranty

Emco Wheaton Retail Corporation service station products are warranted to be free from defects in material and workmanship under normal use and service. Vapor recovery nozzles are warranted for a period of twelve (12) months from date of shipment from Emco Wheaton Retail Corporation or from installation date as specified by the returned warranty card, not to exceed fourteen (14) months from the date of shipment from Emco Wheaton Retail Corporation. This warranty excludes the spout and/or front end components of balance vapor recovery nozzles unless damage is obvious when the nozzle is removed from the shipping carton and the defective nozzle is returned to Emco Wheaton Retail Corporation prior to use and within two (2) months from the date of invoice. Other service station products are warranted for a period of twelve (12) months from the date of manufacture.

Emco Wheaton Retail Corporation shall, at its option, repair or replace that part which proves to be defective. Repaired or replacement nozzles are warranted for the balance of the original warranty period. This warranty is void unless the original purchaser and any subsequent purchaser returns the claimed defective item to Emco Wheaton Retail Corporation for inspection to determine whether the claimed defect is covered by this warranty.

The exclusive and sole remedy under this warranty is repair or replacement of the defective part. Emco is not responsible for claims for damage caused by improper installation or maintenance; corrosive fluids; misuse of the product or use the product for other than its intended purpose; or accident, acts of God, or natural phenomena. Emco will not pay for labor or related expenses, nor shall Emco be liable for any incidental, consequential or exemplary damages. This warranty is void if the Emco Wheaton Retail Corporation product has been previously repaired with parts not approved by Emco Wheaton Retail Corporation, or if a nozzle bears the mark or imprint of a company other than Emco Wheaton Retail Corporation, indicating the nozzle has been rebuilt or repaired by a company other than Emco Wheaton Retail Corporation.

EMCO WHEATON RETAIL CORPORATION MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, (WHETHER WRITTEN OR ORAL), INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

In the event a nozzle is returned to Emco Wheaton Retail Corporation within the warranty period described above, and when tested is found to be functional and without defect, Emco Wheaton Retail Corporation reserves the right to return the nozzle to the customer or apply a Core Credit (see Nozzle Core Return Program), at Emco Wheaton Retail Corporation's discretion.

In the event of failure within the warranty period, call the Customer Service Department at **(800) 234-4394**. Describe the problem and provide the product date stamp information to the customer service representative. In the case of a nozzle, provide the serial number. The customer service representative will provide a product complaint number, if applicable. Ship the defective equipment **PREPAID**, to Emco Wheaton Retail Corporation for repair or replacement.

Emco Wheaton Retail Corporation products should be used in compliance with applicable federal, state and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications are based on the latest product information available at the time of publication. Emco Wheaton Retail Corporation reserves the right to make changes at

any time in prices, materials, specifications and models and to discontinue models without notice or obligation.

Emco Wheaton Retail Corporation warrants the workmanship and materials to be free of defects and will comply with the performance standards of California ARB CP-201 for a period of one (1) year from the date of installation or fourteen months from the date of shipment from Emco Wheaton Retail Corporation.

The following warranty card will be shipped with the Emco vapor recovery components:

EMCO® WHEATON RETAIL

Emco Wheaton Retail Corp.

252-243-0150 • 252-243-4759 (fax) • www.emcoretail.com

IMPORTANT
Product Warranty Registration Card

12 month warranty becomes effective at time of installation. If this card is not returned, warranty becomes effective from date of shipment from Emco.

The maximum warranty life is 14 months from date of shipment.

Please call Emco if this product is being used as a replacement. Replacement with a non-Emco product voids any warranty.

Serial Number:
Installation Date:
Installation Site:
City/State/Zip:
Distributor Name:
Product Style: ☐ A4005EVR Nozzle ☐ A4110EVR Hose Swivel ☐ A4119EVR Safe Break Valve

Part IIIa – Veeder-Root Manufacturing Performance Specifications

1. VEEDER-ROOT VAPOR POLISHER

a. The pressure drop across the Veeder Root Vapor Polisher is measured at a fixed flow rate.

b. The Veeder-Root Vapor Polisher is tested for leaks.

c. The Veeder-Root Vapor Polisher Vapor Valve Smart Sensor communication is tested using Veeder-Root Smart Sensor control protocol.

d. The Veeder-Root Vapor Polisher Vapor Valve Smart Sensor electro-mechanical valve open and close operation is tested.

e. The Veeder-Root Vapor Polisher Vapor Valve Smart Sensor electro-mechanical valve feedback control loop is tested for accurate reporting of the valve position.

Part IIIb – Veeder-Root Warranty

Veeder-Root Vapor Polisher Equipment Warranty Policy
We warrant that this product shall be free from defects in material and workmanship for a period of one (1) year from the date of installation or twenty-four (24 months) from the date of invoice, whichever occurs first. We will repair or replace the product if the product is returned to us transportation prepaid by user within the warranty period, and is determined by us to be defective. The user must contact the Veeder-Root Technical Support for specific detailed information concerning the failed component return to ensure proper processing.

This warranty applies only when the product is installed in accordance with Veeder-Root's specifications, and a Warranty Registration and Checkout Form has been filed with Veeder-Root by an authorized Veeder-Root Distributor. This warranty will not apply: (1) to any product which has been subject to misuse, abuse, negligence, accident, or drive-offs; (2) to systems that are misapplied or are not installed per Veeder-Root's specifications, or which have been modified, rebuilt or repaired by unauthorized persons; or (3) to damage resulting from acts of God.

Repair or replacement of the defective part or component under the terms of this warranty is the EXCLUSIVE REMEDY. 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 MERCHANTA-BILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.**

The following warranty card will be shipped with the Veeder-Root Vapor Polisher:

EQUIPMENT WARRANTY VEEDER-ROOT

Veeder-Root warrants that this product shall be free from defects in material and workmanship for a period of one (1) year from date of installation or twenty-four (24) months from date of invoice, whichever occurs first.

Date of manufacture:

This component was tested at the time of manufacture and meets all the applicable performance standards and specifications to which it was certified: E.O. VR-202, VR-203 and VR-204.

For detailed warranty terms see EO warranty exhibits (VR-202 Exhibit 6, VR-203/VR-204 Exhibit 3) on the ARB Web site at *http://www.arb.ca.gov/vapor/eo-evrphaseII.htm*

577013-868, Rev. E

Veeder-Root TLS-350R and TLS-350 Plus Monitoring Systems Warranty Policy
We warrant that this product shall be free from defects in material and workmanship for a period of one (1) year from the date of installation or twenty-four (24 months) from the date of invoice, whichever occurs first. During the warranty period, we or our representative will repair or replace the product, if determined by us to be defective, at the location where the product is in use and at no charge to the purchaser. Lamps and fuses are not covered under warranty.

We shall not be responsible for any expenses incurred by the user.

This warranty applies only when the product is installed in accordance with Veeder-Root's specifications, and a Warranty Registration and Checkout Form has been filed with Veeder-Root by an authorized Veeder-Root Distributor. This warranty will not apply to any product which has been subjected to misuse, negligence, 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.

If "Warranty" is purchased as part of the Fuel Management Service, Veeder-Root will maintain the equipment for the life of the contract in accordance with the written warranty provided with the equipment. A Veeder-Root Fuel Management Services Contractor shall have free site access during Customer's regular working hours to work on the equipment. Veeder-Root has no obligation to monitor federal, state or local laws, or modify the equipment based on developments or changes in such laws.

Part IVa – Goodyear Manufacturing Performance Specifications

1. COAXIAL HOSES

a. Every coaxial hose is tested for continuity and pressure tests in accordance with UL Standard 330.

b. Every coaxial hose is manufactured to the standards and specifications that passed all tests conducted during the ARB certification for the following:

Exhibit 5 -	Liquid Removal Test Procedure
TP-201.2J -	Pressure Drop Bench Testing of Vapor Recovery Components

Part IVb – Goodyear Maxxim Premier™ Plus Hose Warranty

Veyance Technologies, Inc., the manufacturer of Goodyear Engineered Products guarantees each assembly of Maxxim Premier™ Plus hose to be free from defects in material and workmanship for a period of the earlier to occur of (i) one (1) year from the date of installation or (ii) a maximum of fourteen months from the date of shipment from Veyance Technologies, Inc. to the initial purchaser. No claims under Veyance's warranty will be allowed unless they have been first submitted to Veyance for review. When in Veyance's judgment a defect in material or workmanship has occurred, Veyance's liability is limited to only replacement of the hose assembly.

This warranty applies to the initial purchaser and any subsequent purchaser only and liability with respect thereto is limited to replacement of the original hose assembly. It does not extend to any Maxxim Premier™ Plus hose which has been subject to misuse, neglect, accident, puncturing, cutting or caused by poorly maintained or malfunctioning retractors, pumps, and nozzles or improper installations.

This warranty is in lieu of all warranties expressed or implied including the warranty of merchantability and fitness for a particular purpose. No representative or person is authorized to assume any other liability in connection with the sales of Maxxim Premier™ Plus hose.

Veyance Technologies, Inc., the manufacturer of Goodyear Engineered Products warrants the workmanship and materials of the Maxxim Premier™ Plus to be free of defects and will comply with the performance standards of California ARB CP-201 for a period of the earlier to occur of (i) one (1) year from the date of installation or (ii) a maximum of fourteen months from the date of shipment from Veyance Technologies, Inc.

Veyance Technologies, Inc.
2701 Omaha Ave. • Norfolk, NE 68701
402.644.2600

IMPORTANT
Product Warranty
Registration Card

Warranty is effective until the earlier to occur: (i) 12 months from date of installation or (ii) 14 months from the date of shipment by Veyance Technologies, Inc.

Please call Veyance Technologies, Inc if this product is being used as a replacement. Replacement with a non-Veyance Technologies, Inc product voids any warranty.

Serial Number:
Installation Date:
Installation Site:
City/State/Zip:
Distributor Name:
Product: Maxxim Premier Plus

Part Va – Hirt Manufacturing Performance Specifications

1. HIRT VCS 100 THERMAL OXIDIZER

a. The VCS 100 processor is subjected to an assembly quality check.

b. The VCS 100 processor is visually inspected to verify identification, caution/warning, electrical, and other Agency labels are in place.

c. The VCS 100 processor is subjected to vacuum and pressure leak tests.

d. The VCS 100 processor is subjected to the following functional tests:

i. Power test;
ii. Verify set point of vacuum sensor switch;
iii. Verify operation of main vapor valve;
iv. Verify flow rate of pilot and main vapor valves; and
v. Dielectric test.

Part Vb –HIRT COMBUSTION ENGINEERS, INC. (HCE) VCS 100 THERMAL OXIDIZER WARRANTY POLICY

- HCE warrants the workmanship and materials to be free from defects and will comply with the performance standards of California ARB CP-201 for a period of one (1) year from the date of installation or from date of shipment from HCE, if registration card is not returned.
- Liability under any implied or expressed warranty is limited to replacement of the product.
- HCE is not responsible for improperly installed or misuse of the product.
- HCE cannot be held responsible for damage to the product or its equipment due to acts of nature, vandalism, or neglect.
- HCE products are warranted to be free of defects in material and workmanship.
- In the event of a warranty claim, the purchaser must obtain a Return Authorization Number prior to returning product. All shipping costs are the responsibility of the customer.
- HCE shall repair or replace, at its option, any HCE component which proves to be defective.
- The cost of labor for any field repair, removal, replacement, or diagnosis is not covered by this warranty.
- The liability of HCE is limited solely and specifically to this warranty.

- HCE shall not be liable for any special, collateral, or consequential damages arising from this warranty, the use of this equipment or from any order accepted pursuant thereto.
- The use of parts not authorized by HCE voids the warranty.
- Installation, start-up, service, or repairs of this product by personnel not certified by HCE voids the above described warranty.

The following warranty card will be shipped with the Hirt VCS 100 Thermal Oxidizer:

Hirt Combustion Engineers, Inc.
Tel: (562) 692-1490
Fax: (562) 692-7413
Email: HirtVCS@aol.com

IMPORTANT
PRODUCT WARRANTY
REGISTRATION CARD

THE 12 MONTH WARRANTY BECOMES EFFECTIVE AT TIME OF INSTALLATION IF THIS CARD IS RETURNED WITHIN 30 DAYS OF START-UP. IF THIS CARD IS NOT RETURNED, WARRANTY BECOMES EFFECTIVE FROM DATE OF SHIPMENT FROM HIRT COMBUSTION ENGINEERS, INC.

THE MAXIMUM WARRANTY LIFE IS 18 MONTHS FROM DATE OF SHIPMENT FROM HIRT COMBUSTION ENGINEERS, INC.

PROCESSOR WAS FACTORY TESTED TO AND MET APPLICABLE PERFORMANCE STANDARDS & SPECIFICATIONS TO WHICH IT WAS CERTIFIED: REFERENCE ALL APPLICABLE CARB EXECUTIVE ORDERS, CARB TEST PROCEDURES, AND EXHIBITS.

SERIAL NUMBER: VSE
TURBINE NUMBER: VSE
INSTALLATION DATE:
SITE ADDRESS:
CITY / STATE / ZIP CODE:
DISTRIBUTOR NAME:
ISD BRAND / MODEL (IF ANY):
DATE OF MANUFACTURE:

Part VIa – Franklin Fueling Systems Manufacturing Performance Specifications

The Clean Air Separator tank is designed, constructed, tested, inspected and stamped per the American Society of Mechanical Engineers (ASME) Code Section VIII, Division 1, 2001 Edition, 2003 Addendum. Every Clean Air Separator bladder is performance and pressure tested using the **Clean Air Separator Performance Test** to ensure its integrity.

Part VIb – FRANKLIN FUELING SYSTEMS LIMITED WARRANTY POLICY FOR CLEAN AIR SEPARATOR (CAS)

Franklin Fueling Systems ("FFS") warrants that its products are free from defects in materials and workmanship that exist at the time of sale by FFS and which occur or exist within the applicable warranty period. Additionally, FFS warrants that its EVR products installed in California will conform to the warranty terms and conditions required by the Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities (CP-201) with respect to (a) transferability of warranties, (b) design changes to the EVR product, (c) performance specifications of the EVR products, and (d) duration of the warranty period. **However, in order to qualify for coverage under this warranty, the products must be installed according to the ARB Approved Installation, Operation, and Maintenance manual.**

APPLICABLE WARRANTY PERIODS:

Clean Air Separator: FFS warrants that the workmanship and materials are free of defects and will comply with the performance standards of California ARB CP-201 for a period one (1) year from the date of installation or 18 months from the date of manufacture. **This warranty is void if the Clean Air Separator fails to meet the performance standards as a result of damage to the tank due to corrosion.**

Lockable ball valves, Locks, Master key, Float check valve, and Breather Assembly shipped with installation kit: FFS warrants that the workmanship and materials are free of defects for a period of one (1) year from the date of installation or eighteen (18) months from the date of manufacture.

INSTRUCTIONS AND LIMITATIONS APPLICABLE TO THIS POLICY:

1. All warranty claims must be submitted <u>in writing</u> to FFS or applicable FFS subsidiary promptly after discovery of a defect. In no event may any warranty claim be submitted more than 30 days after the end of the applicable warranty period.

2. All warranty claims must have a written “Returned Goods Authorization” (RGA) from FFS and the RGA number must be affixed to the returned product. All returned products must be shipped freight prepaid with the RGA number affixed to the following address for inspection:

   Healy Products:
   Franklin Fueling Systems, Inc.
   ATTN: Warranty Department
   3760 Marsh Road
   Madison, WI 53718 USA

3. This warranty policy does not cover any labor or shipping charges. FFS shall not be liable for any costs or charges attributable to any product testing, maintenance, installation, repair or removal, or for any tools, supplies, or equipment needed to install, repair, or remove any product.

4. A Healy Certified Technician qualified to perform service on the defective equipment must perform warranty service. Only Healy Certified Technicians are allowed to perform warranty service. **Use of service personnel other than qualified Healy Certified Technicians without prior written approval by FFS will void the warranty.**

5. FFS, will, at its option, repair or replace defective parts returned to its factory. Repaired or replaced parts will be returned freight prepaid by FFS.

THIS WARRANTY DOES NOT APPLY TO THE FOLLOWING:

1. Any product not installed, applied, maintained and used in accordance with FFS's published instructions and with generally accepted industry standards.

2. Any product that has been subject to misuse, misapplication, neglect, alteration, acts of God, acts of terrorism, acts of war, fire, improper installation or use, improper maintenance or repair, damage or casualty.

3. Any product that is operated with any accessory, equipment, component, or part not specifically approved by FFS.

4. Any product that has been in contact with fuels containing greater than 15% methanol, 15% ethanol, or 15% MTBE by volume, including but not limited to, M85/E85 fuel (or other alcohol-rich fuel).

5. Use of replacement parts not sold by FFS, the unauthorized addition of non-FFS products to other FFS products, and the unauthorized alteration of FFS products.

FFS reserves the unrestricted right at any time and from time to time to make changes in the design of and/or improvements upon its product without thereby imposing any obligation upon itself to make corresponding changes or improvements in or upon its products already manufactured. FFS further reserves the right to substitute parts or components of substantially equal quality in any warranty service required by operation of this Limited Warranty.

This written Limited Warranty is the entire warranty authorized and offered by FFS. There are no warranties or representations beyond those expressed in this written document. This written Limited Warranty cannot be amended by any dealer, sales person or agent.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY SPECIFICALLY DISCLAIMED. CORRECTION OF NON-CONFORMITIES, IN THE MANNER AND FOR THE PERIOD OF TIME AS SET FORTH ABOVE, SHALL CONSTITUTE FULFILLMENT OF ALL LIABILITIES OF FFS TO THE PURCHASER WHETHER BASED ON CONTRACT, NEGLIGENCE, OR OTHERWISE.

FFS SHALL NOT, UNDER ANY CIRCUMSTANCES, BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES SUCH AS, BUT NOT LIMITED TO:

DAMAGE TO OR LOSS OF OTHER PROPERTY OR EQUIPMENT, LOSS OF USE OF EQUIPMENT, FACILITIES OR SERVICE, LOSS OF PROFIT OR SALES, COST OF PURCHASES OR REPLACEMENT GOODS, CLAIMS OF CUSTOMERS OF THE PURCHASER, FAILURE TO WARN AND/OR INSTRUCT, LOSS OF FUEL OR OTHER PRODUCTS, OR COSTS OF ENVIRONMENTAL REMEDIATION, OR DIMINUTION IN PROPERTY VALUE. THE REMEDIES OF THE PURCHASER SET FORTH HEREIN ARE EXCLUSIVE, AND THE LIABILITY OF FFS SHALL NOT, EXCEPT AS EXPRESSLY PROVIDED HEREIN, EXCEED THE PRICE OF THE PRODUCTS UPON WHICH SUCH LIABILITY IS BASED.

This Limited Warranty gives you specific legal rights. You may have other rights, which vary from state to state. Where any term of this warranty is prohibited by such laws, it shall be null and void, but the remainder of this warranty shall remain in full force and effect.

ANY LITIGATION RELATED TO THIS LIMITED WARRANTY POLICY OR THE FFS PRODUCT MUST BE MAINTAINED IN EITHER THE FEDERAL DISTRICT COURT FOR THE NORTHERN DISTRICT OF INDIANA, FORT WAYNE DIVISION (OR ANY SUCCESSOR JURISDICTION) OR IN A STATE COURT SITTING IN ALLEN COUNTY, INDIANA. YOU HEREBY IRREVOCABLY CONSENT AND SUBMIT TO THE EXCLUSIVE JURISDICTION OF THE APPLICABLE FEDERAL OR STATE COURTS SPECIFIED HEREIN AND IRREVOCABLY WAIVE ANY OBJECTION YOU MAY HAVE HAD BASED UPON IMPROPER VENUE, FORUM NON CONVENIENS, OR OTHER SIMILAR DOCTRINES OR RULES. THE INTERNAL LAWS OF THE STATE OF INDIANA SHALL GOVERN THE INTERPRETATION OF, OR ANY DISPUTE ARISING UNDER OR RELATING TO, THIS LIMITED WARRANTY POLICY.

Executive Order VR-203-I
VST Phase II EVR System

Exhibit 4
Required Items in Conducting TP-201.3

The instructions below are required when conducting TP-201.3 for the VST Phase II EVR system with the VST ECS Membrane Processor, Veeder-Root Vapor Polisher, Hirt Thermal Oxidizer, and Franklin Fueling Systems Clean Air Separator. The tester shall document that each step was followed as indicated below and shall include the page of this Exhibit with the submission of TP-201.3 test results. **See footnote regarding testing of pressure/vacuum vent valve**. Note that districts may require use of an alternate form to meet these requirements, provided the alternate form includes the same minimum parameters.

VST ECS Membrane Processor Installed

1. Prior to conducting TP-201.3, the three ball valves on the VST Membrane Processor shall be open, as shown in Figure 1.

2. The VST Membrane Processor shall be turned off. Refer to the ARB Approved Installation, Operation, and Maintenance Manual for instructions on turning off the processor. Not turning off the processor will bias the test toward failure.

3. After conducting TP-201.3, leave the three ball valves in the open locked position. Turn the VST Membrane Processor back on.

Required Steps	Verification (please circle)
1. All ball valves are in the open locked position before conducting TP-201.3?	Yes No
2. Processor is turned off before conducting TP-201.3?	Yes No
3. All ball valves in the open locked position and Processor is turned back on after conducting TP-201.3?	Yes No

Test Company: _____ Facility Name:_____

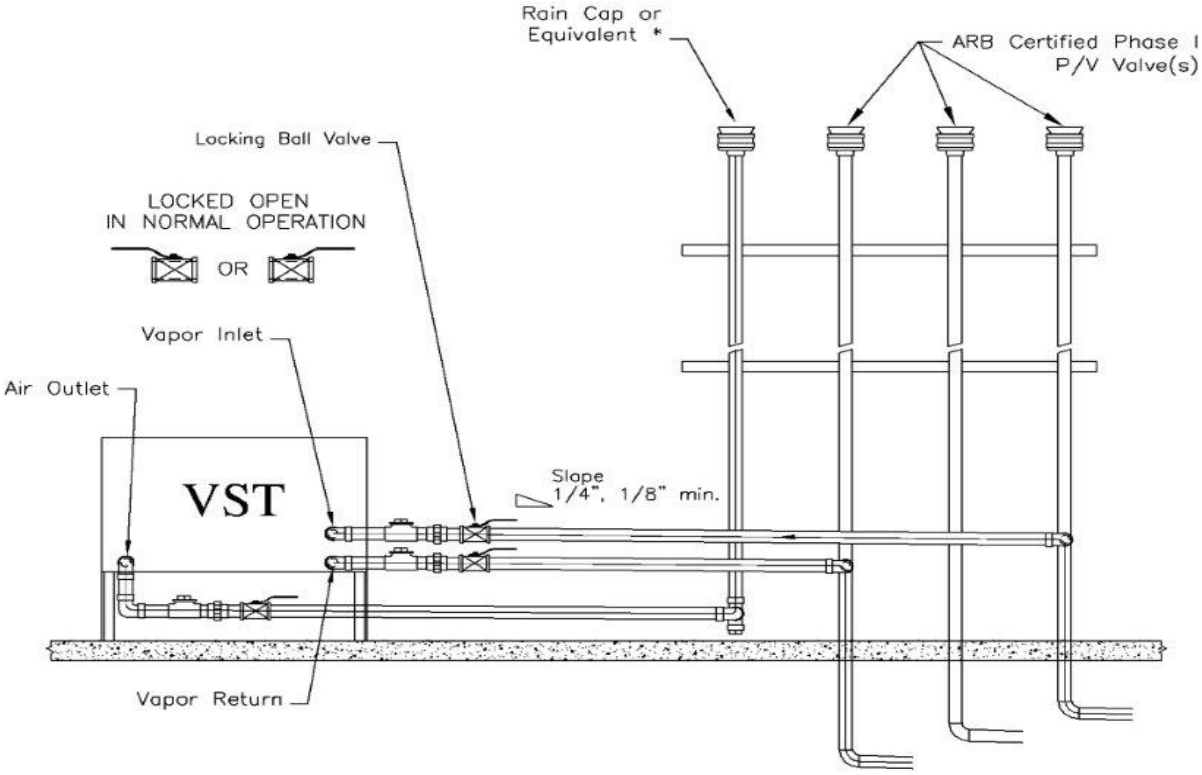
_____
Print Name (Technician) Signature Date

_____
Technician Certification Number and Expiration Date
(ICC or District Training Certification, as applicable)

[1] **Note: If the P/V vent valve is required to be tested by the local District, then the P/V vent valve shall be tested prior to conducting Exhibit 4.**

Figure 1

Configuration of VST Membrane Processor to Conduct TP-201.3



CAUTION: THE HANDLES ON THE LOCKING BALL VALVES MUST NOT BE REMOVED

* If a P/V valve is used, the internal components MUST be removed to allow open venting to the atmosphere.

Veeder-Root Vapor Polisher Installed

1. Prior to conducting TP-201.3, the ball valve on the inlet of the Veeder-Root Vapor Polisher shall be Open, as shown in Figure 2. At the TLS Console, manually close the vapor valve in the PMC Diagnostic menu (reference VR-203 IOM Section 15, PMC Diagnostic Menus, or VR-204 IOM Section 12, PMC Diagnostic Menus).

2. After conducting TP-201.3, enter the PMC Diagnostic Menu at the TLS Console and set the vapor valve to automatic mode.

3. The ball valve on the inlet of the Veeder-Root Vapor Polisher shall remain opened and locked.

Required Steps	Verification (please circle)
1. Inlet ball valve is open and vapor valve is closed before conducting TP-201.3?	Yes No
2. Vapor valve is in the automatic mode after conducting TP-201.3?	Yes No
3. Inlet ball valve is in the open locked position after conducting TP-201.3?	Yes No

Test Company: _____ Facility Name:_____

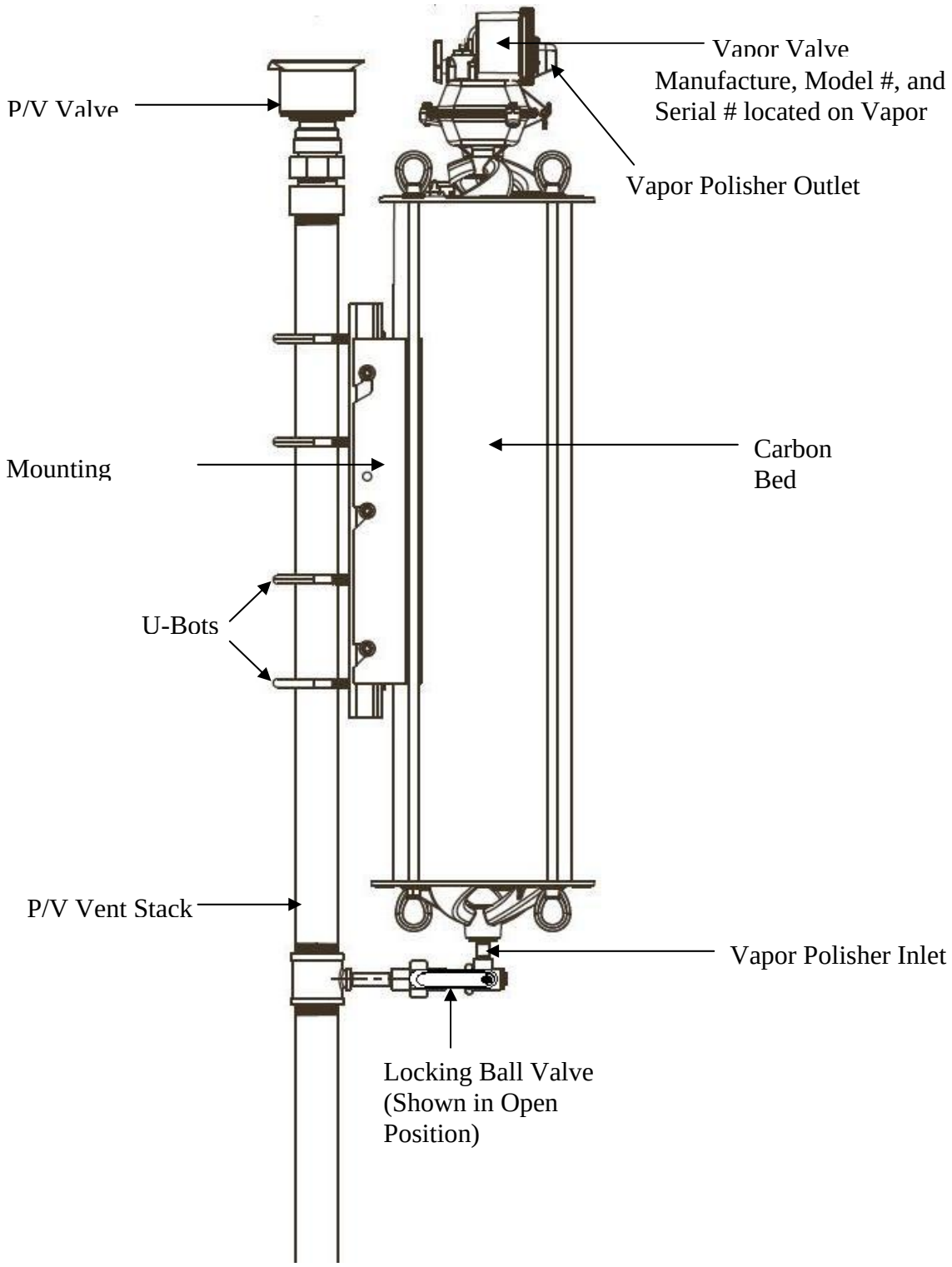
_____

Print Name (Technician) Signature Date

_____

Technician Certification Number and Expiration Date
(ICC or District Training Certification, as applicable)

Figure 2
Configuration of Veeder-Root Vapor Polisher to Conduct TP-201.3



Hirt Thermal Oxidizer Installed

1. Prior to conducting TP-201.3, the ball valve on the inlet of the Hirt VCS 100 processor shall be Open (Open to UST Ullage), as shown in Figure 3. At the Hirt Indicator Panel, turn the Power Switch to the “Off” position.

2. After conducting TP-201.3, turn the Power Switch to the “On” position.

3. The ball valve on the inlet of the Hirt VCS 100 processor shall remain opened and locked.

Required Steps	Verification (please circle)
1. Inlet ball valve is open and Power Switch is in “Off” position before conducting TP-201.3?	Yes No
2. Power Switch is in “On” position after conducting TP-201.3?	Yes No
3. Inlet ball valve is in the open locked position after conducting TP-201.3?	Yes No

Test Company: _____ Facility Name:_____

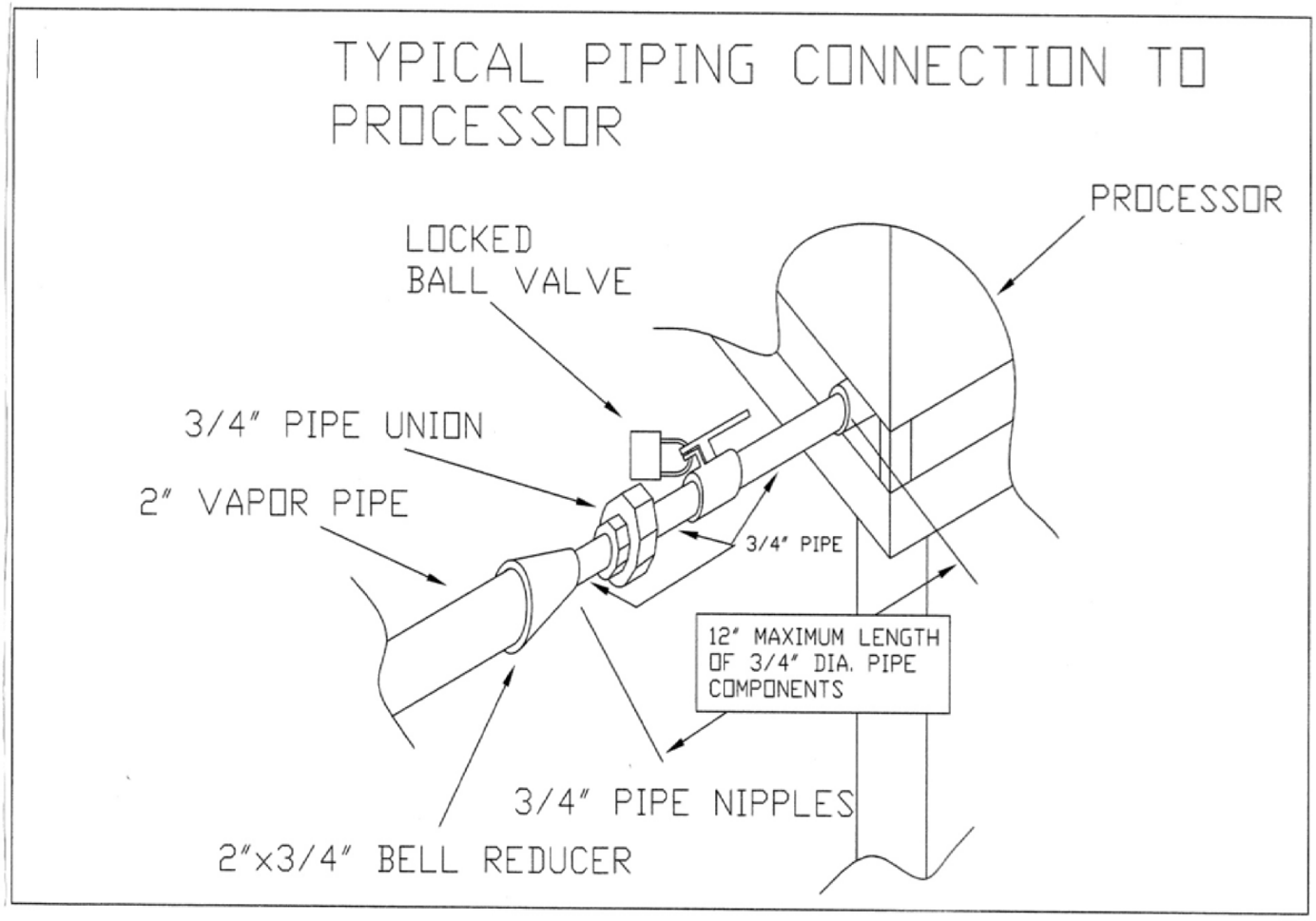
_____

Print Name (Technician) Signature Date

_____

Technician Certification Number and Expiration Date
(ICC or District Training Certification, as applicable)

Figure 3
Configuration of Hirt VCS 100 Thermal Oxidizer to Conduct TP-201.3



Franklin Fueling System Clean Air Separator Installed

1. Prior to conducting TP-201.3, all four ball valves on the CAS shall be closed, as shown in Figure 4 or Figure 4H, to isolate it from the UST system to permit the pressurization of the UST system.

2. After conducting TP-201.3, the four ball valves on the Healy Clean Air Separator (CAS) shall be locked in their normal operating positions as shown in Figure 2B-7 or Figure 2B-7H, Exhibit 2.

Required Steps	Verification (please circle)
1. All four CAS ball valves closed before conducting TP-201.3	Yes No
2. All four CAS ball valves in normal operating positions after conducting TP-201.3.	Yes No

Test Company: _____ Facility Name:_____

_____

Print Name (Technician) Signature Date

_____

Technician Certification Number and Expiration Date
(If required to meet the requirements of the local district)

Figure 4

Configuration of Healy Clean Air Separator to Conduct TP-201.3

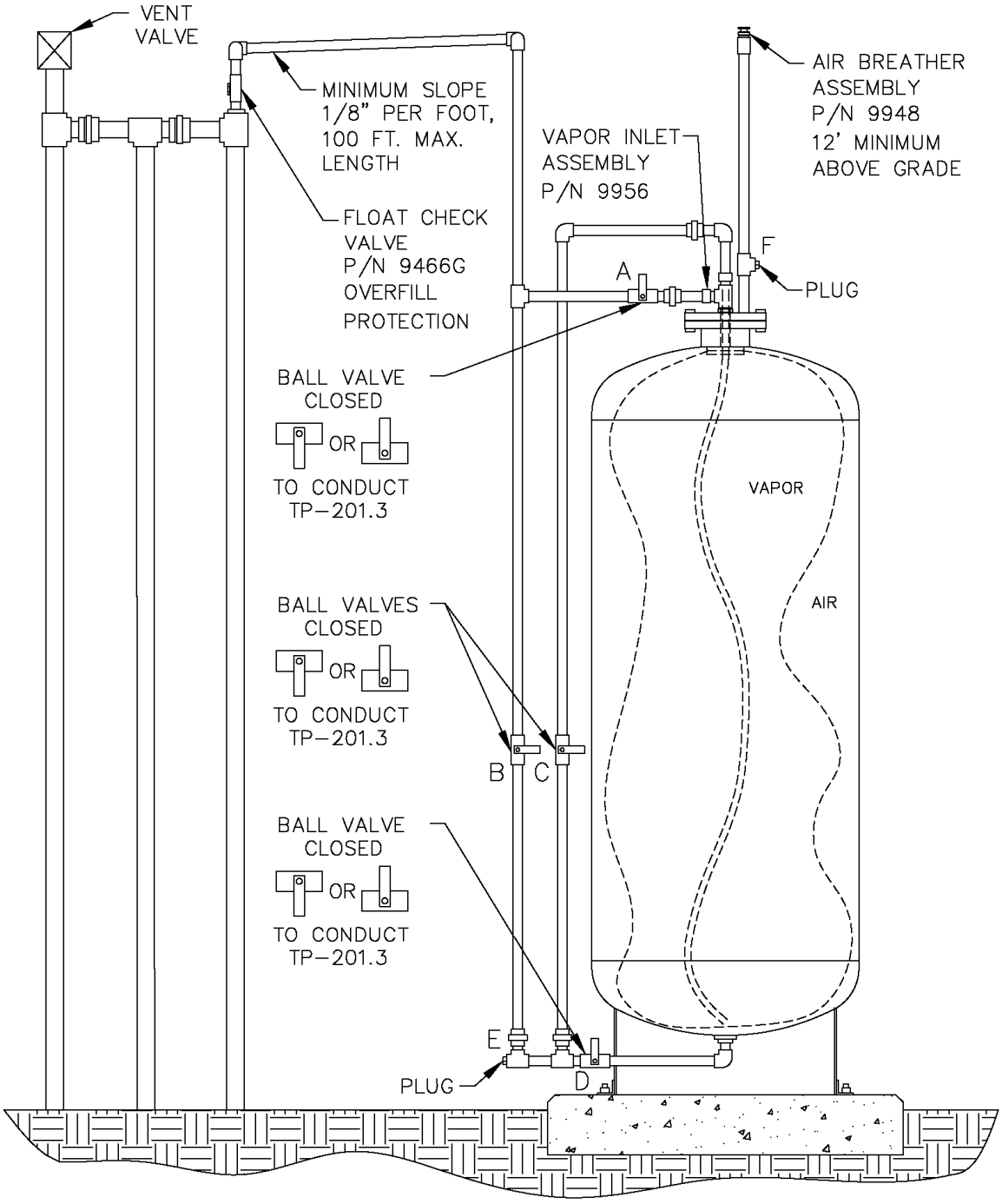
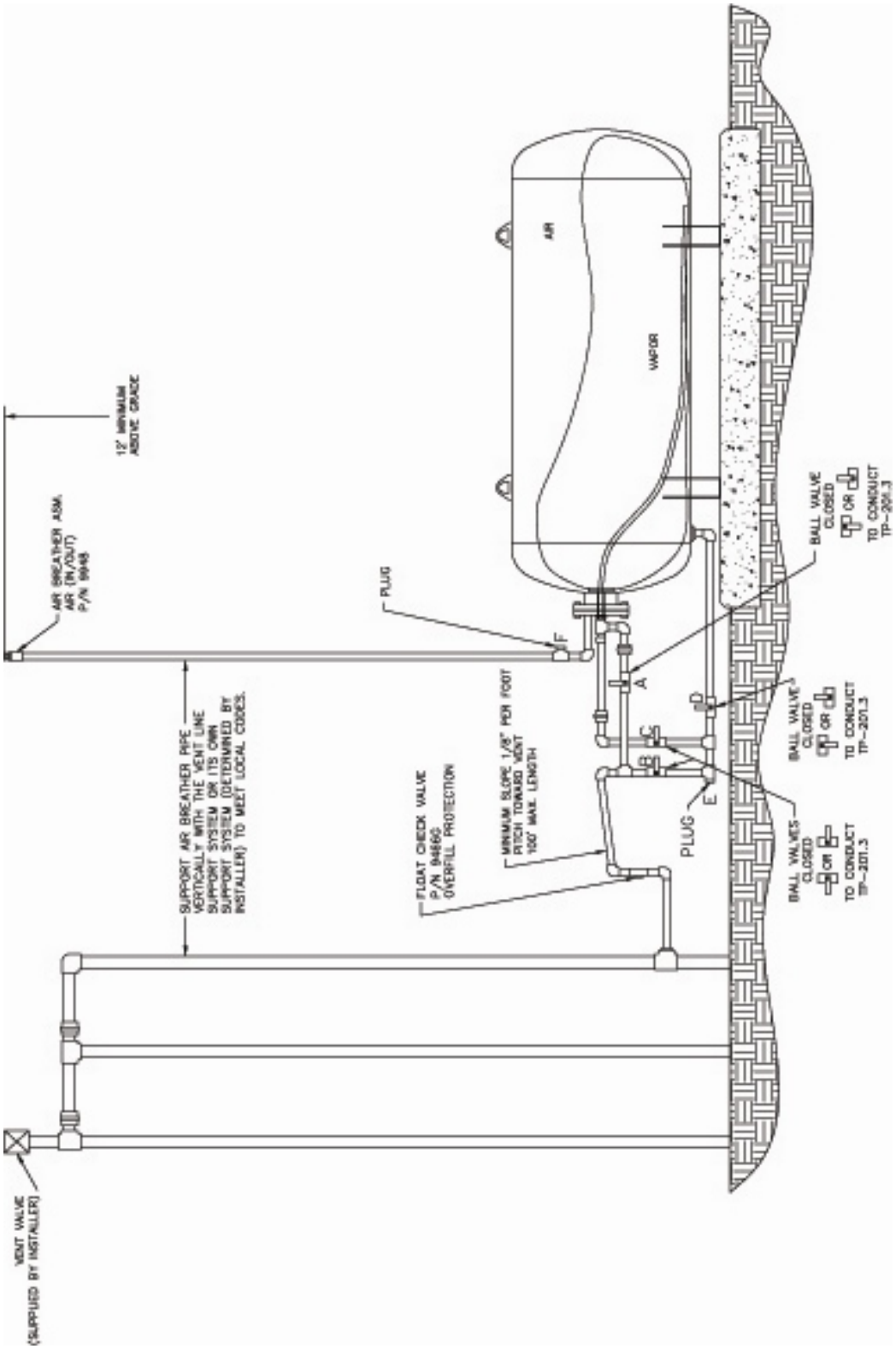


Figure 4H

Configuration of Healy Clean Air Separator to Conduct TP-201.3



Executive Orders VR-203-I and VR-204-I
VST Phase II EVR System

Exhibit 5
Liquid Removal Test Procedure

Definitions common to all certification and test procedures are in:

D-200 Definitions for Vapor Recovery Procedures

For the purpose of this procedure, the term "ARB" refers to the California Air Resources Board, and the term "Executive Officer" refers to the ARB Executive Officer or his or her authorized representative or designate.

1. PURPOSE AND APPLICABILITY

1.1 This procedure is used to quantify the removal rate of liquid from the vapor passage of a Phase II balance system hose equipped with a liquid removal device. This procedure provides a method to determine compliance with the liquid removal requirements specified in ARB Executive Orders VR-203 and VR-204 and any subsequent amendments or revisions.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 This test procedure provides two options to determine the compliance of liquid removal devices. Under option 1 (short version), liquid in the vapor path of a coaxial hose is drained and measured. If the volume of liquid drained equals or exceeds 25 ml, a liquid removal test is conducted. For those hoses with less than 25 ml drained, no further testing is required. Under option 2 (long version), all hoses are evaluated regardless of the volume of liquid drained. Option 2 includes a prewetting and wall adhesion step. Both options test the liquid removal device by introducing gasoline into the vapor path of the coaxial hose through the nozzle bellows. After 7.5 gallons of gasoline is dispensed, the amount of gasoline remaining in the hose is measured and the liquid removal rate is determined. The district shall specify which testing option is to be used.

Caution: When draining gasoline from the vapor side of the hose, make sure the dispenser is not activated. Gasoline is drained from the vapor side of the hose by compressing the bellows and engaging the fuel lever (note the nozzle vapor valve is on the same stem as the fuel valve). If the dispenser is activated, gasoline in the fuel hose may be pressurized when engaging the fuel lever.

3. BIASES AND INTERFERENCES

3.1. Slits or tears in the hose or nozzle vapor path may bias the results towards compliance.

3.2. This test shall not be conducted on any fueling point where the hanging hardware is

defective as identified in Exhibit 2.

3.3. Any spillage of gasoline invalidates the test for any volumes that are required to be measured or recorded.

3.4. A breach of the inner product hose may introduce additional gasoline into the outer vapor path resulting in a larger volume drained than introduced.

3.5. Not having the liquid extraction device (indicated by the mark on the outside of the house) at the bottom of the hose loop during liquid removal testing, as shown in Figure 1, will bias the results towards failure.

3.6. If testing a fueling point with a VST Model VST-EVR-NB nozzle, the test procedure requires the use of VST's nozzle spout plug, P/N VST-STP-100 as shown in Figure 2. If testing a fueling point with a EMCO Model A4005EVR nozzle, the test procedure requires the use of EMCO's nozzle spout plug, P/N 494635EVR as shown in Figure 3. This tool is used to plug the spout when draining liquid from the vapor side of the hose. Not plugging the spout may bias the results towards failure. Nicks, cuts, or tears in the plug o-rings will bias the results towards failure.

3.7. Dispensing rates not between 6.0 and 10.0 gallons per minute (GPM) invalidates the test.

4. SENSITIVITY, RANGE, AND PRECISION

4.1 The range of measurement of the liquid removal rate is dependent upon the range of the graduated cylinder used for testing.

4.2 To ensure precision, graduated cylinder readings shall be measured at the liquid level meniscus.

5. EQUIPMENT

5.1. Nozzle Spout Plug: If testing a fueling point with a VST Model VST-EVR-NB nozzle, use VST's spout plug, P/N VST-STP-100 (Figure 2). If testing a fueling point with a EMCO Model A4005EVR nozzle, use EMCO's nozzle spout plug, P/N 494635EVR as shown in Figure 3.

5.2. Stopwatch. Use a stopwatch accurate to within 0.2 seconds.

5.3. Funnels. Large and small gasoline compatible, non-breakable, funnels with dimensions similar to those as shown in Figure 4, or equivalent.

5.4. Graduated Cylinders. Gasoline compatible, non-breakable 0-25ml, 0-100ml, 0-250 ml, and 0-500 ml graduated cylinders with stable base plates. The 25ml cylinder may be necessary to quantify volumes of liquid less than 20 ml.

5.5. Gasoline Test Tank. (Optional) A portable tank, meeting fire safety requirements for use with gasoline, may be used to receive the gasoline dispensed during testing.

The tank shall have sufficient volume so that at least 10.0 gallons may be dispensed prior to activating the primary shutoff mechanism of the nozzle. **When using a gasoline test tank, ensure that a ground strap is used and that it is properly connected to an acceptable ground.** To minimize testing-related emissions, vehicle refueling events should be used for this procedure whenever feasible.

5.6. Traffic Cones. Use traffic cones to encircle the area where testing is conducted.

5.7. Field Data Sheet. Use the appropriate data sheet to record liquid removal test information. Forms 1 and 2 serve as examples; districts may require modified versions.

5.8. Gasoline Container. Use a portable fuel container equipped with a tight fitting cap, of at least 1.0 gallon capacity.

NOTE: THIS TEST PROCEDURE PROVIDES TWO OPTIONS TO DETERMINE COMPLIANCE OF LIQUID REMOVAL DEVICES. THE DISTRICT SHALL SPECIFY WHICH TESTING OPTION IS TO BE USED

6. OPTION 1 (SHORT VERSION)

PRE-TEST PROCEDURE

6.1 Verify that the 500 ml graduated cylinder is empty. Position the large funnel into the graduated cylinder.

6.2 Remove the nozzle from the dispenser. **Do not activate dispenser!** If testing a fueling point with a VST Model VST-EVR-NB nozzle, install VST's spout plug, P/N VST-STP-100 in the tip of the spout (Figure 2). If testing a fueling point with an EMCO Model A4005EVR nozzle, install EMCO's nozzle spout plug, P/N 494635EVR in the tip of the spout (Figure 3). Carefully tilt the spout into the funnel/graduated cylinder assembly.

6.3 Lower the nozzle and funnel/graduated cylinder assembly as close to the ground as possible. "Walk out" the hose while keeping the nozzle lowered and hose fully extended. The hose shall slope downward from the dispenser toward the nozzle.

6.4 **Do not activate dispenser!** Open the nozzle's vapor check valve by compressing the bellows and engaging the fuel lever. Allow 20 seconds for all liquid to drain. Use caution to avoid spillage.

6.5 Remove VST's or EMCO's spout plug and return the nozzle to the dispenser and measure the volume of liquid drained. If the volume drained is less than 200 ml, transfer the liquid into an appropriately sized graduated cylinder. For example, if 40 ml of liquid was drained, use the 100 ml graduated cylinder to take the measurement.

6.6 Record the amount of liquid drained on Form 1 ("PRE-TEST").

6.7 If the volume drained is greater than or equal to 25 ml, proceed to Section 6.8 of the procedure. Hoses with greater than 25 ml drained are considered to be pre-wetted. If the amount drained is less than 25 ml, proceed to the next nozzle/hose to be evaluated and repeat Section 6.1-6.6

TEST PROCEDURE (FOR HOSES WITH GREATER THAN 25 ML DRAINED)

6.8 Pour 150 ml to 175 ml of gasoline into the 250 ml graduated cylinder. Measure and record this volume on Form 1 (VI).

6.9 Remove the nozzle from the dispenser and position the nozzle upright so that the spout is in a vertical position. **Do not activate dispenser!**

6.10 Open the nozzle's vapor check valve by compressing the bellows and engaging the fuel lever. Carefully insert the stem of the small funnel between the bellows and nozzle spout.

6.11 Pour the measured volume into the vapor path of the hose. Use caution not to spill the gasoline. Remove the small funnel after the gasoline has been introduced.

6.12 Insert the nozzle into a vehicle or test tank fill pipe.

6.13 Find the mark on the outside of the hose which indicates the location of the liquid pick-up device. Ensure the mark is at the bottom of the hose loop when dispensing as shown in Figure 1. This can be accomplished by lifting up the back of the hose, adjusting nozzle position, or adjusting the test tank position.

6.14 Dispense 7.5 (±0.5) gallons at the highest possible flow rate by holding the nozzle lever in the maximum handheld position. Use a stopwatch to measure the time elapsed while dispensing. Record the volume of fuel dispensed (G) and the elapsed time (T) on Form 1. Return nozzle to the dispenser.

6.15 Calculate the dispensing rate using the equation below. If the dispensing rate is not between 6.0 and 10.0 gallons per minute (GPM), the test results are invalid.

$$GPM = 60 \times \left(\frac{G}{T}\right)$$

Where:

GPM	=	dispensing rate (in gallons per minute)
G	=	gallons of fuel dispensed
T	=	number of seconds required to dispense

6.16 Using the 250 ml graduated cylinder and large funnel, carefully drain the remaining liquid from the vapor path of the hose as described in Section 6.1 through 6.5 **(make sure dispenser is not activated and spout plug is installed before draining liquid!)**. Record this quantity on Form 1 (VF).

6.17 Use Equation 9.1 to calculate the liquid removal rate for all the applicable hoses tested.

6.18 If the liquid removal rate is less than 5.0 ml/gallon, but greater than or equal to 4.5 ml/gallon, repeat the test two additional times and average the three results.

7. OPTION 2 (LONG VERSION)

PRETEST PROCEDURE

7.1 Carefully pour 150 ml of gasoline into the 250 ml graduated cylinder.

7.2 Remove the nozzle from the dispenser. **Do not activate dispenser!** If testing a fueling point with a VST Model VST-EVR-NB nozzle, Install VST's spout plug, P/N VST-STP-100 in the tip of the spout as shown in Figure 2. If testing a fueling point with an EMCO Model A4005EVR nozzle, install EMCO's nozzle spout plug, P/N 494635EVR in the tip of the spout (Figure 3). Position the nozzle upright so that the spout is in a vertical position.

7.3 Open the nozzle's vapor check valve by compressing the bellows and engaging the fuel lever. Carefully insert the stem of the small funnel between the bellows and nozzle spout.

7.4 Pour the gasoline from the 250 ml graduated cylinder into the vapor path of the hose. Use caution not to spill the gasoline. Remove the small funnel after the gasoline has been introduced.

7.5 Verify that the 500 ml graduated cylinder is empty. Position the large funnel into the graduated cylinder.

7.6 Carefully tilt the spout into the funnel/graduated cylinder assembly. **Make sure VST's or EMCO's spout plug is installed and the dispenser is deactivated.**

7.7 Lower the nozzle and funnel/graduated cylinder assembly as close to the ground as possible. "Walk out" the hose while keeping the nozzle lowered and hose fully extended. The hose shall slope downward from the dispenser toward the nozzle.

7.8 Open the nozzle's vapor check valve by compressing the bellows and engaging the fuel lever. Allow 20 seconds for all liquid to drain. Use caution to avoid spillage. If necessary, drain full graduated cylinders into a portable gas can until the hose is empty.

7.9 Remove VST's or EMCO's spout plug and return the nozzle to the dispenser.

TEST PROCEDURE

7.10 Pour 150 ml to 175 ml of gasoline into the 250 ml graduated cylinder. Measure and record this volume on Form 2 (VI).

7.11 Remove the nozzle from the dispenser. **Do not activate dispenser!** Position the nozzle upright so that the spout is in a vertical position.

7.12 Open the nozzle's vapor check valve by compressing the bellows and engaging the fuel lever. Carefully insert the stem of the small funnel between the bellows and nozzle spout.

7.13 Pour the measured volume into the vapor path of the hose. Use caution not to spill the gasoline. Remove the small funnel after the gasoline has been introduced.

7.14 Insert the nozzle into a vehicle or test tank fill pipe.

7.15 Find the mark on the outside of the hose which indicates the location of the liquid pick-up device. Ensure the mark is at the bottom of the hose loop when dispensing as shown in Figure 1. This can be accomplished by lifting up the back of the hose, adjusting nozzle position, or adjusting the test tank position.

7.16 Dispense 7.5 (±0.5) gallons at the highest possible flow rate by holding the nozzle lever in the maximum handheld position. Use a stopwatch to measure the time elapsed while dispensing. Record the volume of fuel dispensed (G) and the elapsed time (T) on Form 2. Return nozzle to the dispenser.

7.17 Calculate the dispensing rate using the equation below. If the dispensing rate is not between 6.0 and 10.0 gallons per minute (GPM), the test results are invalid.

$$GPM = 60 \times \left(\frac{G}{T}\right)$$

Where:

GPM	=	dispensing rate (in gallons per minute)
G	=	gallons of fuel dispensed
T	=	number of seconds required to dispense

7.18 Using the 250 ml graduated cylinder and large funnel, carefully drain the remaining liquid from the vapor path of the hose as described in Section 7.5 through 7.8 **(make sure dispenser is deactivated and spout plug is installed before draining liquid!)**. Record this quantity on Form 2 (VF).

7.19 Open the nozzle's vapor check valve by compressing the bellows and engaging the fuel lever. **Do not activate dispenser!** Carefully insert the stem of the small funnel between the bellows and nozzle spout

7.20 Use the 250 ml graduated cylinder and small funnel to pour 150 ml of gasoline into the vapor passage of the hose. Dispense no gasoline.

7.21 Using the 250 ml graduated cylinder and large funnel, completely drain the gasoline from the vapor passage back into the graduated cylinder as described in Section 7.5

through 7.9 **(make sure dispenser is deactivated and spout plug is installed before draining liquid!)**.

7.22 Subtract the volume drained (value from Section 7.21) from the volume added (value from Section 7.20). This value represents the volume of gasoline lost due to wall adhesion. The purpose of the wall adhesion value is to quantify the amount of gasoline lost to evaporation from transfer to and from the graduated cylinders and adhesion of liquid to vapor passage surfaces in previous measurements. Record this quantity on Form 2 (VW).

7.23 Use Equation 9.2 to calculate the liquid removal rate for all the applicable hoses tested.

7.24 If the liquid removal rate is less than 5.0 ml/gallon, but greater than or equal to 4.5 ml/gallon, repeat the test two additional times and average the three results.

8. POST TEST PROCEDURES

8.1. Ensure nozzle spout plug(s) is removed and nozzle is hung in dispenser cradle.

8.2. Empty all containers and return any excess gasoline to the underground storage tank.

8.3. Remove the traffic cones from the testing area.

9. CALCULATING RESULTS

9.1 If using OPTION 1(short version), the liquid removal rate shall be calculated as follows:

$$VR = \frac{VI - VF}{G}$$

Where:

VR	=	Gasoline removed per gallon dispensed, milliliters/gallon
VI	=	Total initial volume poured into hose vapor passage, milliliters
VF	=	Volume of gasoline remaining in the hose vapor passage after dispensing, milliliters
G	=	Total dispensed, gallons

9.2 If using OPTION 2 (long version), the liquid removal rate shall be calculated as follows:

$$VR = \frac{(VI - VW) - VF}{G}$$

Where:

VR	=	Gasoline removed per gallon dispensed, milliliters/gallon
VI	=	Total initial volume poured into hose vapor passage, milliliters
VW	=	Volume of liquid lost due to wall adhesion, milliliters
VF	=	Volume of gasoline remaining in the hose vapor passage after

dispensing, milliliters
G = Total dispensed, gallons

10. REPORTING RESULTS

10.1. Record all applicable liquid removal rate information on the appropriate form as shown in Form 1 and 2. Districts may require the use of alternate forms provided that the alternate forms include the same parameters as identified in Forms 1 and 2.

10.2. If the calculated liquid removal rate is greater than or equal to 5 milliliters/gallon, the liquid removal device has demonstrated compliance.

10.3. If the calculated liquid removal rate is less than 5 milliliters/gallon, the liquid removal device is not in compliance.

11. ALTERNATIVE TEST PROCEDURES

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

FIGURE 1
Position of Liquid Removal Device
When Conducting Liquid Removal Testing

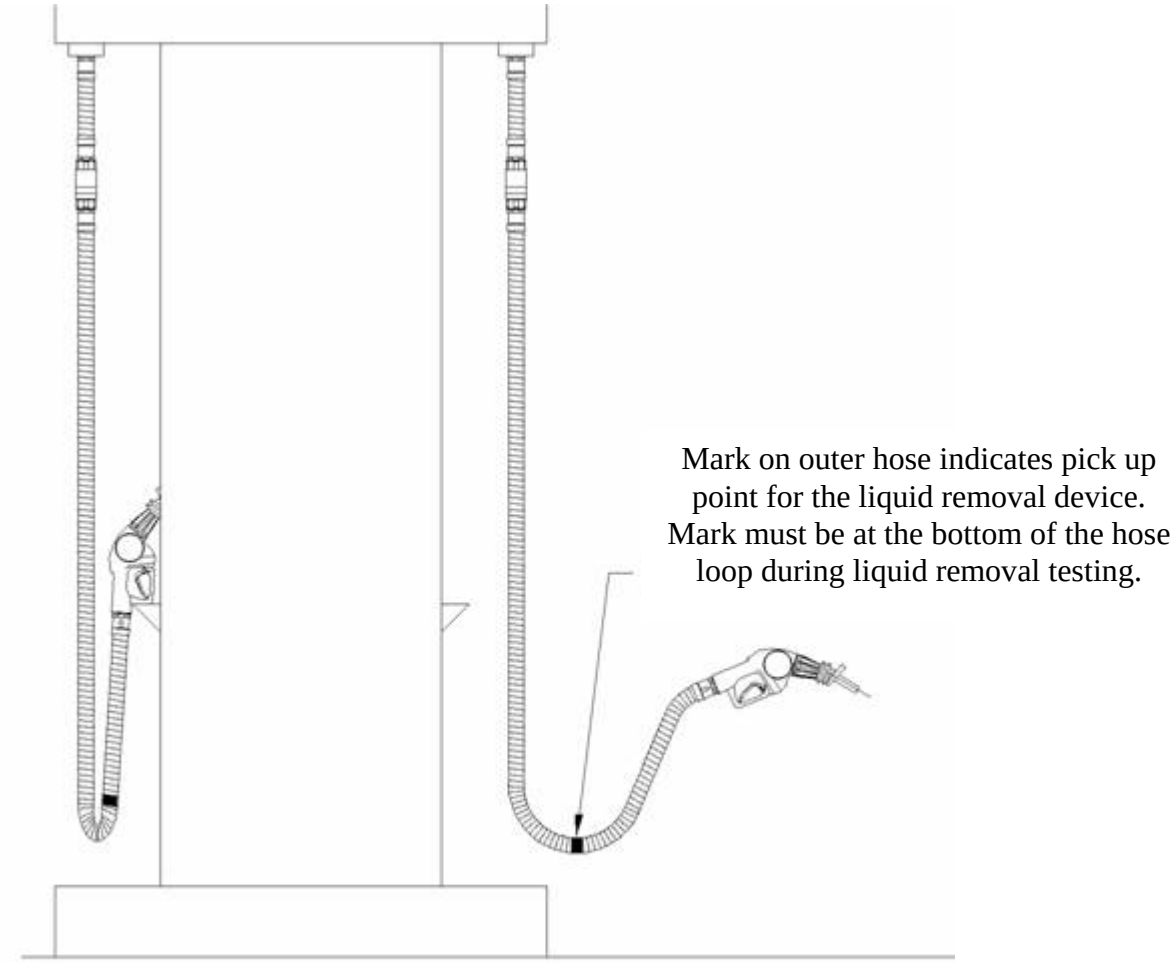
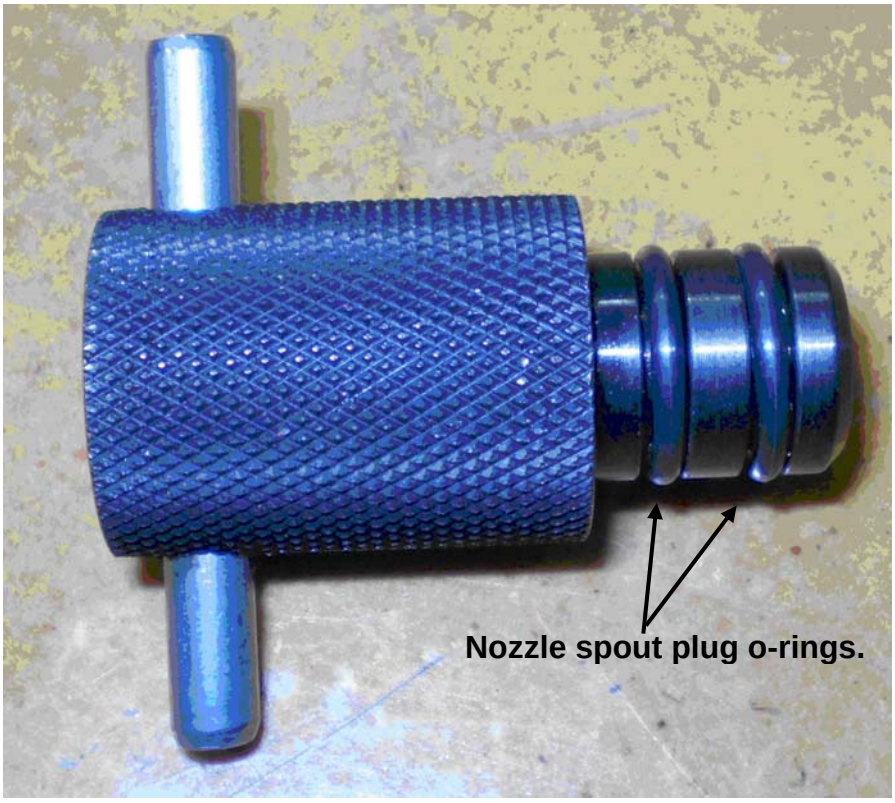
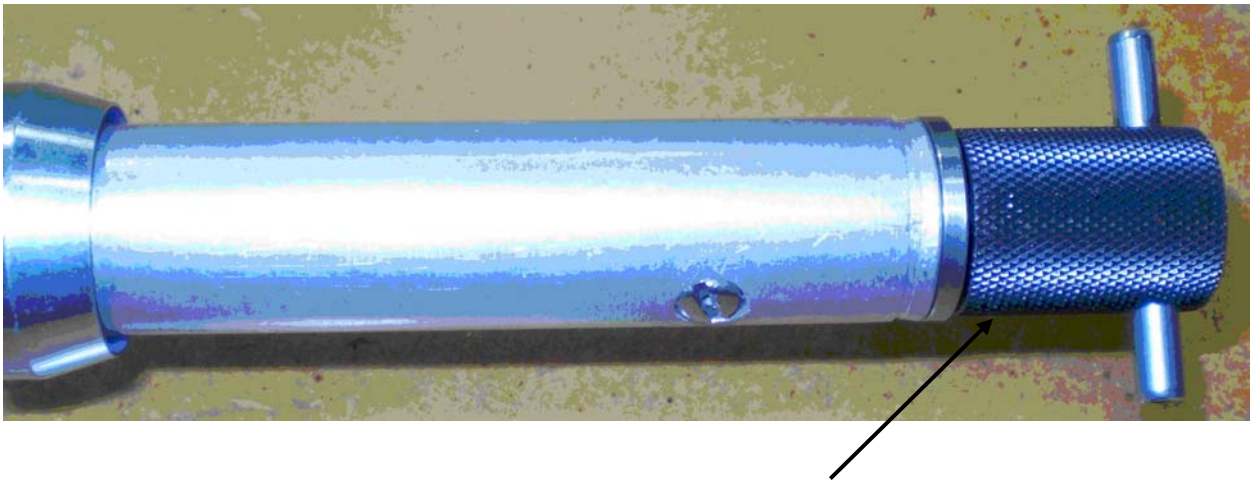


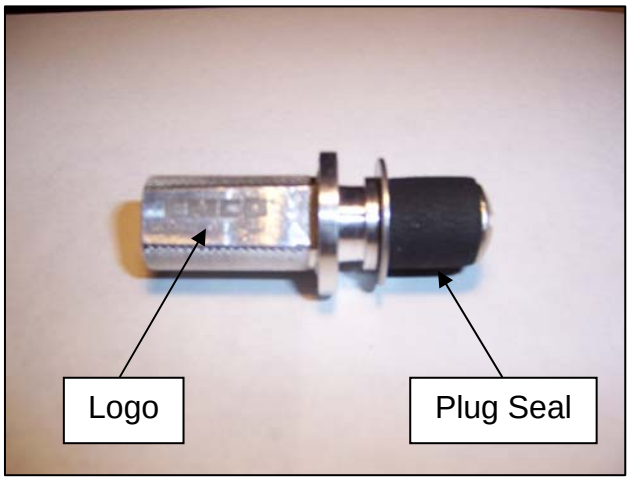
FIGURE 2
VST Nozzle Spout Plug P/N VST-STP-100





Plug properly inserted into nozzle spout.
Both plug o-rings seated into nozzle spout.

FIGURE 3
EMCO Nozzle Spout Plug P/N 494635EVR



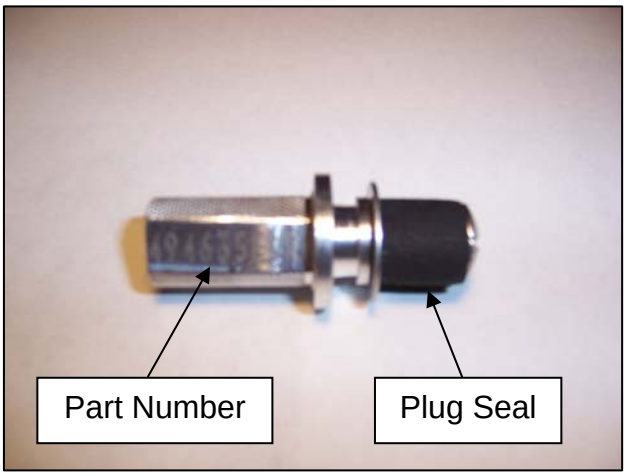
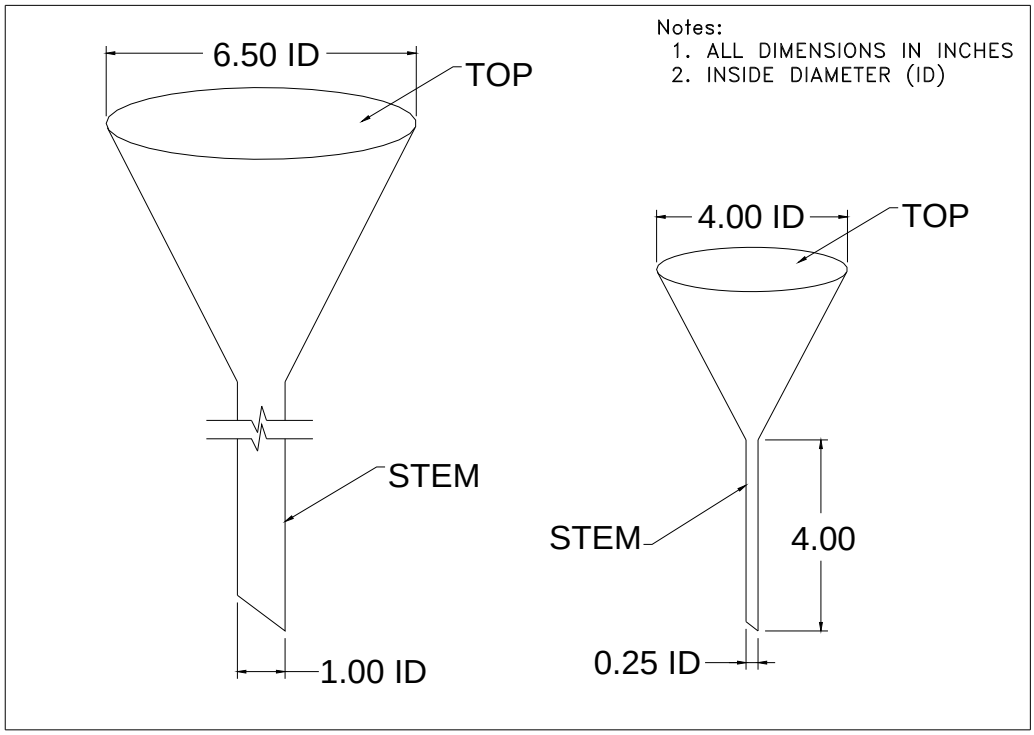


FIGURE 4
Recommended FUNNEL SPECIFICATIONS



FORM 1: LIQUID REMOVAL TEST DATA SHEET (OPTION 1)

Facility Name & Address	Facility Representative & Title		
		Test Date	
		A/C or Permit No.	
		Testing Company	
		Tester Name	
	Phone No.	VST Training Cert # (if applicable)	
		Inspector Name	

GENERAL INFORMATION				PRE-TEST	TEST RUN					VR=(VI-VF)/G
Dispenser Number	Product Grade	Make & Model of Hose	Serial Number of Hose	Volume Drained From Hose in mL	Volume Poured Into Hose in mL (VI)	Gallons Dispensed (G)	Seconds to Dispense (T)	Dispensing Rate (60*(G/T))	Volume Remaining in mL (VF)	Liquid Removal Rate (mL/gal)

FORM 2: LIQUID REMOVAL TEST DATA SHEET (OPTION 2)

Facility Name & Address	Facility Representative & Title		
		Test Date	
		A/C or Permit No.	
		Testing Company	
		Tester Name	
	Phone No.	VST Training Cert # (if applicable)	
		Inspector Name	

GENERAL INFORMATION				PRE-TEST	TEST RUN					VR=((VI-VW)-VF)/G
Dispenser Number	Product Grade	Make & Model of Hose	Serial Number of Hose	Volume Poured into Hose in mL (VI)	Gallons Dispensed (G)	Seconds to Dispense (T)	Dispensing Rate (60*(G/T))	Volume Remaining in mL (VF)	Volume Lost to Wall Adhension in mL (VW)	Liquid Removal Rate (mL/gal)

Executive Orders VR-203-I
VST Phase II EVR System

Exhibit 6
Required Items for Conducting TP-201.4

The instructions below are required when conducting TP-201.4 for the VST Phase II EVR system. The tester shall document that each step was followed as indicated below and shall include this page of the Exhibit with the submission of TP-201.4 test results. Note that districts may require use of an alternate form to meet these requirements, provided the alternate form includes the same minimum parameters.

The VST Model VST-EVR-NB nozzle and EMCO Model A4005EVR nozzle incorporates a lever-actuated vapor valve. The vapor valve is on the same stem as the fuel valve. When conducting TP-201.4, the nozzle lever must be actuated to open the vapor valve and allow vapor to flow from the nozzle to the underground storage tank. The following steps must be taken when conducting Methodology 1 of TP-201.4:

1. The dispenser shall not be activated. If the dispenser is activated, gasoline in the fuel hose may be pressurized when engaging the fuel lever.
2. *If the Hirt VCS 100 Thermal Oxidizer is installed, turn it off. At the Hirt indicator Panel, turn the Power Switch to the "Off" position.*
3. Prior to inserting the VST or EMCO EVR nozzle into the fillpipe of the Dynamic Back Pressure Test Unit in step 7.1 of TP-201.4, completely drain any gasoline in the nozzle and vapor path of the hose. The dispenser must be deactivated and the nozzle lever and bellows shall be fully engaged.
4. When flowing nitrogen per step 7.1.2, fully engage the nozzle lever to allow vapor flow from the nozzle to the UST.
5. *If the Hirt VCS 100 Thermal Oxidizer is installed, after conducting TP-201.4, turn the Hirt VCS 100 Power Switch to the "On" position.*

Required Steps For Each Nozzle Tested	Verification (please circle)
1. Is dispenser deactivated?	Yes No
2. Is Hirt VCS 100 Thermal Oxidizer turned off? (if installed)	*Yes No NA*
3. Is nozzle and hose completely drained of gasoline prior to inserting nozzle into Dynamic Back Pressure Unit?	Yes No
4. Is nozzle lever fully engaged when conducting flow test?	Yes No
5. *Is Hirt VCS 100 Thermal Oxidizer turned on? (if installed)*	*Yes No NA*

Test Company: _____ Facility Name:_____

_____
Print Name (Technician) Signature Date

_____
Technician Certification Number and Expiration Date
(ICC or District Training Certification, as applicable)

Executive Orders VR-203-I and VR-204-I
VST Phase II EVR System

Exhibit 7
Nozzle Bag Test Procedure

Verification of the integrity of the VST or EMCO EVR nozzle vapor valve shall be performed on installed nozzles by use of the following test.

1. Seal nozzle(s) at the gasoline dispensing facility (GDF) in a plastic bag, using tape or other means to secure the bag around the base of the nozzle (see Figure 1). Any plastic bag large enough to enclose the nozzle and having a thickness of no greater than 2 mils can be used.

2. Observe the bagged nozzle(s) for 30 seconds.

3. Any nozzle where the bag can be seen visually expanding or collapsing has a defective vapor valve and is not in compliance with Exhibit 2.

4. Record the test results on the "Nozzle Bag Test Results" form provided in this Exhibit. Districts may require use of an alternate form, provided that the alternate form includes the same minimum parameters.

5. Remove the bags from all the nozzles and return the nozzles to the dispenser holsters.

Figure 1
Example of Bagged Nozzle

NOZZLE BAG TEST RESULTS

SOURCE INFORMATION		TEST COMPANY INFORMATION	
Facility (DBA)/Site Address:	Facility Representative/Title:	Test Company Name	# of Nozzles:_____ # Nozzles Tested: _____ # Nozzles Passed: _____ # Nozzles Failed: _____ # Nozzles not Tested: _____
Print Name	Print Name	Print Name of Tester	
Street Address	Title ( )	Street Address	
City Zip	Phone No.	City Zip	
District Inspector:	☐ P/O ☐ S/A ☐ A/C Number:	Date of Test:	Time of Test:

Dispenser	Gas Grade	Nozzle Type	Bag Expanded or Collapsed after 30 Seconds
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No

Executive Orders VR-203-I and VR-204-I
VST Phase II EVR System

Exhibit 8
VST ECS Hydrocarbon Sensor Verification Test Procedure

Definitions common to all certification and test procedures are in:

D-200 Definitions for Vapor Recovery Procedures

For the purpose of this procedure, the term "ARB" refers to the California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate.

1. PURPOSE AND APPLICABILITY

1.1 This procedure will determine the accuracy of the VST Hydrocarbon (HC) Non-Dispersive Infrared sensor (HC sensor) using known hydrocarbon concentrations (propane) calibration gases at gasoline dispensing facilities (GDFs).

1.2 This procedure is applicable for compliance testing.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

Known concentrations of certified calibration gases are passed through the HC sensor as illustrated in Figure 1 or 2, and then compared with the HC average concentration as determined from the PMC Percent Hydrocarbon Diagnostic Report. The Percent Hydrocarbon Diagnostic report can be downloaded onto a laptop computer via the TLS-350 RS-232 connection. Sampling is conducted for a minimum of five (5) minutes period for each certified test gas. To prevent any HC sensor biases, this test shall be conducted with the processor in the manually “off” mode from the TLS-350 control panel for the duration of the test. This test can be performed while product is being dispensed into motor vehicles.

3. EQUIPMENT AND SUPPLIES

3.1 Gas Cylinder Regulator

Use a two stage pressure regulator with gauges indicating cylinder pressure and supply line pressure. Supply line pressure shall be set between 5 and 10 pounds per square inch gauge (psig). A Mesa Model 400 or equivalent preset flow regulator with a fixed flow rate of one (1) liter per minute (LPM) can be used as an alternative to the above two stage regulator.

3.2 Flow Meter

Use a Dwyer Model RMA, or equivalent flow meter capable of reading a gas flow rate at one (1) liter per minute (LPM). A flow meter is not required if using a fixed rate regulator as specified in step 3.1

3.3 Calibration Gases

Cylinders of calibration gases using propane in nitrogen listed below.

(1) High-Range Gas: Concentration between 10-14% by volume.
(2) Mid-Range Gas: Concentration between 2-5% by volume.
(3) Zero Gas: Nitrogen with a hydrocarbon concentration less than 0.25% by volume.

3.4 Laptop, associated cables, and software are required for RS232 connection to the TLS-350 (reference Section 16 “Pressure Management Control” of the ARB Approved Installation, Operation and Maintenance Manual for hardware and software requirements).

4. CALIBRATIONS

The calibration gases must be certified according to the following:

To an analytical accuracy of ± 2%, traceable to a reference material approved by the National Institute of Standards and Technology (NIST) and recertified at least every two years.

Information on calibration gas cylinders shall be entered into a log identifying each cylinder by serial number. Documentation of certification shall be maintained with the gas cylinders at all times and shall also be attached to Form 1. The calibration gas log shall be maintained with the gas cylinders at all times and made readily available to the district upon request. Sufficient information shall be maintained to allow a determination of the certification status of each calibration gas and shall include: (1) the date put in service, (2) assay result, (3) the dates the assay was performed, and (4) the organization and specific personnel who performed the assay.

5. PRE-TEST REQUIREMENTS

Install all required testing apparatus as illustrated in Figure 1 through 3. Connect the calibration test gas to the inlet tee of the HC sensor. Install the outlet tubing to the HC sensor outlet tee. This tubing is used to vent of the calibration gas to atmosphere.

6. TEST PROCEDURE

6.1 Manually turn off the VST membrane processor as follows:

6.1.1 On the TLS Console front panel, use the ‘mode key’ to scroll to ‘DIAG MODE’ and then use the function and step keys, as shown in Figure 4 to view the ‘VAPOR PROCESSOR MODE’ menu.

6.1.2 From the ‘VAPOR PROCESSOR MODE‘ menu, change the vapor processor mode of operation from automatic to manual mode. From the ‘VAPOR PROCESSOR STATE’ menu, verify the VP STATE is in the “off” mode. The processor shall be in the off mode for the duration of the test.

6.2 Record the start time from the TLS-350, on Form 1. The testing technician shall synchronize his/her watch with the clock on the TLS-350.

6.3 Isolate the VST HC sensor by closing the in-line ball valve upstream of the HC sensor.

6.4 Introduce the zero, mid-range and high-range gases, in that order, into the VST HC sensor sample line at a flow of 1 LPM for five continuous minutes.

6.5 Record the time before and at the end of each five minute test run on Form 1. Districts may require the use of an alternate form, provided it includes the same minimum parameters as identified in Form 1.

6.6 From the TLS-350 front panel, return the membrane processor to the automatic run mode.

6.7 Press the <MODE> key to leave the 'PMC DIAGNOSTIC' menu.

6.8 Disconnect test apparatus from the VST HC sensor inlet and outlet tees and replace plugs. Return the in-line ball valve to the open position.

7. OBTAIN HC DATA FROM PMC

The HC data can be obtained from the PMC via an RS-232 connection to a laptop computer. Once connected, the HC data can be viewed from the "Percent Hydrocarbon Diagnostic Report". This report can be printed or saved to a file. A printed copy of this report must be attached to Form 1. Instructions on accessing this report via the RS-232 connection are found in Section 16 "Pressure Management Control" of the ARB Approved Installation, Operation, and Maintenance Manual. This report will provide HC concentration readings at 15 second intervals for each of the 5-minute test runs. Calculate the average HC concentration from the **last three minutes of each test run** and record on Form 1.

8. CALCULATION

Calculate and record the difference between the average HC concentration from the PMC Percent Hydrocarbon Diagnostic Report (Step 7) and compare with each corresponding calibration gas concentration.

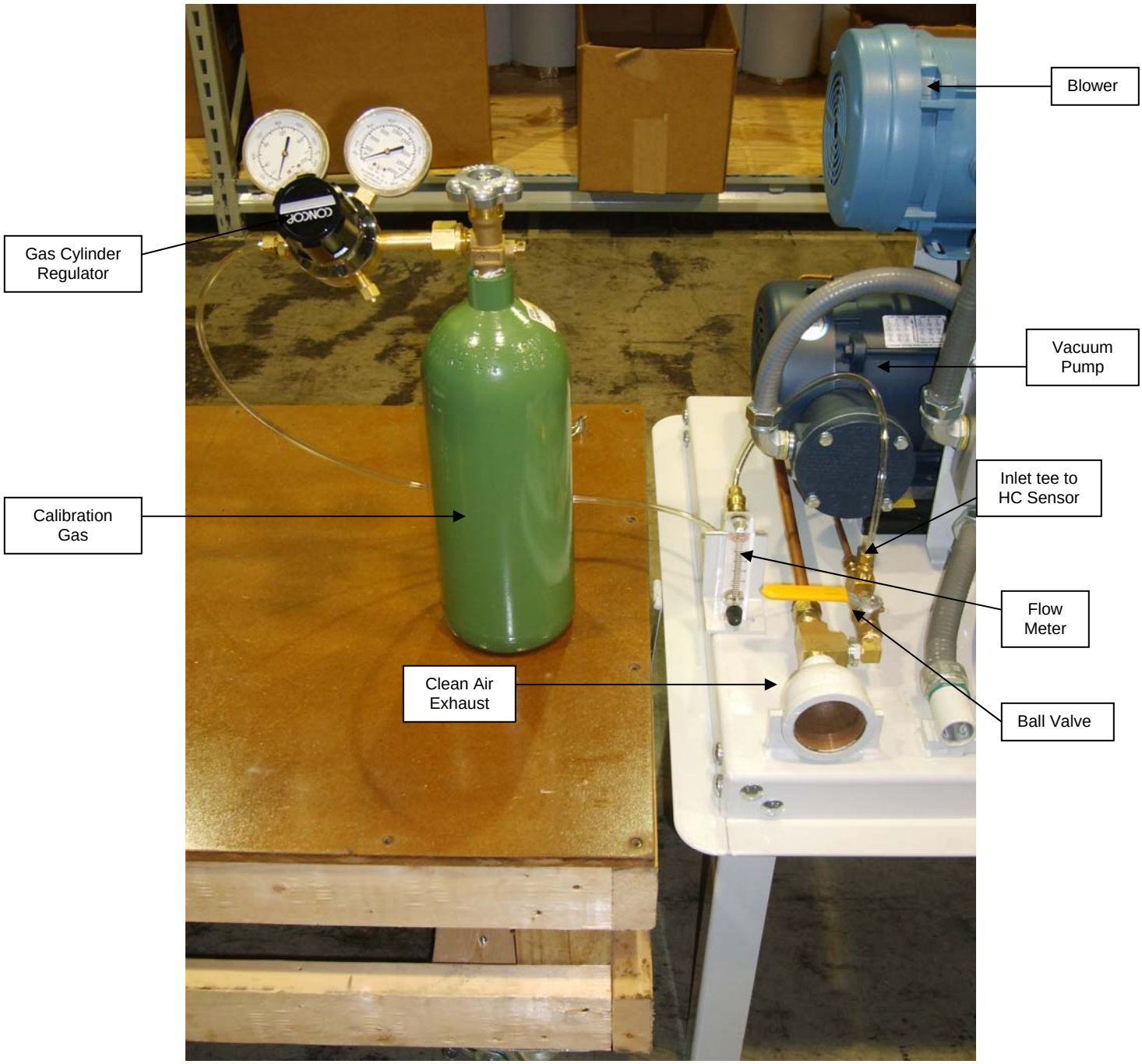
Difference = (Calibrations Gas Concentration (Step 3.3)) – (Average HC Concentration from PMC (Step 7))

The difference shall be within ±1.0% HC concentration from the calibration gas for the zero and mid-range gas and ±2.0% for the high-range gas. Record "Pass" if within specified limits or "Fail" if not within specified limits on Form 1. If any failure is recorded, the VST ECS Processor is not in compliance with Exhibit 2.

9. ALTERNATIVE TEST PROCEDURES

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

Figure 1
Equipment Configuration for Verifying Hydrocarbon Sensor Performance



Note: Two stage pressure regulator configuration

Figure 2
Equipment Configuration for Verifying Hydrocarbon Sensor Performance

Note: Preset flow regulator configuration

Figure 3
Equipment Configuration for Verifying Hydrocarbon Sensor Performance

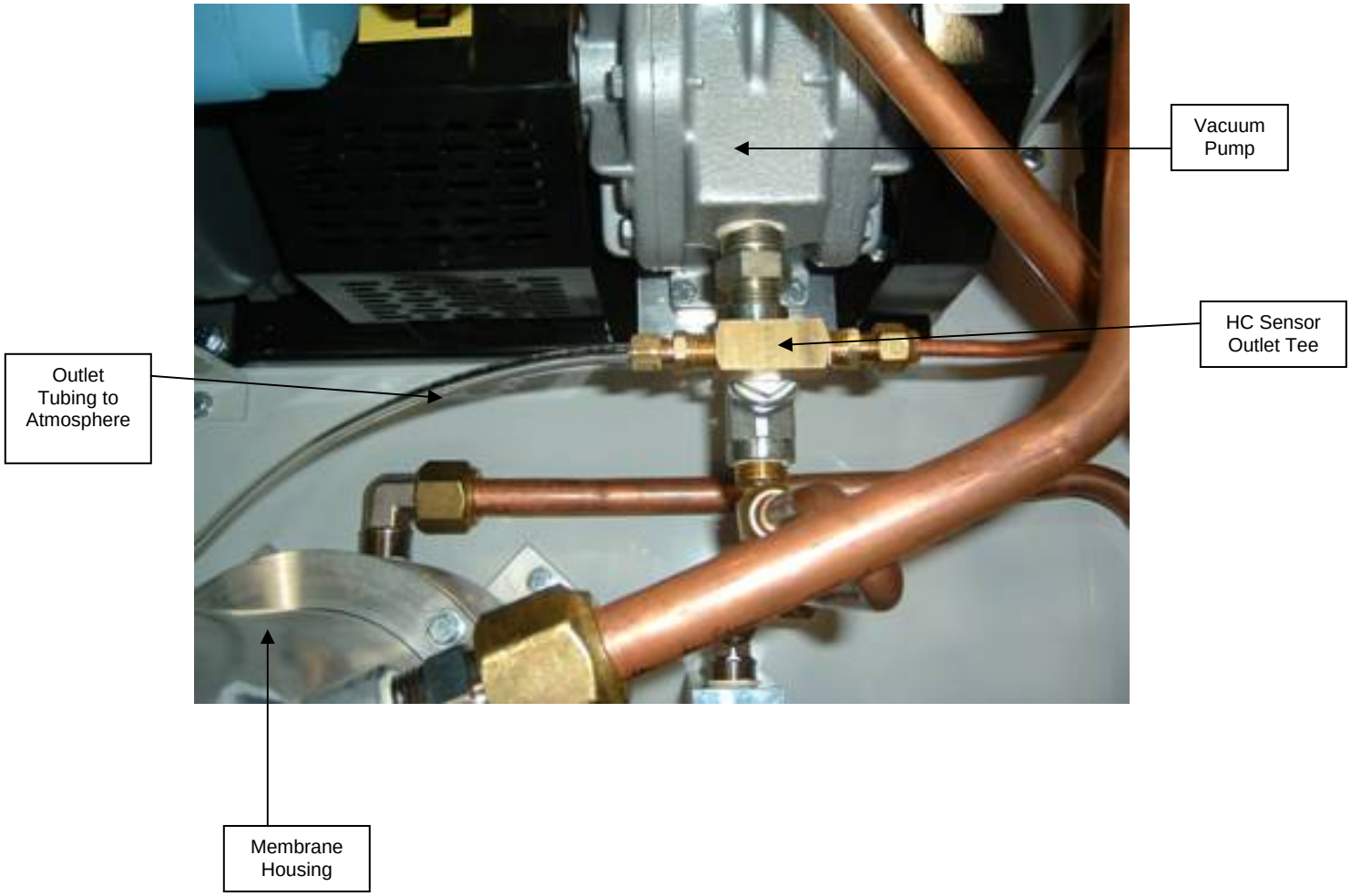
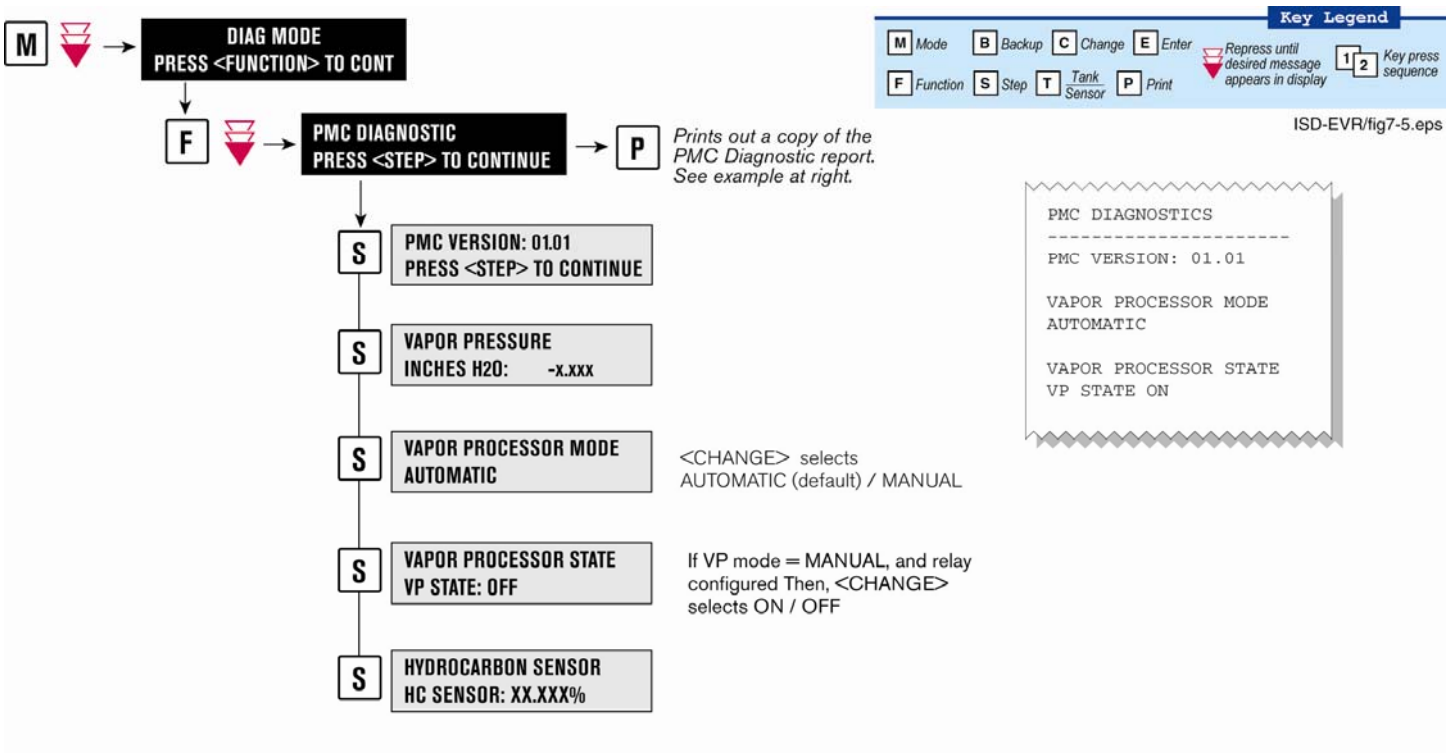


Figure 4


M
DIAG MODE
PRESS <FUNCTION> TO CONT
F
PMC DIAGNOSTIC
PRESS <STEP> TO CONTINUE
P
Prints out a copy of the PMC Diagnostic report. See example at right.
S
PMC VERSION: 01.01
PRESS <STEP> TO CONTINUE
S
VAPOR PRESSURE
INCHES H2O: -x.xxx
S
VAPOR PROCESSOR MODE
AUTOMATIC
<CHANGE> selects AUTOMATIC (default) / MANUAL
S
VAPOR PROCESSOR STATE
VP STATE: OFF
If VP mode = MANUAL, and relay configured Then, <CHANGE> selects ON / OFF
S
HYDROCARBON SENSOR
HC SENSOR: XX.XXX%
Key Legend
M Mode
B Backup
C Change
E Enter
F Function
S Step
T Tank Sensor
P Print
Repress until desired message appears in display
1 2 Key press sequence
ISD-EVR/fig7-5.eps
PMC DIAGNOSTICS
PMC VERSION: 01.01
VAPOR PROCESSOR MODE
AUTOMATIC
VAPOR PROCESSOR STATE
VP STATE ON

Form 1
Hydrocarbon Sensor Verification Data Sheet

Test Data Sheet for Performance Verification of VST NDIR Sensor	
Facility:	Test Company:
Address:	Test Personnel:
City:	VST or Veeder-Root Tech Certification # (as applicable)
State:	
Zip Code:	ICC or District Training Certification (as applicable)

Calibration Gas Concentration (% Propane). Note: Calibration gas information listed in Section 4 of Exhibit 6 shall be attached to this form.		
Zero Gas:	High-Range Gas:	Mid-Range Gas:
Serial #:	Serial #:	Serial #:

Test Results

Start Time	Stop Time	Calibration Gas Percent Concentration (Propane) (step 3.3	Average Percent HC Concentratio n from PMC (step 7)	Percent Difference (Difference shall be within ± 1% for zero and mid-range gas and within ± 2% for high-range gas) (step 8)	Pass/Fail

Executive Orders VR-203-I and VR-204-I
VST Phase II EVR System

Exhibit 9
VST ECS
Determination of
Processor Activation Pressure

Definitions common to all certification and test procedures are in:

D-200 Definition for Vapor Recovery Procedures

For the purpose of this procedure, the term "ARB" refers to the California Air Resources Board, and the term, "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designee.

1. Purpose and Applicability

1.1 The purpose of this test procedure is to determine compliance with the VST processor activation (e.g. turns on) pressure requirement of Exhibit 2.

1.2 This procedure is applicable for compliance testing.

2. Principle and Summary of Test Procedure

The UST pressure at which the VST membrane processor activates is determined by using a test assembly connected to the pressure sensor as shown in Figure 1 of this procedure (the pressure sensor is located in the dispenser closest to the tanks). The test assembly consists of an oral syringe (or other device capable of introducing low pressures up to approximately 0.5 inches WC) and an electronic pressure measuring device such as a digital manometer connected into a tee at the pressure sensor. This test can be performed while product is being dispensed into motor vehicles.

3. Biases and Interference's

3.1 No transfer of gasoline from any cargo tanks to the USTs shall occur within three hours prior to conducting this test.

3.2 This test shall not be conducted if TP-201.3 was conducted within the last three hours.

3.3 This test shall not be conducted if the processor is operating (audible indication that the processor is running).

4. Equipment, Range and Accuracy

4.1 Digital Manometer (Electronic Pressure Measuring Device)

A digital (electronic) manometer with 0.01 inches WC, or better, resolution. The sensor must have a minimum measuring range of +/- 10 inches WC. The sensor must also be accurate to 0.05 inches WC for any pressure measurement made during the prescribed tests. For a manometer with a +/- 10 inches WC measurement range, this requires a 0.25% basic accuracy.

4.2 Oral Syringe (used in determining processor activation pressure)

Use a 3 cubic centimeter (cc) or 6cc oral syringe or equivalent that is capable of introducing air pressure at approximately 0.1 inches WC increments up to a maximum pressure of 0.5 inches WC (see Figure 1).

5 Calibration Requirements

5.1 A copy of the most current calibration of the electronic pressure measuring device shall be kept with the equipment.

5.2 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 180 consecutive days. Accuracy checks shall be performed, with nitrogen, at a minimum of three (3) points (e.g., 20, 50 and 80 percent of full scale) each for both positive and negative pressure readings. Accuracy shall meet the requirements of Section 4.

6 Pre-Test Procedure

6.1 Turn on digital manometer and allow instrument to warm up for five minutes.

6.2 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.

6.3 Prepare test assembly as shown in Figure 1. Lubricate seal of oral syringe plunger with petroleum jelly (or other lubricant). Use Tygon tubing (or equivalent) from the oral syringe (or equivalent) to the pressure sensor and to the digital manometer as shown in Figure 1. Plug or cap the end of the Tygon tubing (used to connect to the tee on the pressure sensor) and pressurize test assembly to approximately 2.0-5.0 inches WC for at least 5 seconds. There shall be no indications of vapor leaks when using liquid leak detection solution.

6.4 Remove the cap from the ambient reference port of the Vapor Pressure Sensor valve and connect the Tygon tubing (or equivalent) of the test assembly to the tee on the Vapor Pressure Sensor Valve as shown in Figure 1.

7 Test Procedure

7.1 Close the ball valve located at the tee to the pressure sensor to isolate the pressure sensor from the UST ullage (see Atmospheric Valve Position in Figure 2).

7.2 Slowly press the oral syringe (or equivalent) until a pressure of 0.10 inches WC is obtained. Maintain this pressure for at least 5 seconds. Does the VST membrane processor activate? If the membrane processor does not activate, continue increasing pressure at 0.1 inches WC intervals and hold for at least 5 seconds per interval or until the processor activates, up to a maximum pressure of 0.5 inches WC.

NOTE: Listen for audible indication that the processor activated (or turned on).

7.3 Record the VST membrane processor activation pressure on Form 1, Data Form for VST Processor Activation Pressure Test.

7.4 Verify that the processor activation pressure value is less than or equal to 0.4 inches WC. If the pressure value is not less than or equal to 0.4 inches WC, the VST processor is not in compliance with the activation pressure requirements of Exhibit 2.

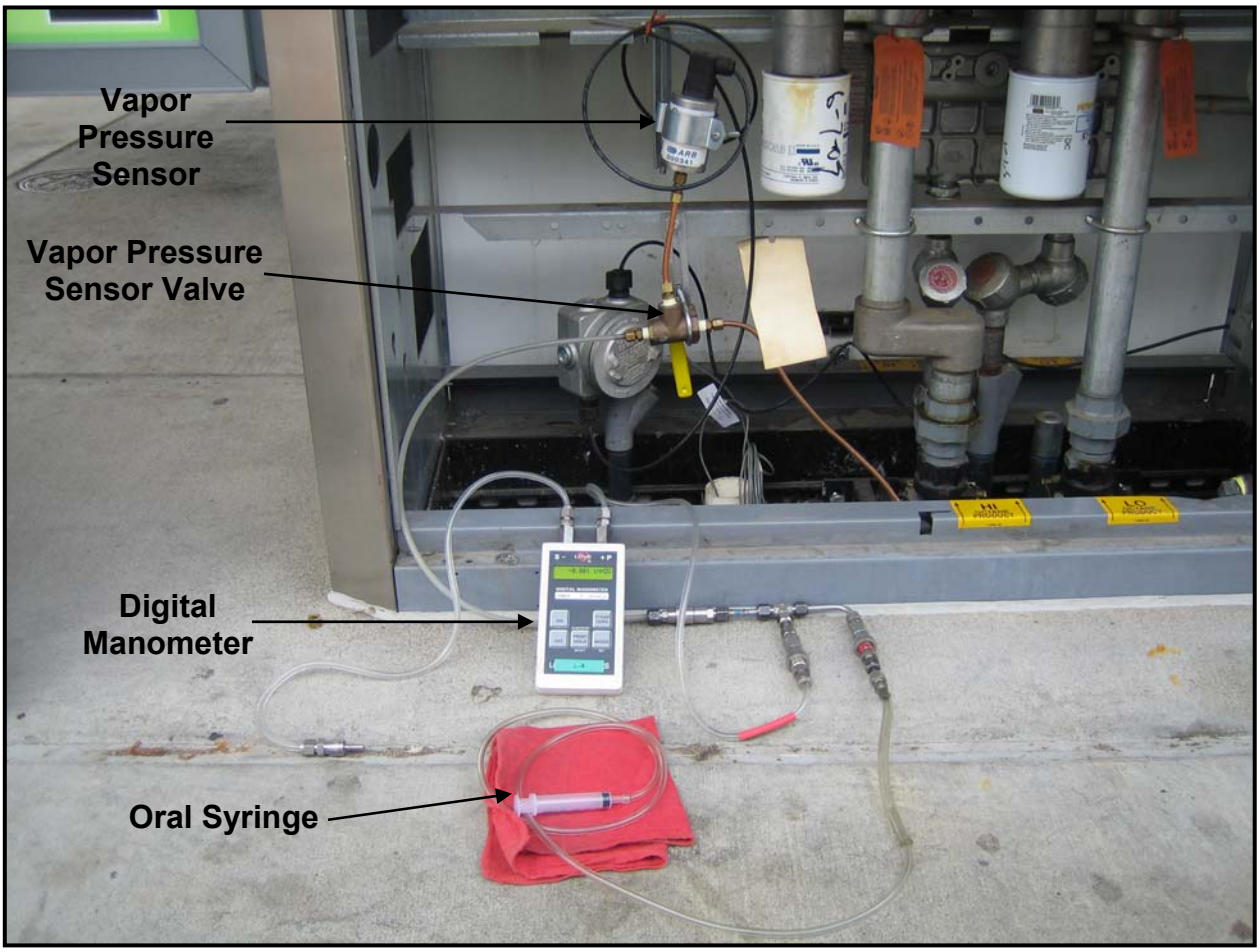
7.5 Replace the cap on the ambient reference port of the Vapor Pressure Sensor valve. Restore the Vapor Pressure Sensor valve by turning it 90 degrees so that the flow arrows point to both the Vapor Pressure Sensor sensing port and the UST vapor space sensing line (see Normal Valve Position in Figure 2).

8 Alternate Procedures and Reporting Forms

8.1 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.

8.2 District may require the use of alternate forms, provided they include the same minimum parameters as identified in Form 1.

Figure 1: Typical Field Installation of Test Assembly for Determining VST Processor Activation



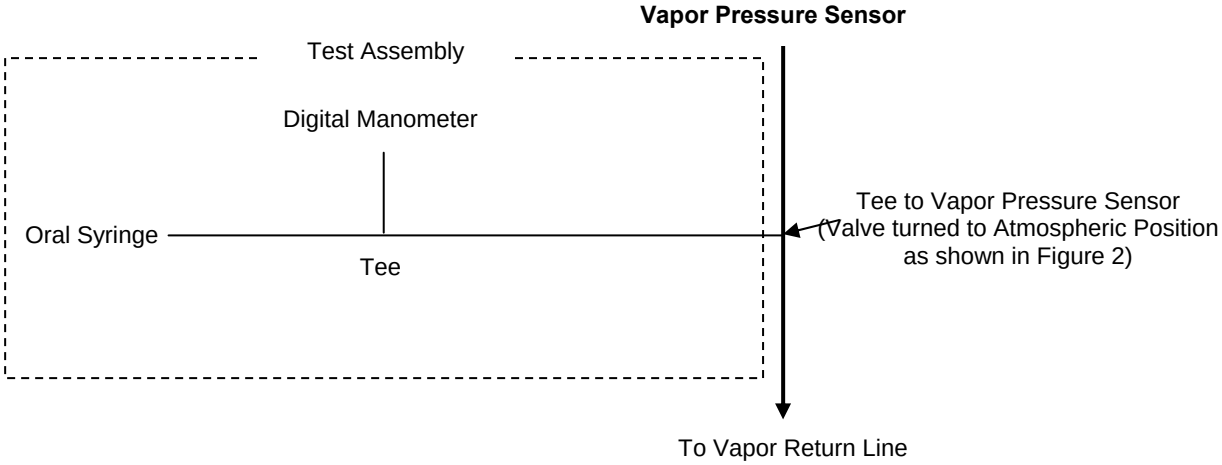
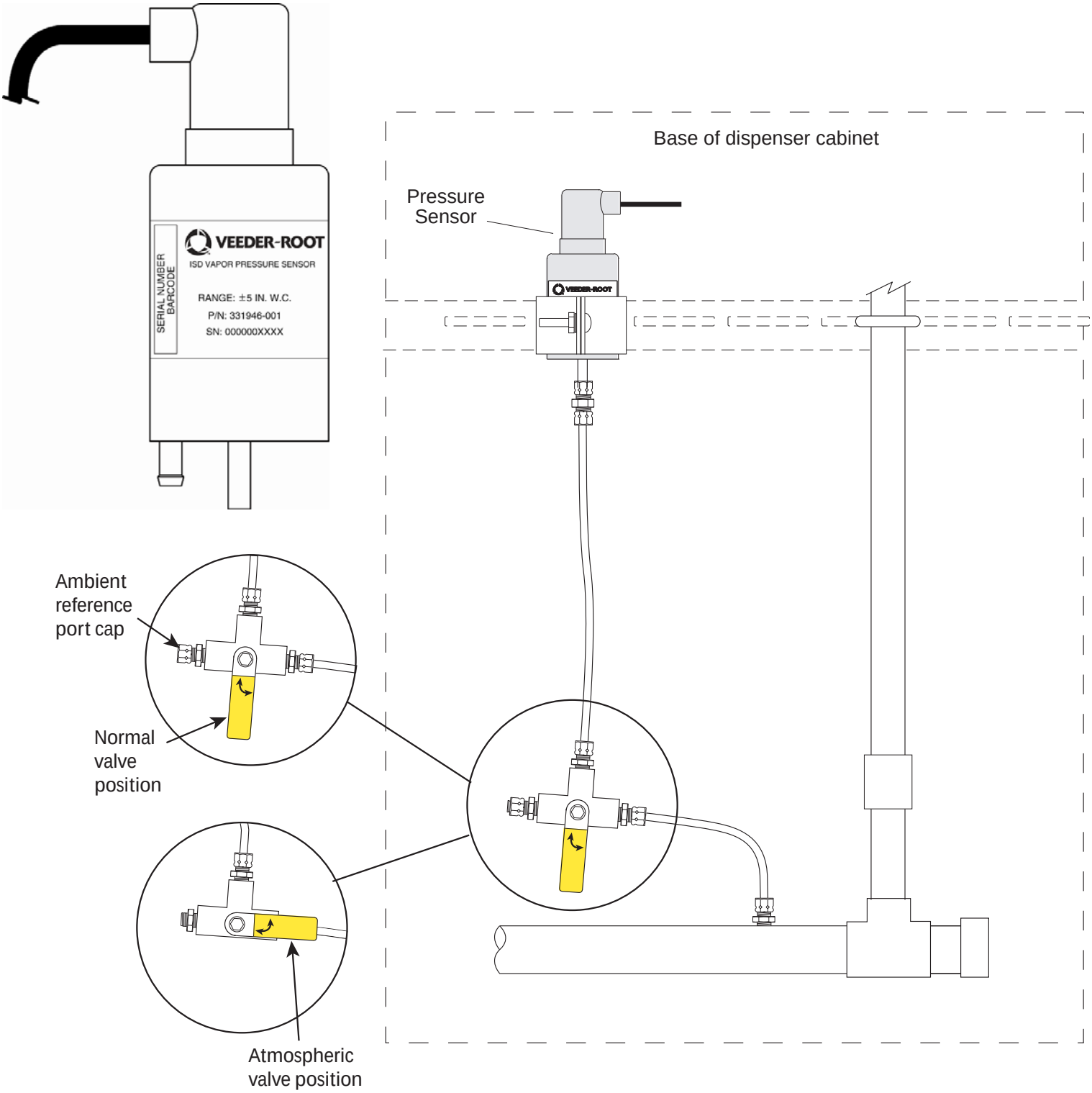


Figure 2: Vapor Pressure Sensor Valve Position



Form 1

Data Form for VST Processor Activation Pressure Test

DATE OF TEST _____

SERVICE COMPANY NAME	**SERVICE COMPANY'S TELEPHONE**
SERVICE TECHNICIAN	**VST 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 8.1	**VALVE SET TO ATMOSPHERIC VALVE POSITION (PER FIG. 2)?**	☐
STEP 8.3	**VST PROCESSOR ACTIVATION PRESSURE: _____Inches WC**	
STEP 8.4	**Is the VST Processor Activation Pressure ≤ 0.4 inches WC?** ☐ **Yes** ☐ **No** **IF NO: THE VST PROCESSOR IS NOT IN COMPLIANCE WITH THE ACTIVATION PRESSURE REQUIREMENTS OF EXHIBIT 2.**	
STEP 8.5	**REFERENCE PORT CAP REPLACED?** **VALVE SET TO NORMAL VALVE POSITION (PER FIG 2)?**	☐ ☐

Executive Orders VR-203-I and VR-204-I
VST Phase II EVR System

Exhibit 10
VST ECS / Veeder-Root Vapor Polisher
Vapor Pressure Sensor Verification Test Procedure

Definitions common to all certification and test procedures are in:

D-200 Definition for Vapor Recovery Procedures

For the purpose of this procedure, the term "ARB" refers to the California Air Resources Board, and the term, "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designee.

1. Purpose and Applicability

1.1 The purpose of this test procedure is to determine if the Pressure Management Control (PMC) Vapor Pressure Sensor (listed in Exhibit 1) is operating in accordance with the pressure sensor requirements of Exhibit 2. This procedure is used:

1.1.1 To determine the measured ullage pressure in underground gasoline storage tanks (USTs) installed at gasoline dispensing facilities (GDFs) equipped with a VST Phase II enhanced vapor recovery system and compare to the pressure reading of the PMC at the TLS console.

1.1.2 To determine whether the Vapor Pressure Sensor complies with the performance specification when the sensor is exposed to ambient pressure.

1.2 This procedure is applicable for compliance testing.

2. 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 Figures 10-1 and 10-2 of this exhibit. 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 on the vent stack or in the dispenser closest to the tanks, to the Atmospheric Valve Position as shown in Figure 10-3. This test can be performed while product is being dispensed into motor vehicles.

3. Biases and Interferences

3.1 This test shall not be conducted within 30 minutes following gasoline transfer from a cargo tank.

3.2 This test shall not be conducted if the processor is operating (audible indication that the processor is running).

3.3 The range of the Veeder-Root ISD system vapor pressure sensor is between positive and negative five (±5) inches water column. If the headspace of the underground storage tank is under a vacuum of greater than negative five inches water column (i.e.-6, -7, -8 etc.), the results of section 8.4 could be biased toward non compliance. Under such condition, the vacuum level should be relieved to a value between negative five and negative two inches water column by depressing the poppet of the Phase I vapor adaptor. Once an adequate amount of air has been ingested into the headspace, the remaining vacuum must be allowed to stabilize for a minimum of fifteen (15) minutes before taking a reading.

4. Range and Accuracy

4.1 A digital (electronic) manometer with 0.01 inches WC, or better, resolution. The sensor must have a minimum measuring range of +/- 10 inches WC. The sensor must also be accurate to 0.05 inches WC for any pressure measurement made during the prescribed tests. For a manometer with a +/- 10 inches WC measurement range, this requires a 0.25% basic accuracy.

5. Equipment

5.1 The dust cap test assembly shall be modified in the following manner:

5.1.1. Install a probe in the center of the dust cap as shown in Figure 10-1 (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.

5.1.2. Install female quick connect fitting on the top of the dust cap, offset from the center probe as shown in Figure 10-1. A Swagelok, part number SS-QC4-B-4-PM, quick connect fitting or equivalent can be used.

5.1.3. Use “Tygon tubing” or equivalent to connect the manometer to the dust cap (Figure 10-2). 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 10-2).

5.2 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.

5.3 Digital Manometer (Electronic Pressure Measuring Device)

See the requirements of Section 4.1 above.

6 Calibration Requirements

6.1 A copy of the most current calibration of the electronic pressure measuring device shall be kept with the equipment.

6.2 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 180 consecutive days. Accuracy checks shall be performed at a minimum of three (3) points (e.g., 20, 50 and 80 percent of full scale) each for both positive and negative pressure readings. Accuracy shall meet the requirements of Section 4.

Determining UST Pressure

7 Pre-Test Procedure

7.1 Turn on digital manometer and allow instrument to warm up for five minutes.

7.2 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.

7.3 Attach the male quick connect fitting to the female quick connect fitting on the modified vapor dust cap.

7.4 Attach digital manometer to open end of Tygon tubing.

8 Test Procedure

8.1 Attach the dust cap or vapor coupler test assembly to the vapor adaptor (Figure 10-2). If the headspace of the underground storage tank is under a vacuum of greater than negative five inches water column (i.e.-6, -7, -8 etc.), the vacuum should be relieved to a value between negative five and negative two inches water column as described in Section 3.3 above.

8.2 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 10-4 to view the current pressure value.

8.3 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 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.

8.4 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 of Exhibit 2.

8.5 Press the <MODE> key to leave the 'PMC DIAGNOSTIC' menu

Determining Ambient Pressure

9 Test Procedure for Testing Sensor Under Ambient Pressure

9.1 Access the Vapor Pressure Sensor, which is located on the vent stack or in the dispenser closest to the tanks. Record pressure sensor location and serial number on the data form.

9.2 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 10-3).

9.3 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 10-4 to view the current pressure value.

9.4 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 of Exhibit 2.

9.5 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 10-3).

9.6 Press the <MODE> key to leave the 'PMC DIAGNOSTIC' menu.

9.7 Record the above information on 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.

10 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 10-1 - Typical Modified Vapor Adaptor Dust Cap (Bottom View)

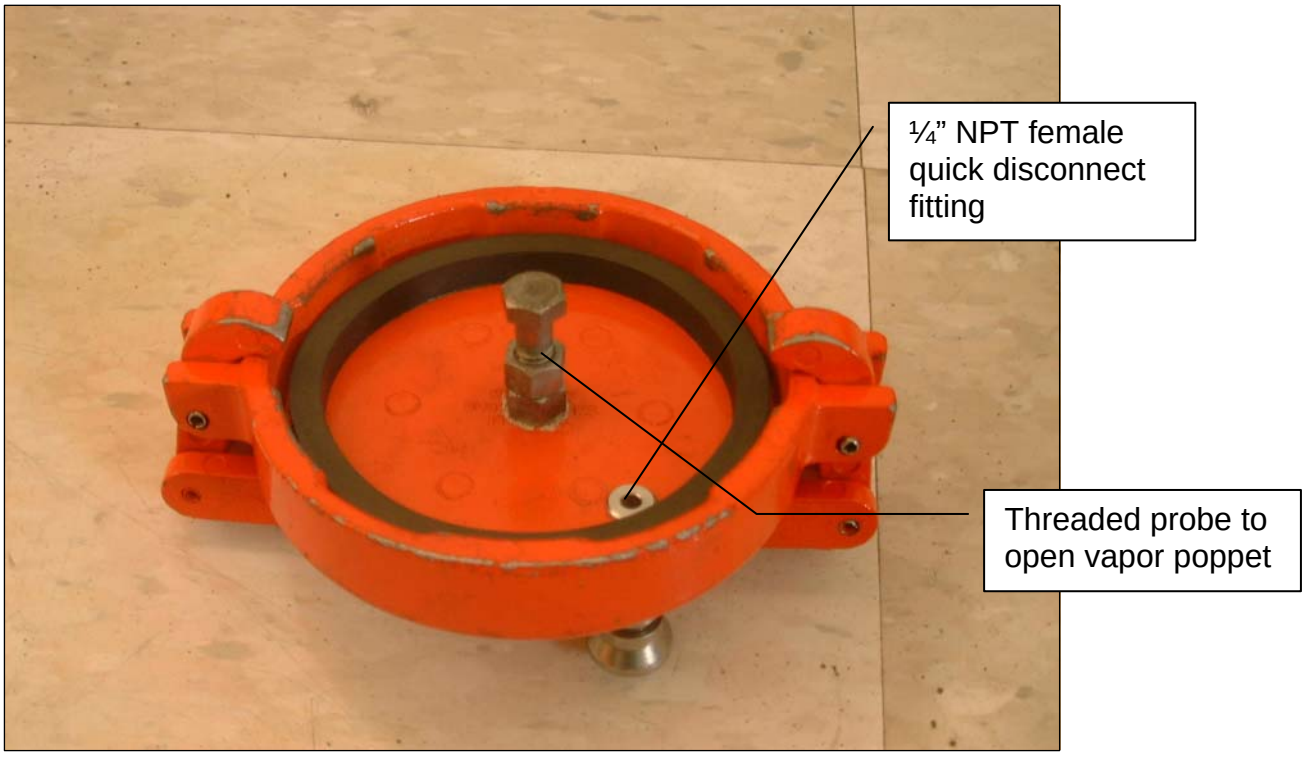


Figure 10-2 - Typical Field Installation of UST Pressure Measurement Assembly

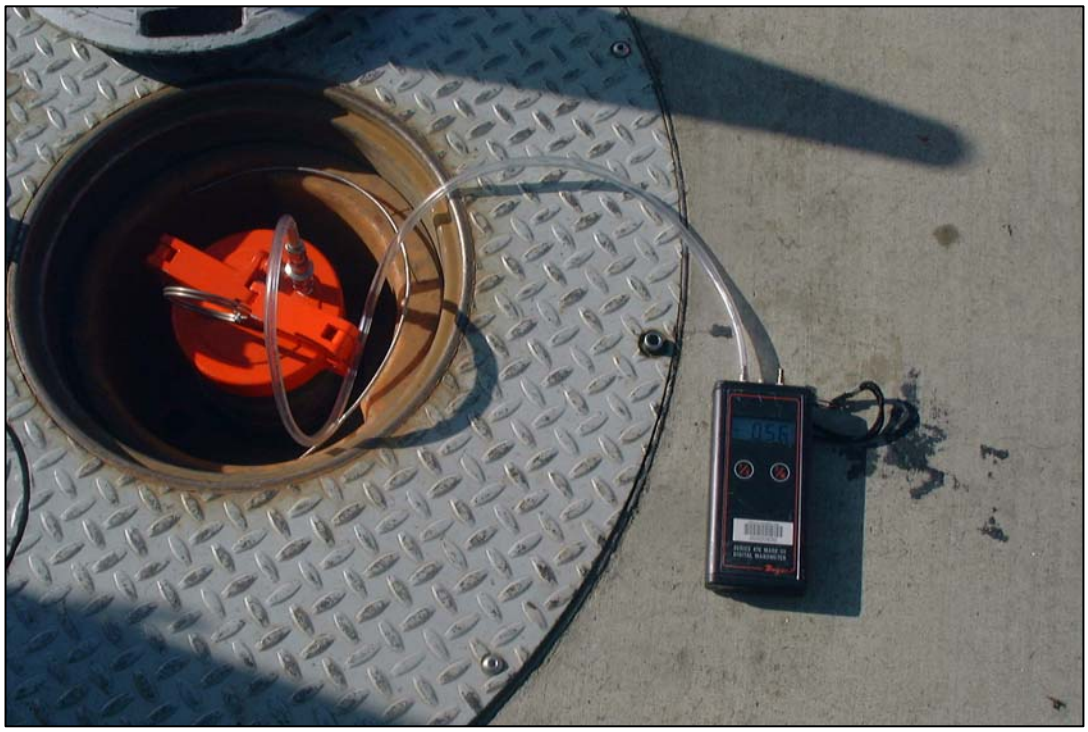


Figure10-3
Vapor Pressure Sensor Valve Position

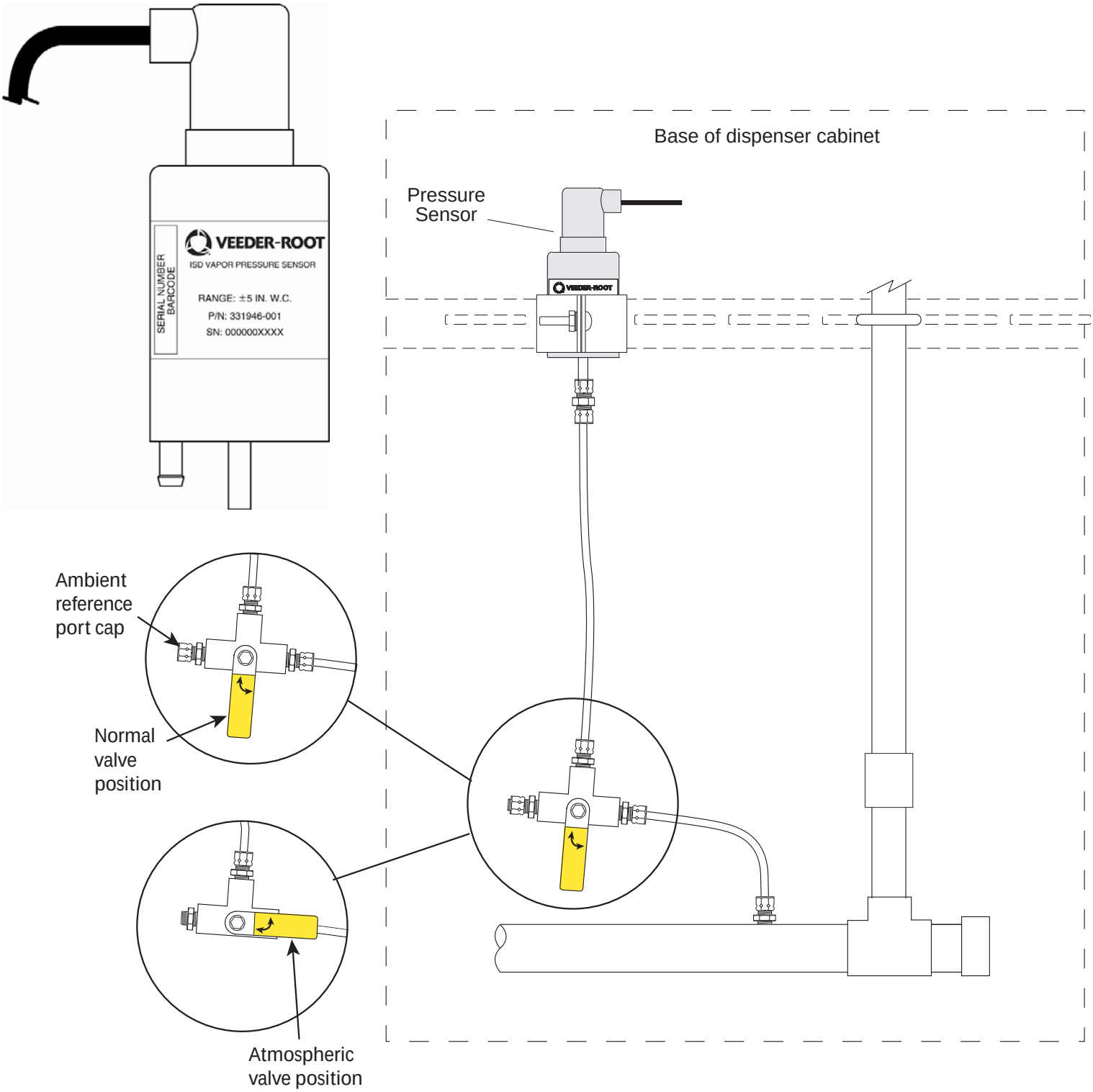
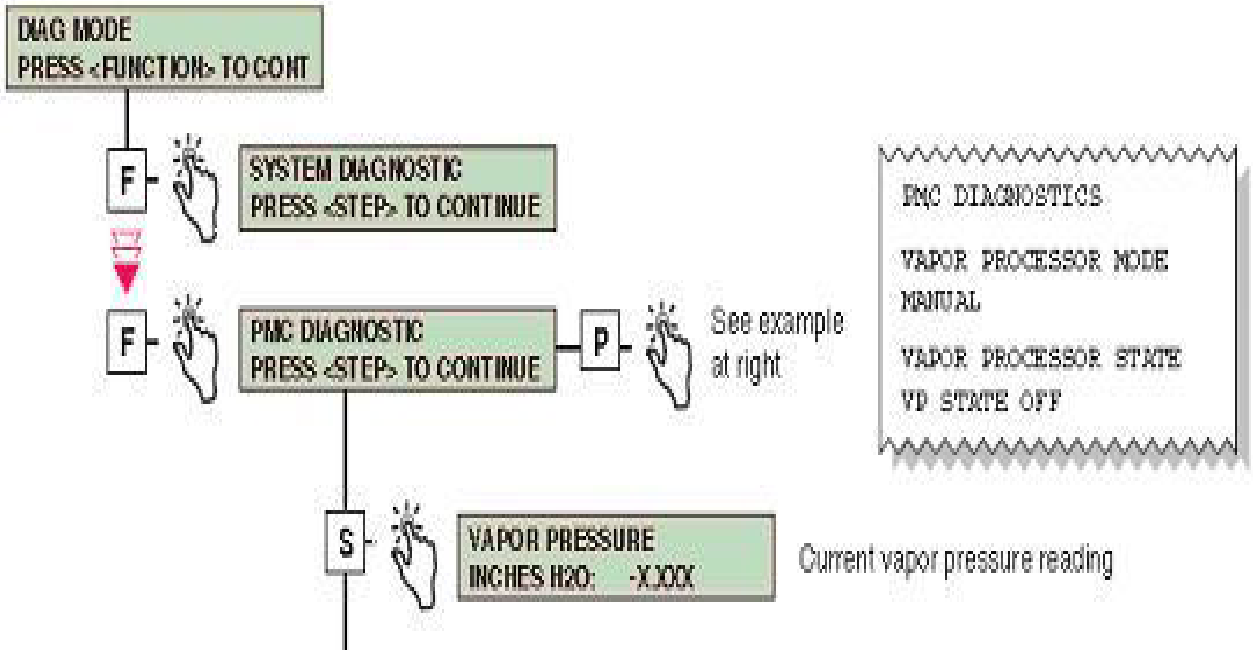


Figure 10-4
Accessing the Vapor Pressure Sensor Reading



Form 1

Data Form for Vapor Pressure Sensor UST Pressure Test

DATE OF TEST _____

SERVICE COMPANY NAME	SERVICE COMPANY'S TELEPHONE
SERVICE TECHNICIAN	VST 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) or VENT STACK	FP #_____ ☐ VENT STACK ☐	PRESSURE SENSOR SERIAL NUMBER: _____

STEP 8.3	DIGITAL MANOMETER VALUE _____ inches WC
STEP 8.3	TLS 350 SENSOR VALUE _____ inches WC (OBTAIN VALUE USING TLS CONSOLE KEYPAD SEQUENCE SHOWN IN FIG. 10-4, Vapor Pressure)
STEP 8.4	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 OF EXHIBIT 2.
STEP 8.5	MODE KEY PRESSED TO EXIT PMC DIAGNOSTIC MENU? ☐

Form 2

Data Form for Vapor Pressure Sensor Ambient Reference Test

DATE OF TEST _____

SERVICE COMPANY NAME		**SERVICE COMPANY'S TELEPHONE**	
SERVICE TECHNICIAN		**VST or VEEDER-ROOT TECH CERTIFICATION # (as applicable)** **ICC or DISTRICT TRAINING CERTIFICATION (as applicable)**	
STATION NAME		**DISTRICT PERMIT #**	
STATION ADDRESS	**CITY**	**STATE**	**ZIP**
STEP 9.1	**PRESSURE SENSOR LOCATION:** **DISPENSER FUELING POINT (FP) or VENT STACK**	**FP #** _____ ☐ **VENT STACK** ☐	**PRESSURE SENSOR SERIAL NUMBER:**_____
STEP 9.2	**REFERENCE PORT CAP REMOVED?** ☐ **VALVE SET TO AMBIENT REFERENCE PORT (PER FIG. 10-3)?** ☐		
STEP 9.3	**NON-CALIBRATED SENSOR VALUE** _____**Inches WC** **(OBTAIN VALUE USING TLS CONSOLE KEYPAD SEQUENCE SHOWN IN FIG. 10-4, Vapor Pressure)**		
STEP 9.4	**PRESSURE BETWEEN +0.20 & -0.20?** **Yes** ☐ **No** ☐ **IF NO: THE PRESSURE SENSOR IS NOT IN COMPLIANCE WITH THE PRESSURE SENSOR REQUIREMENTS OF EXHIBIT 2.**		
STEP 9.5	**REFERENCE PORT CAP REPLACED?** ☐ **VALVE SET TO NORMAL VALVE POSITION (PER FIG 10-3)?** ☐		
STEP 9.6	**MODE KEY PRESSED TO EXIT PMC DIAGNOSTIC MENU?** ☐		

Executive Orders VR-203-I and VR-204-I
VST Phase II EVR System

Exhibit 11
Veeder-Root Vapor Polisher Operability Test Procedure

Definitions common to all certification and test procedures are in:

D-200 Definitions for Vapor Recovery Procedures

For the purpose of this procedure, the term "ARB" refers to the California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate.

1. PURPOSE AND APPLICABILITY

This test verifies the pressure integrity of the vapor polisher, confirms that the operating pressure is within certification parameters at a known flow rate, and verifies the readings of the various thermometer elements and atmospheric pressure sensor. Proper function of the valve is confirmed during the leakage and flow tests.

The pressure integrity test will identify leaks that can be caused by valve or seal failure, loose fittings, cracking or structural damage. The flow test identifies any restrictions that can be caused by dirty filters, clogged passageways, contaminated carbon or any other restriction or collapse of flow passages. The thermometer test will identify a failed sensor element that could lead to reduced performance in vapor containment or pressure management. The atmospheric pressure sensor test verifies the accuracy of that sensor.

The station may remain open (normal fuel dispensing, deliveries, etc.) while conducting this procedure.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 Pressure Integrity Test

This test confirms that the vapor polisher is capable of maintaining system pressures within certification limits. The leak tightness of the polisher is checked at 8 inches water column (WC). Proper closure of the vapor valve is verified during this test.

2.2 Flow Test

This test confirms flow characteristics through the vapor polisher are maintained within certification limits. The back-pressure across the polisher is checked at a flow rate of 18.0 standard cubic feet per hour (scfh). Proper opening of the vapor valve is verified during this test.

2.3 Thermometer Test

This test verifies that the temperature sensing elements are functioning correctly and indicating valid temperature readings within acceptable ranges. Thermometers are checked against each other as an indication of valid readings. If criteria are not met, accuracy of the thermometers is checked against a calibrated reference thermometer.

2.4 Atmospheric Pressure Sensor Test

This test verifies that the atmospheric pressure sensing element is functioning correctly and indicating valid readings within an acceptable range. The sensor is checked against a local independent source (e.g., U.S. Weather Service, airports, Districts etc.)

3. BIASES AND INTERFERENCES

3.1 The pressure integrity test should not be conducted within 2 hours of Vapor Polisher loading or purging to minimize affects of thermal decay in the carbon bed. Thermal conditions created by heavy loading of the vapor polisher can cause the test pressure to collapse as it cools.

3.2 The thermometer test should not be conducted within 2 hours after a delivery into any tank that is connected to the vapor recovery system. This allows sufficient time for the fuel and ullage temperatures to equalize in the event that fuel is dropped into the tank at significantly different temperatures from the ambient UST temperature.

4. EQUIPMENT, RANGE and ACCURACY

4.1 Nitrogen tank fitted with a pressure regulator capable of maintaining a 10 inch WC test pressure.

4.2 A flow meter, with flow control valve, with 18.3 scfh full scale range and ± 2% of full scale accuracy. The meter must be accurate within 0.4 scfh for any flow setting made during the prescribed tests.

4.3 A digital (electronic) manometer with 0.01 inches WC, or better, resolution. The sensor must have a minimum measuring range of +/- 10 inches WC. The sensor must also be accurate to 0.05 inches WC for any pressure measurement made during the prescribed tests. For a manometer with a +/- 10 inches WC measurement range, this requires a 0.25% basic accuracy.

4.4 A thermometer with 1° C (1.8 ^{o} F), or better, resolution and accuracy is required to conduct the alternate thermometer test procedure.

4.5 Gasoline resistant hoses, fittings, connectors as required.

5. CALIBRATION REQUIREMENTS

5.1 A copy of the most current calibration shall be kept with all equipment.

5.2 All flow measuring devices shall be bench tested for accuracy using a reference gauge or National Institute of Standards and Technology (NIST) traceable standard at least once every 180 consecutive days. Accuracy checks shall be performed, with nitrogen, at a minimum of three (3) points (e.g., 20, 50 and 80 percent of full scale) and shall meet the requirements of Section 4.

5.3 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 180 consecutive days. Accuracy checks shall be performed at a minimum of three (3) points (e.g., 20, 50 and 80 percent of full scale) each for both positive and negative pressure readings. Accuracy shall meet the requirements of Section 4.

5.4 Thermometer calibration shall be checked at least once every 180 consecutive days using an ice bath, ambient air, and boiling water. This accuracy check shall be conducted by comparison to a NIST traceable measurement device. Accuracy shall meet the requirements of Section 4.

6. PRE-TEST REQUIREMENTS

Install all required testing apparatus as illustrated in Figure 1. Connect the digital manometer using a tee to the Vapor Polisher inlet test port. Be sure the connection is made in-line with the 3-way valve. Connect the nitrogen tank via the flow control valve and meter to the tee at the polisher inlet test port. Be sure the connection is made at right angles to the 3-way valve connection so that flow must go through at a 90 degree corner.

7. TEST PROCEDURE

7.1 <u>Pressure Integrity Test:</u> At the TLS console in the GDF kiosk, confirm if the valve has been closed for two hours by checking the date and time when the valve was closed in the IV800 RS232 command (see example below and VR-203 IOM Section 15, Viewing PMC Reports via RS-232 Connection or VR-204 IOM Section 12, Viewing ISD Reports via RS-232 Connection). Manually close the vapor valve in the PMC Diagnostic menu (VR-203 IOM Section 15, PMC Diagnostic Menus, or VR-204 IOM Section 12, PMC Diagnostic Menus). If the valve had not already been closed for at least two (2) hours then wait two hours before beginning the Pressure Integrity Test. Connect the test apparatus to the vapor polisher inlet by moving the inlet 3-way valve to the test position. Start the nitrogen flow, at 15 to18 scfh, to pressurize the closed polisher system to 8± 0.10 inches WC, then shut off the flow control valve. Wait for at least 1 minute before recording first reading. After 1 minute, record the starting pressure in inches of water column to 2 decimal places and wait for 60 seconds. Record the final pressure 60 seconds after the starting pressure. Record all results on Form 1.

Example IV8000 Command		
IV8000		
OCT 25, 2008 6:27 PM		
VAPOR POLISHER		
VALVE EVENT	PRESSURE	
DATE-TIME	"WC	EVENT CODE
8-25-08 2:27PM	-1.528	OPEN EXCESS PURGE
8-25-08 3:03PM	-0.480	CLOSE PURGE Hi P
8-25-08 3:56PM	-1.511	OPEN EXCESS PURGE
8-25-08 4:02PM	-1.330	CLOSE EMPTY

Use leak detection solution to check for leaks at the compression fittings used to connect the bottom of the Vapor Polisher to the inlet 3-way valve during the above pressure integrity test.

7.2 Flow Test: At the TLS console in the GDF kiosk, enter the PMC Diagnostic Menu to manually open the polisher vapor valve (VR-203 IOM Section 15, PMC Diagnostic Menus, or VR-204 IOM Section 12, PMC Diagnostic Menus). After the valve is open, set flow control valve to 18.0± 0.2 scfh. Record pressure at the inlet in inches of water column to 2 decimal places. Turn off flow and set the polisher vapor valve to automatic mode and the inlet test port 3-way valve back to the normal operating position. Record all results on Form 1. Remove test equipment.

7.3 Thermometer Test:

7.3.1 At the TLS console front panel, verify that a delivery had not occurred in the last 2 hours by using the following commands.

MM DD YY hh mm ss PM
ALL FUNCTIONS NORMAL
<FUNCTION>
<FUNCTION>
IN TANK INVENTORY
PRESS <STEP> TO CONT
<STEP>
T1: PROBE TYPE MAG1
VOLUME = 10,500 GALS
<STEP>
T1: REG
DELIVERY 5,050
GAL
<PRINT> **Print most recent deliveries**
<TANK/SENSOR> **Select next Tank**

7.3.2 At the TLS console, record the Vapor Polisher Ambient temperature and the Outlet Temperature from the Vapor Polisher SMART SENSOR DIAGNOSTIC Menu on the TLS. See Table 1 below for procedures to access the diagnostic report. Record all results on Form 1.

7.3.3 At the TLS Console record the gasoline tank thermometer values, T4 and T5, from the IN-TANK DIAGNOSTIC Menu for each gasoline storage tank. See

Table 2 below for procedures to access the diagnostic report. Record all the results on Form 1.

7.4 Atmospheric Pressure Sensor Test:

7.4.1 At the TLS Console access the atmospheric pressure reading using the menus outlined below in Table 3 and record on Form 1.

7.4.2 Obtain an atmospheric pressure reading from a local (within 50 miles) independent source (e.g., U.S. Weather Service, airports, Districts, etc.) in inches mercury and record on Form 1. Note: Some sources may give atmospheric pressure values at sea-level and will need to be adjusted to account for altitude. Neglecting to adjust the atmospheric pressure value at higher altitudes may result in differences between the local and TLS atmospheric pressure readings greater than 10%.

7.5 Alternative to Form 1: Districts may require the use of an alternate Form, provided it includes the same minimum parameters as identified in Form 1.

Table 1

Accessing Vapor Polisher Ambient and Outlet Temperatures
On the TLS Console

DIAG MODE
PRESS <FUNCTION> TO CONT

<FUNCTION>
<FUNCTION>

SMART SENSOR DIAGNOSTIC
PRESS <STEP> TO CONT

<STEP>

S1: *Valve Label*

TYPE: VAPOR VALVE

<TANK> to change SS device
<PRINT> print report

SMARTSENSOR DIAGNOSTIC
- - - - - - - - - - - -
AUG 20, 2008 4:52 PM
S6:VAPOR VALVE
VAPOR VALVE
SERIAL NUMBER: 111110
VALVE POSITION: OPEN
OPEN CAP: CHARGED
CLOSE CAP: CHARGED
AMBIENT TEMP: 65.08F
OUTLET TEMP **67.11F**
SENSOR FAULT:
NONE

Table 2

Accessing Fuel Thermometer Data on TLS

```
DIAG MODE
PRESS <FUNCTION> TO CONT
<FUNCTION>
<FUNCTION>
IN-TANK DIAGNOSTIC
PRESS <STEP> TO CONT      <STEP>   T1: PROBE TYPE MAG1
                                   SERIAL NUMBER  XXXXXX
                                   <CHNG> to change tank
                                   <PRINT> print report
                                   IN-TANK DIAGNOSTIC
                                   - - - - - - - - - - -
                                   PROBE DIAGNOSTICS
                                   T 1: PROBE TYPE MAG1
                                   SERIAL NUMBER    000000
                                                 ::
                                                 ::
                                   TEMP SENSOR DATA
                                   T6:   70.998 F
                                   T5:   70.300 F
                                   T4:   68.540 F
                                   T3:   68.998 F
                                   T2:   68.200 F
                                   T1:   65.348 F
```

Table 3

Accessing Atmospheric Pressure on the TLS Console

```
DIAG MODE
PRESS <FUNCTION> TO CONT
<FUNCTION>
<FUNCTION>
SMART SENSOR DIAGNOSTIC
PRESS <STEP> TO CONT      <STEP>   S1: ATMP Label
                                   TYPE: ATMP SENSOR
                                   <STEP>
                                   <STEP>
                                   ATMP SENSOR DIAGS
                                   PRESS <ENTER>
                                   <PRINT>   SMARTSENSOR
                                             DIAGNOSTIC
                                             MM DD YY HH MM SS
                                             Sn: ATMP Label

                                             TYPE: ATMP SENSOR
                                             SN: XXXXXXXX
                                             ATM PRESSURE: 0.062 PSI
```

8. RESULTS

8.1 Pressure Integrity Test

Verify that the end pressure is greater than 7.0 inches WC and that the decrease (see Form 1) between the start and end pressures is less than 0.5 inches WC. If not the polisher is not in compliance with the Exhibit 2 leakage requirements. This is equivalent to a leakage of about 0.01 CFH at 2 inches WC. If the decrease in pressure is greater than 0.5 inches WC, then retest (once) to be sure it is not due to thermal loss during the test. Correct valve function (closure and sealing) is confirmed if the pressure decrease between the start and end of the test are less than 0.5 inches WC.

8.2 Flow Test

Verify that the pressure drop across the polisher at 18.0 scfh flow is between 1.69 inches WC and 2.25 inches WC. If not the polisher is not in compliance with the Exhibit 2 back pressure requirements.

8.3 Thermometer Test

8.3.1 Gasoline (UST) Tank Thermometer

8.3.1.1 Subtract T4 from T5 and record the difference on Form 1.

8.3.1.2 If the difference between sensors in 8.3.1.1 exceeds 10° F, then the test procedures specified in Section 9 must be conducted.

8.3.2 Vapor Valve Thermometer

8.3.2.1 From the diagnostic report, compare the canister outlet temperature with the ambient thermometer.

8.3.2.2 If the difference between sensors in 8.3.2.1 exceeds 10° F, then the test procedures specified in Section 9 must be conducted.

8.4 Atmospheric Pressure Sensor Test
If the difference between the local and TLS atmospheric readings is greater than 10% of the local reading (see Form 1 for details) then the polisher is not in compliance with the Exhibit 2 atmospheric pressure sensor requirements.

8.5 All TLS and PMC reports used to access information to conduct this procedure must be attached to Form 1.

9 ADDITIONAL TEST PROCEDURES

The following tests are run in the event that the tests specified in Section 7.3 and 8.3 do not pass.

9.1. Gasoline (UST) Tank Thermometer -

9.1.1. Remove the tank probe from the tank and carefully lay it down on the forecourt while leaving it connected to the TLS. Wait 15 minutes for the probe to equalize with ambient temperature. Using the calibrated thermometer, obtain the ambient temperature near the probe. Access the Gasoline Tank Temperature T5 using Table 2. Record T5 and the calibrated thermometer reading (cal) on Form 1.

9.1.2. Compare the In-Tank Probe Diagnostic printout temperature T5 with the calibrated thermometer. If the difference between the two temperatures is greater than 10° F then the T5 thermometer does not meet the specifications set forth in Exhibit 2.

9.2. Vapor Valve Thermometer -

9.2.1. Using the setup described in Figure 1, introduce nitrogen flow (18 SCFH) into the canister for 2 minutes. Note: Pressure readings from the Vapor Polisher inlet do not need to be recorded if the canister has already passed the flow test.

9.2.2. Print the diagnostic Smart Sensor Vapor Valve Diagnostic report and record the Vapor Polisher outlet and ambient temperatures on Form 1.

9.2.3. If the difference between the canister outlet and ambient sensors is less than 10 degrees F, both sensors are operating properly. Otherwise, proceed to the next step.

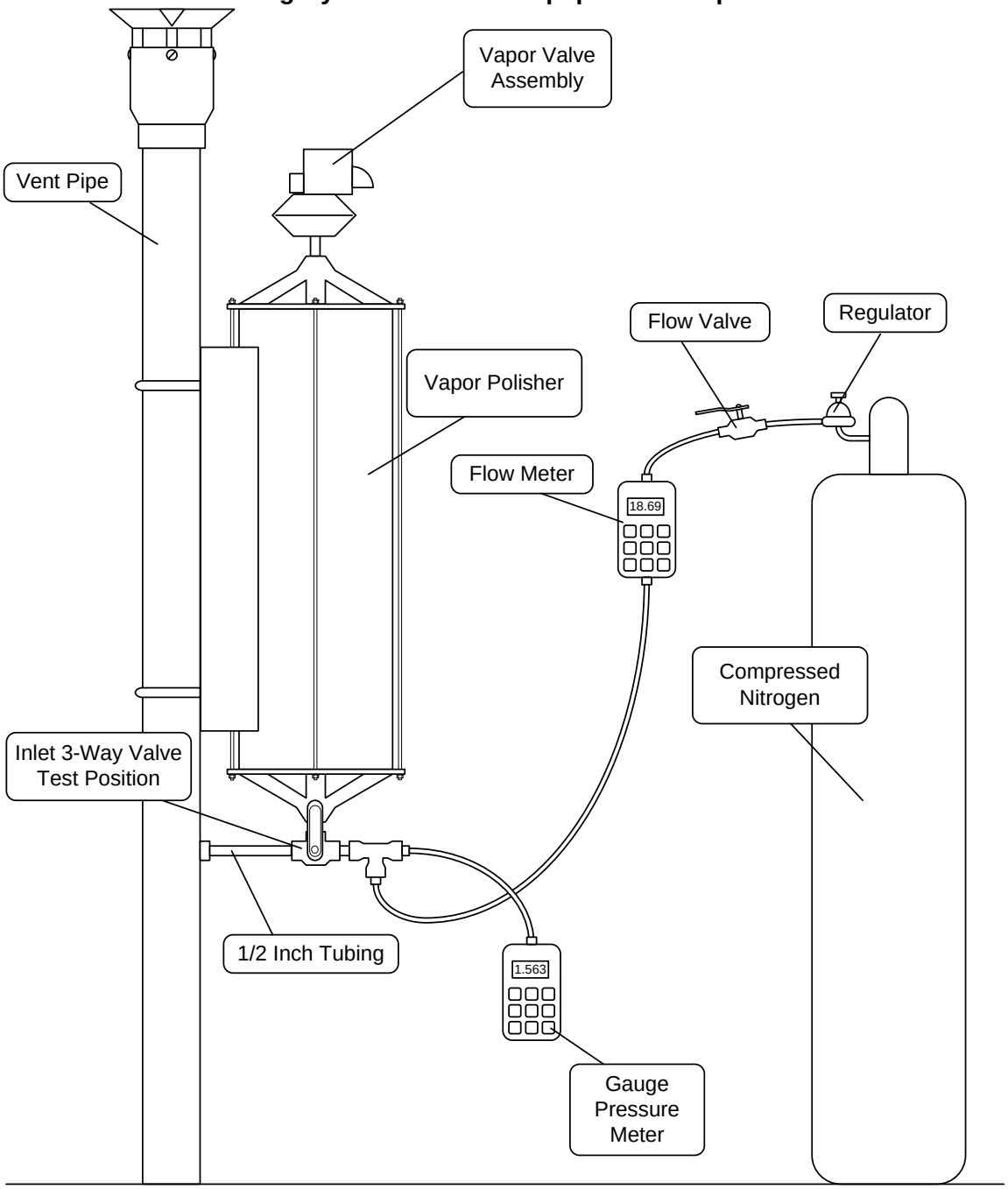
9.2.4. Remove the Vapor Polisher outlet temperature probe from the canister, according to IOM Section 14, Canister Thermal Probe Replacement, and let it sit for 15 minutes to allow the sensor to equalize with ambient temperature. Record the ambient and outlet temperature readings on Form 1.

9.2.5. Using the calibrated thermometer (cal), record the ambient temperature taken near the probe on Form 1.

9.2.6. Compare the Smart Sensor Vapor Valve Diagnostic printout Outlet Temp with the calibrated thermometer. If the difference between the two temperatures is greater than 10° F then the outlet thermometer does not meet the specifications set forth in Exhibit 2.

9.2.7. Compare the Smart Sensor Vapor Valve Diagnostic printout ambient Temp with the calibrated thermometer. If the difference between the two temperatures is greater than 10° F then the outlet thermometer does not meet the specifications set forth in Exhibit 2.

Figure 1
Pressure Integrity and Flow Test Equipment Setup



Leakage and Flow Test Equipment Setup

FORM 1:
VEEDER ROOT VAPOR POLISHER OPERABILTY TEST

DATE OF TEST:

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

STATION ADDRESS	**CITY**	**STATE ZIP**

STEP 7.1	**3-WAY VALVE IN CORRECT POSITION (PER FIG. 1)?** ☐ **START PRESSURE:** _____ **FINAL PRESSURE:** _____ **DIFFERENCE:** _____
STEP 8.1	**1. IS THE FINAL PRESSURE > 7.0 INCHES WC?** **Yes** **No** **2. IS THE FINAL PRESSURE > THE START PRESSURE** **Yes** **No** **3. IF NO TO #2, IS THE <u>DECREASE</u> in PRESSURE <0.5 INCHES WC? Yes** **No** (IF NO TO QUESTION 1 OR 3 ABOVE: THE VR POLISHER IS NOT IN COMPLIANCE WITH THE LEAKAGE REQUIREMENTS OF EXHIBIT 2.)
STEP 7.2	**VAPOR CONTROL VALVE OPEN?** ☐ **FLOW RATE:** _____ **PRESSURE:** _____
STEP 8.2	**IS THE PRESSURE BETWEEN 1.69 AND 2.25 INCHES WC?** **Yes** **No** (IF NO: THE VAPOR POLISHER IS NOT IN COMPLIANCE WITH THE BACK PRESSURE REQUIREMENTS OF EXHIBIT 2.)

STEP 7.3

IS THE DIFFERENCE BETWEEN SENSORS LESS THAN 10º F? **Yes** **No** ☐
(IF NO: THE VAPOR POLISHER IS NOT IN COMPLIANCE WITH THE TEMPERATURE RANGE REQUIREMENTS OF EXHIBIT 2.)

Test	**7.3.1**	**9.2.2**	**9.2.4&5**	**Tank 1**	**7.3.2**	**9.1**
Ambient				**T5**		
Outlet				**T4**		
Cal				**T5 - T4**		
Diff				**Cal**		
Diff Outlet & Cal (9.2.6)				**T5 - Cal**		
Diff Ambient & Cal (9.2.7)				**Tank 2**	**7.3.2**	**9.1**
				T5		
				T4		
				T5 - T4		
				Cal		
				T5 - Cal		
				Tank 3	**7.3.2**	**9.1**
				T5		
				T4		
				T5 - T4		
				Cal		
				T5 - Cal		

STEP 7.4

TLS ATM Pressure Reading _____ psi
Convert PMC pressure reading which is in term of psi value to atmospheric pressure in inches mercury: (psi +14.7) x 2.036 = _____
Atmospheric pressure from local source _____ inches mercury
Difference between Local and TLS = _____ A
0.10 x Local = _____ B

IS A < B? **Yes** **No**
(IF NO: THE VR POLISHER IS NOT IN COMPLIANCE WITH THE ATMOSPHERIC TEST REQUIREMENTS OF EXHIBIT 2.)

Executive Orders VR-203-I and VR-204-I
VST Phase II EVR System

Exhibit 12
Veeder-Root Vapor Polisher
Hydrocarbon Emissions Verification Procedure

Definitions common to all certification and test procedures are in:

D-200 Definitions for Vapor Recovery Procedures

For the purpose of this procedure, the term "ARB" refers to the California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate.

1. PURPOSE AND APPLICABILITY

This test procedure is used to verify the proper performance of the Veeder-Root Vapor Polisher. The test determines hydrocarbon (HC) emissions under iso-butane vapor loading conditions.

The station may remain open (normal fuel dispensing, deliveries, etc.) while conducting this procedure.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

This procedure is used to verify proper performance of the Veeder-Root Vapor Polisher in meeting the hydrocarbon (HC) emission specification listed in Exhibit 2. A 10% iso-butane compressed gas standard is used as the inlet test gas (i.e., to provide HC flow at the Vapor Polisher inlet) while monitoring HC emissions from the Vapor Polisher exhaust using a portable non-dispersive infrared (NDIR) analyzer calibrated to iso-butane. The flow through the Vapor Polisher and HC monitoring is maintained for six (6) minutes.

3. BIASES AND INTERFERENCES

3.1 This test shall not be conducted if the Vapor Polisher percent load is greater than 80% (VR-203 IOM Section 15, PMC Diagnostic Menu, or VR-204 IOM Section 12, PMC Diagnostic Menu). If load is greater than 80% then conduct the purge procedure in Appendix A.

3.2 Exhibit 11 (Vapor Polisher operability tests) must be conducted prior to conducting the Exhibit 12 test to assure valid results.

3.3 Catalytic bead HC sensors shall not be used for this test due to the absence of air in the inlet test gas.

3.4 Values measured at less than or greater than 9,000 ppm (0.9% by volume) should not be considered as quantitative results since accuracy and calibration checks are not required by this test at those levels.

4. EQUIPMENT

4.1 A flow meter, with flow control valve, with 18.3 scfh full scale range and ± 2% of full scale accuracy. The meter must be accurate within 0.4 scfh for any flow setting made during the prescribed tests.

4.2 Gasoline resistant hoses, fittings, connectors.

4.3 Portable NDIR hydrocarbon analyzer, 0 to 18,000 ppm range (1.8 % by volume for iso-butane), with a minimum accuracy of ±0.1% by volume, such as RKI Instruments “Eagle” model (with NDIR HC sensor) or equivalent. Only an NDIR analyzer calibrated to iso-butane may be used for this test. The manufacturer’s operating instructions for the HC analyzer and proof or evidence that the sensor is NDIR shall be kept with the equipment at all times so that proper procedure can be verified.

4.4 Ladder or other access means to manually sample vapor outflow from the top of the Vapor Polisher assembly.

4.5 A calibration check gas of iso-butane in nitrogen or air at a concentration of 9,000 ppm (0.9% by volume. The calibration check gas must be certified to an analytical accuracy of ±2% traceable to a reference material approved by the National Institute of Standards and Technology (NIST) and recertified at least every two years.

4.6 An inlet test gas of iso-butane **in nitrogen** (air balance gas not allowed) at a nominal concentration of 10% by volume (100,000 ppm). The actual value of the gas concentration shall be between 9.7 and 10.3% by volume (97,000 to 103,000 ppm). The calibration check gas must be certified to an analytical accuracy of ±2% traceable to a reference material approved by the National Institute of Standards and Technology (NIST) and recertified at least every two years.

4.7 Pressure regulators for the calibration check gas cylinder and the inlet test gas cylinder.

4.8 Stopwatch with an accuracy of ± 0.2 seconds.

5. CALIBRATION REQUIREMENTS

5.1 All flow measuring devices shall be bench tested for accuracy using a reference gauge or NIST traceable standard at least once every 180 consecutive days. Accuracy checks shall be performed, with nitrogen, at a minimum of three (3) points (e.g., 20, 50 and 80 percent of full scale) and shall meet the requirements of Section 4.

5.2 Information on the calibration check gas and inlet test gas shall be entered into a log identifying each cylinder by serial number. Documentation of certification shall be maintained with the gas cylinders at all times and shall also be attached to Form 1. The calibration check gas log shall be maintained with the gas cylinders at all times and made readily available to the district upon request. Sufficient information shall be maintained to allow a determination of the certification status of each calibration gas and shall include: (1) the date put in service, (2) assay result, (3) the dates the assay was performed, and (4) the organization and specific personnel who performed the assay.

6. PRE-TEST REQUIREMENTS

6.1 Follow the HC analyzer manufacturer's procedure for instrument start-up and warm-up.

6.2 Check the zero reading of the HC analyzer using ambient air. If the result is greater than 1,000 ppm (0.1% by volume) then re-zero the analyzer per the manufacture's recommended procedures. Record results on Form 1.

6.3 Check the calibration of the HC analyzer by running the 9,000 ppm (0.9% by volume) calibration check gas following the manufacturer's procedures. The reading must be between 8,000 and 10,000 ppm (0.8% and 1.0% by volume). Record results on Form 1. If the result is outside of the required range then the analyzer shall be recalibrated per manufacturer's specifications prior to conducting this test.

6.4 Assemble the inlet test gas cylinder, regulator, flow meter and flow control valve, and transfer line as shown in Figure 1. Attach the HC analyzer sampling line to the outlet test port ¼ inch NPT fitting on the top of the polisher as shown in Figure 1.

6.5 Visually check to ensure the inlet 3-way valve (see **Figure 1**) to the Vapor Polisher is in the closed test position so the flow is coming from the inlet test gas to the inlet of the Vapor Polisher.

6.6 At the TLS console, set the Vapor Polisher to the manual open position (reference VR-203 IOM Section 15, PMC Diagnostic Menus, or VR-204 IOM Section 12, PMC Diagnostic Menus).

7. TEST PROCEDURE

7.1 Set the inlet test gas flow rate to 15 scfh. Adjust the flow rate as necessary during the test to maintain the flow rate of 14 to 16 scfh. Start the stopwatch. Record the start and end flow rates on Form 1.

7.2 Record the first HC reading three (3) minutes after starting the stopwatch. Take three (3) more readings one (1) minute apart for a total test time of 6 minutes.

7.3 Record the HC concentration for each minute from minute 3 to 6 on Form 1, with other required information. All results less than 9,000 ppm shall be recorded as "< 9000 ppm". All results greater than or equal to 9,000 ppm shall be recorded as "> 9000 ppm".

7.4 Alternative to Form 1: Districts may require the use of an alternate Form, provided it includes the same minimum parameters identified in Form 1.

7.5 Remove test equipment. Re-install the outlet test port cap by applying Teflon™ tape to the threads and tighten the cap ¼ inch turn past snug. Ensure that the 3-way inlet valve is in the normal operating ("open") position. At the TLS console re-set the Vapor Valve to the automatic mode.

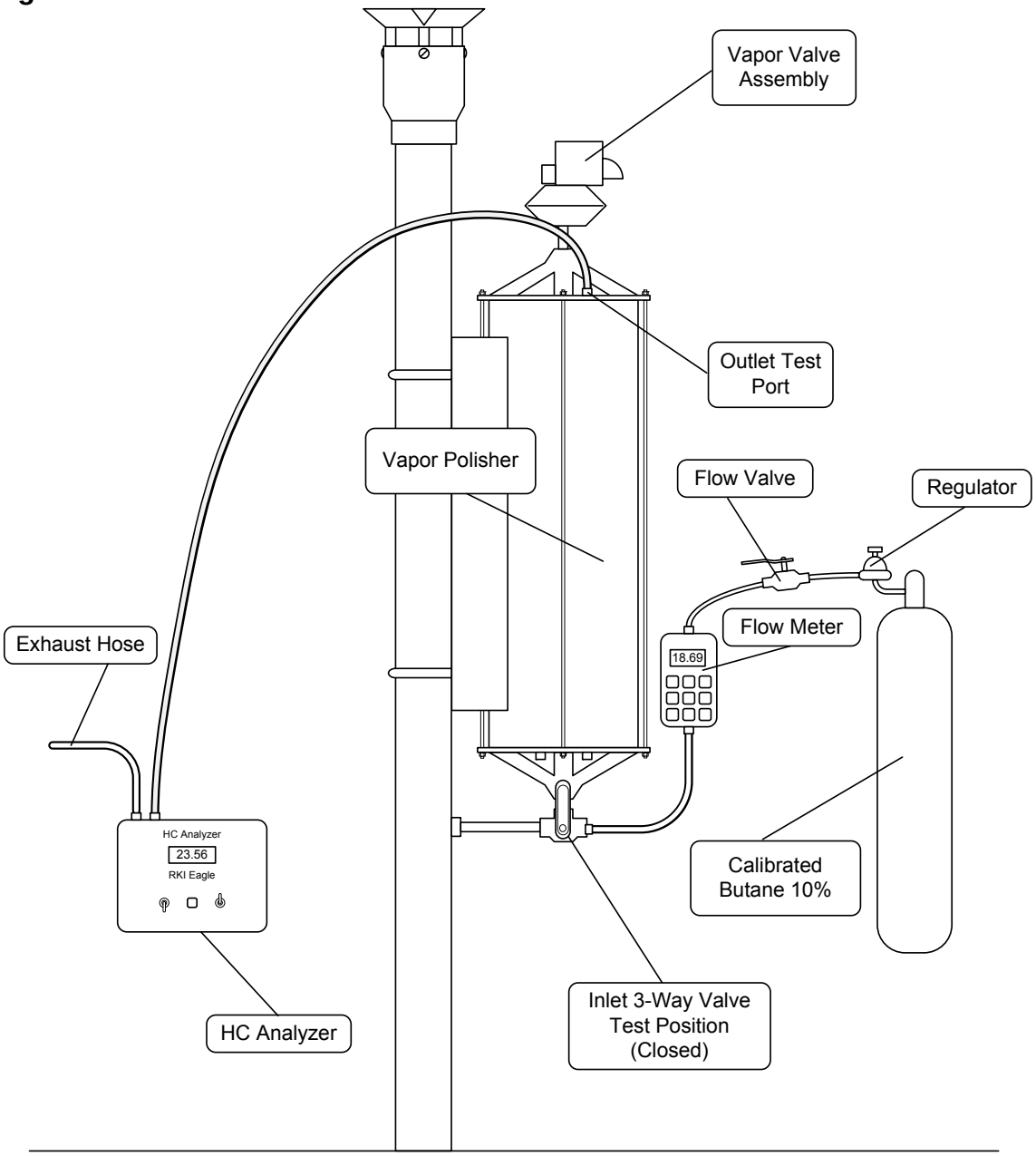
8. RESULTS

If the emission concentration is ≥ 9000 ppm (0.9% by volume during any part of the test, then the Vapor Polisher is not in compliance with the Exhibit 2 HC emission requirements.

9. ALTERNATIVE TEST PROCEDURES

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

Figure 1


Vapor Valve Assembly
Outlet Test Port
Vapor Polisher
Flow Valve
Regulator
Flow Meter
18.69
Exhaust Hose
HC Analyzer
23.56
RKI Eagle
Calibrated Butane 10%
Inlet 3-Way Valve Test Position (Closed)
HC Analyzer

FORM 1: VEEDER ROOT VAPOR POLISHER HC EMISSIONS TEST

DATE OF TEST:

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

STEP 6.2 **6.3**	**CAL GAS DOCUMENTATION ATTACHED?** ☐ **HC ANALYZER ZERO CHECK READING:** _____ **HC ANALYZER CAL CHECK READING:** _____ **IS THE ZERO READING < 1,000 ppm? Yes No** **IS THE CAL CHECK READING BETWEEN 8,000 and 10,000 ppm? Yes No** (IF NO: THE HC ANALYZER MUST BE RE-CALIBRATED.)
STEP 6.5 **6.6**	**3-WAY VALVE IN CORRECT POSITION (PER FIG. 1)?** ☐ **PMC VALVE MODE SET TO MANUAL OPEN?** ☐
STEP 7.1	**START FLOW RATE: _____ END FLOW RATE: _____**
STEP 7.3	**HC READING AT 3 MIN:** _____ **HC READING AT 4 MIN:** _____ **HC READING AT 5 MIN:** _____ **HC READING AT 6 MIN:** _____ **IS THE HC CONC. < 9,000 ppm FOR ALL READINGS? Yes No** (IF NO: THE VR POLISHER IS NOT IN COMPLIANCE WITH THE HC EMISSION REQUIREMENTS OF EXHIBIT 2.)
STEP 7.5	**3-WAY VALVE SET TO NORMAL OPEN POSITION?** ☐ **(UST Ullage to Vapor Polisher)** **RE-SET VAPOR VALVE TO AUTOMATIC MODE?** ☐

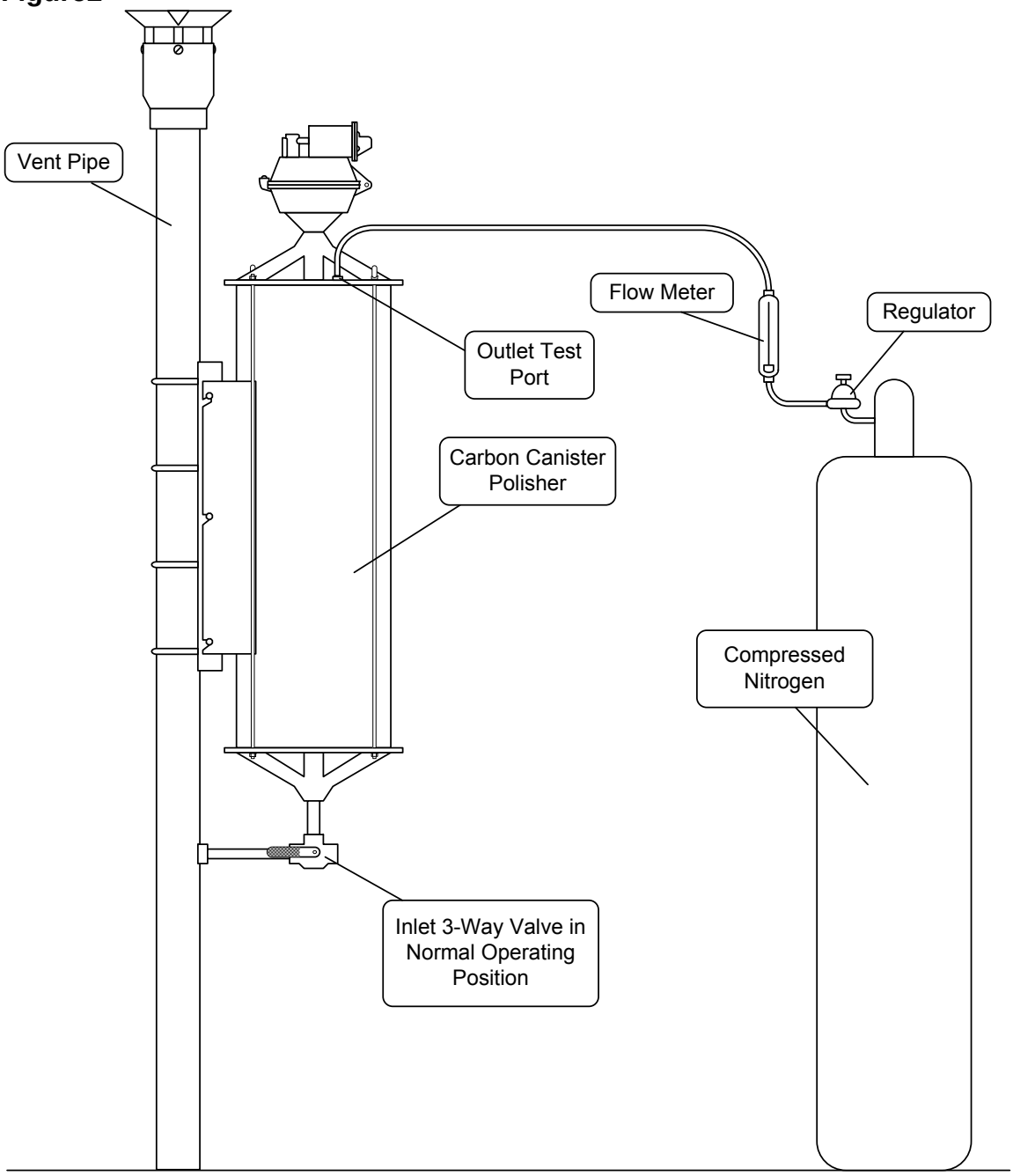
Appendix A: Partial Manual Purge Procedure

The purpose of this procedure is to purge a fully or mostly loaded canister to ensure that the HC load is less than 80% so that a Hydrocarbon Emissions Verification Test (Exhibit 12) can be performed.

1. Use the TLS PMC Diagnostic menus to manually close the canister vapor valve to be sure nitrogen supply gas will flow through the carbon and not out the exhaust vent.
2. Refer to Figure 2. Temporarily move the manual inlet test port three way valve to the test port position to disconnect the canister from the UST vent stack.
3. Connect a nitrogen gas supply with regulator and flow meter to the outlet test port.
4. Return the manual test port three way valve back to the normal operating position to reconnect the canister to the UST vent stack.
5. Open the nitrogen gas supply valve and set a flow rate of 18 CFH. This starts the purging process.
6. After 35 minutes of flow, which provides approximately 10 cubic feet of purge volume, close the nitrogen gas supply valve. The load on the carbon will now be less than 80% so that a normal Vapor Emission Operability Test can be performed after finishing this procedure. Note that the PMC Diagnostic Load % does not change as a result of this procedure because the canister vapor valve was manually closed in Step1.
7. Temporarily move the manual inlet test port three way valve to the test port position to disconnect the canister from the UST vent stack.
8. Disconnect the nitrogen gas supply from the canister outlet test port and replace the test port plug using fuel resistant sealing compound to seal off the port.
9. Return the manual test port three way valve back to the normal operating position to reconnect the canister to the UST vent stack.
10. Using the TLS PMC Diagnostic menus, return control of the canister vapor valve to automatic mode.

A Hydrocarbon Emissions Verification Test can now be performed.

Figure2



Purging Test Equipment Setup

Executive Order VR-203-I
VST Phase II EVR System with Hirt Thermal Oxidizer

Exhibit 13
Hirt VCS 100 Processor
With Indicator Panel
Operability Test Procedure

Definitions common to all certification and test procedures are in:

D-200 Definitions for Vapor Recovery Procedures

For the purpose of this procedure, the term "ARB" refers to the California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate.

1. PURPOSE AND APPLICABILITY

This test procedure verifies the operational status of the Hirt VCS 100 Processor and Indicator Panel.

The station may remain open (normal fuel dispensing) while conducting this procedure.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The Hirt VCS 100 Processor is designed to activate (e.g. thermally oxidize vapors) when the underground storage tank (UST) ullage pressure exceeds a nominal -0.40 inches water column ("w.c.). Processor activation will be verified by exposing the processor's internal vacuum sensor/switch to an atmospheric pressure input. The processor should activate and the Indicator Panel Processing lamp should light.

3. BIASES AND INTERFERENCES

3.1 This test is only valid when total ullage is 70% or less than capacity of GDF storage tanks.

3.2 At least 24 hours must have elapsed after any tests that introduce air and/or nitrogen into the vapor spaces, such as, but not limited to TP-201.3 (including Exhibit 4), TP-201.4 (including Exhibit 6) and Exhibit 5.

3.3 There shall be no Phase I bulk product deliveries into or out of the storage tank(s) within the three (3) hours prior to the test or during performance of this test procedure.

3.4 Processor should be inactive (i.e. powered but not processing gasoline vapor).

4. EQUIPMENT

4.1 Hand tools: 5/16" nut driver or equivalent, 3/8" open end wrench.

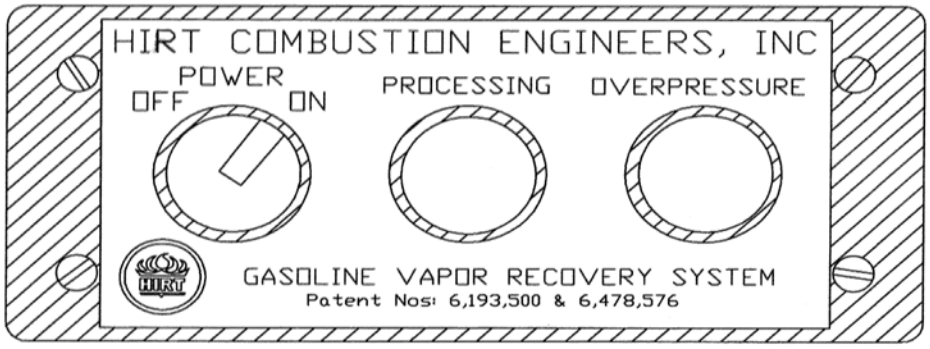
4.2 Stopwatch: Use a stopwatch with an accuracy of ±0.2 seconds.

4.3 Teflon pipe tape.

5. TEST PROCEDURE

5.1 System Status Check: Locate Hirt Indicator Panel and verify that the green lamp on the POWER switch is lit, to be sure power is ON. Record on Form 1. If the Power switch is not lit, the processor does not meet the Exhibit 2 Hirt VCS 100 Thermal Oxidizer specifications and no testing shall be conducted.

Indicator Panel Face



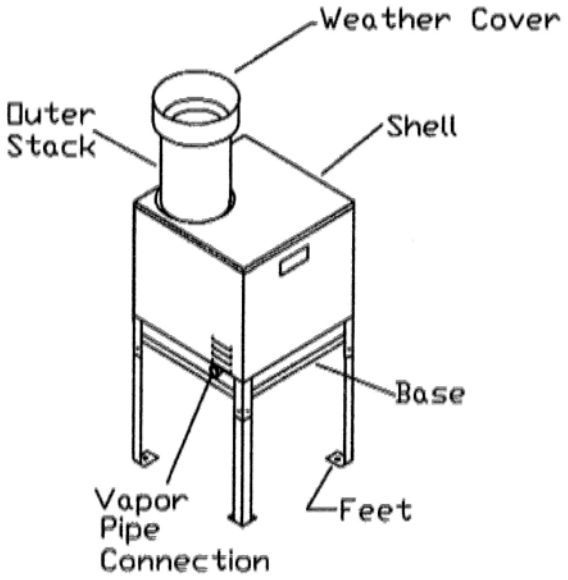
5.2 Check green PROCESSING lamp on Indicator Panel. Is the green PROCESSING lamp on? Record on Form 1. If so, then wait until PROCESSING lamp is extinguished before proceeding to step 5.3, to meet BIAS condition 3.4.

5.3 Forced Processor Operation: Turn POWER to processor OFF at Indicator Panel.

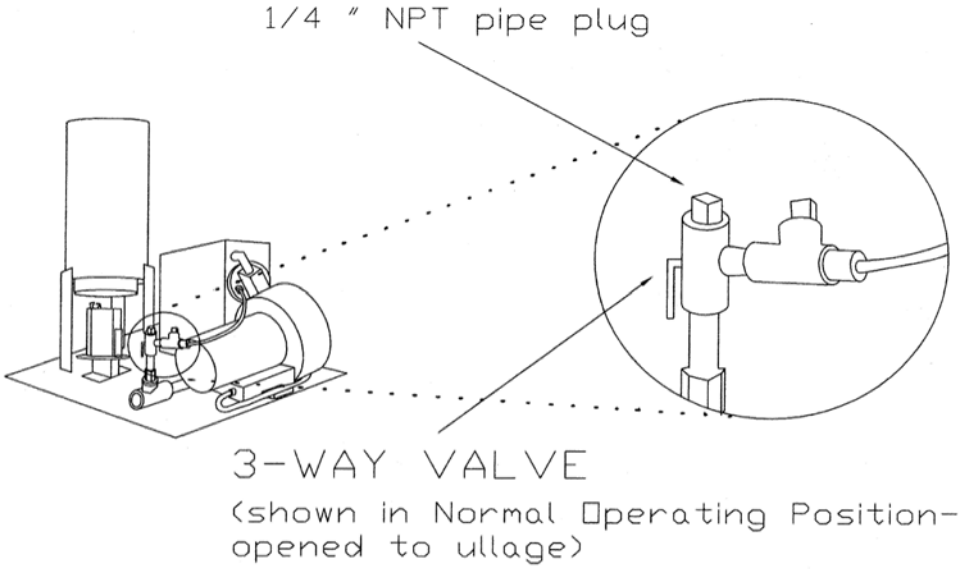
CAUTION: Processor components, such as Shell, Stack, Burner, and Weather Cover can be Hot! Use care when handling processor or removing its parts.

5.4. Remove screw from Weather Cover with 5/16” nut driver and remove Weather Cover from Outer Stack.

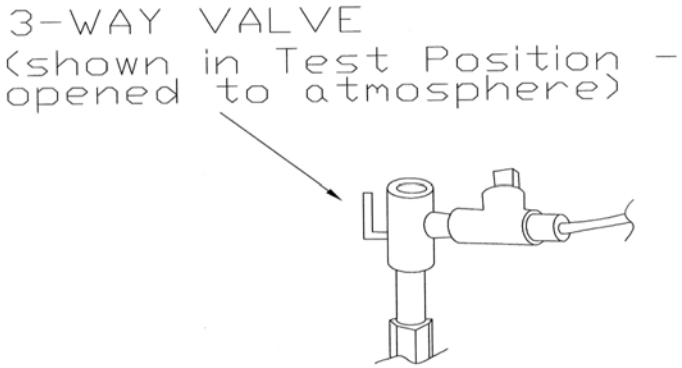
5.5 Remove (4) screws holding Shell to Base with 5/16” nut driver and then remove Shell.



5.6 Locate 3-Way Valve on tubing leading to Vacuum Sensor/Switch. The 3-Way Valve handle should be pointing down, in the Normal Operating Position – Opened to UST Ullage. Remove the 1/4" NPT pipe plug from 3-Way Valve with 3/8" wrench.



5.7 Turn 3-Way Valve handle to the up position.



5.8 Turn POWER to processor ON at Indicator Panel, and verify that green lamp on POWER switch is lit. Start the stopwatch.

5.9 Verify green PROCESSING lamp on the Indicator Panel lights within 3 minutes. Record on Form 1. If the Processing lamp is on, processor meets the Exhibit 2 Processor specifications. If the Processing lamp is not on within 3 minutes, the processor does not meet the Exhibit 2 Processor specifications and needs technical service.

5.10 Verify the OVERPRESSURE lamp on the Indicator Panel lights within sixty two (62) minutes. Record on Form 1. If the OVERPRESSURE lamp is on, processor meets the Exhibit 2 Processor specifications. If the OVERPRESSURE lamp is not on within sixty two (62) minutes, the processor does not meet the Exhibit 2 Processor specifications and needs technical service.

5.11 Turn POWER to processor OFF at Indicator Panel.

5.12 Turn 3-Way Valve handle back down to Normal Operating Position. Reinstall 1/4" NPT plug (with Teflon pipe tape) and tighten ¼ turn past snug. Reinstall Shell and Weather Cover.

5.13 Turn POWER to processor ON at Indicator Panel. Testing is completed.

6. REPORTING

Record all results on Form 1. Districts may require the use of an alternate Form, provided it includes the same minimum parameters as identified in Form 1.

FORM 1:
HIRT VCS 100 PROCESSOR OPERABILITY TEST

DATE OF TEST:

SERVICE COMPANY NAME	SERVICE COMPANY'S TELEPHONE
SERVICE TECHNICIAN	HIRT TECHNICIAN CERTIFICATION #(as applicable) CC or DISTRICT TRAINING CERTIFICATION (as applicable)
STATION NAME	DISTRICT PERMIT #

STATION ADDRESS	CITY	STATE ZIP

Was TP-201.3 (Including Exhibit 4) conducted in the last 24 hours?	Yes ____ No ____
Was TP-201.4 (Including Exhibit 6) conducted in the last 24 hours?	Yes ____ No ____
Was Exhibit 5 conducted in the last 24 hours?	Yes ____ No ____
Was there a fuel delivery within the last 3 hours?	Yes ____ No ____
The % ullage of GDF storage tank(s) is _____ gallons.	

STEP 5.1	**Is POWER switch lit?**	YES ☐ NO ☐
STEP 5.2	**Is PROCESSING lamp ON?** If "YES", test cannot be performed until lamp goes off.	YES ☐ NO ☐
STEP 5.9	**Time for PROCESSING Lamp to Light? _____ minutes** **Did PROCESSING Lamp light within three (3) minutes?**	YES ☐ NO ☐
STEP 5.10	**Time for OVERPRESSURE Lamp to Light? _____ minutes** **Did OVERPRESSURE Lamp light within sixty two (62) minutes?**	YES ☐ NO ☐

Exhibit 14

Determination of Static Pressure Performance of the Healy Clean Air Separator

1 APPLICABILITY

Definitions common to all certification and test procedures are in:

D-200 Definitions for Vapor Recovery Procedures

For the purpose of this procedure, the term “ARB” refers to the California Air Resources Board, and the term “ARB Executive Officer” refers to the Executive Officer of the ARB or his or her authorized representative or designate.

1.1 This test procedure is used to quantify the vapor tightness of the Healy Clean Air Separator (CAS) pressure management system installed as part of a gasoline dispensing facility (GDF) under Executive Order VR-203.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 The Clean Air Separator, while isolated from the vapor recovery system, is evaluated for vapor integrity using a vacuum decay procedure. The vacuum decay after 5 minutes is compared with an allowable value. The allowable value is based upon the initial vacuum level when conducting the test using the table provided in this test procedure.

2.2 A positive pressure decay procedure is included that conducts the same evaluation as the vacuum decay but with positive pressure. This test is conducted if there is insufficient vacuum (not greater than – 2.00” wc) to conduct the vacuum decay. Districts have the authority to specify in the permit conditions that this positive pressure test is to be conducted even if the vacuum test has been conducted.

3 RANGE

3.1 The full-scale range of the electronic measuring device shall not exceed 0-20.00” wc with a minimum accuracy of not less than 0.25 percent of full-scale.

4 INTERFERENCES

4.1 Leaks in the piping for the Clean Air Separator could bias the test results toward non-compliance.

4.2 Introduction of gaseous nitrogen into the system at flow rates exceeding 4 CFM (240 CFH) may bias the results of the test toward non-compliance. Only gaseous nitrogen shall be used to conduct this test.

4.3 Pressurizing the Clean Air Separator bladder greater than 14.00” wc could damage the bladder, biasing the test toward non-compliance.

4.4 Thermal Bias for Electronic Manometers

Electronic manometers shall have a warm-up period of at least 15 minutes followed by a drift check of 5 minutes. If the drift exceeds 0.01” wc, the instrument should not be used.

5 APPARATUS

5.1 Nitrogen

Use commercial grade gaseous nitrogen in a high pressure cylinder, equipped with a two-stage pressure regulator.

5.2 Pressure Measurement Device

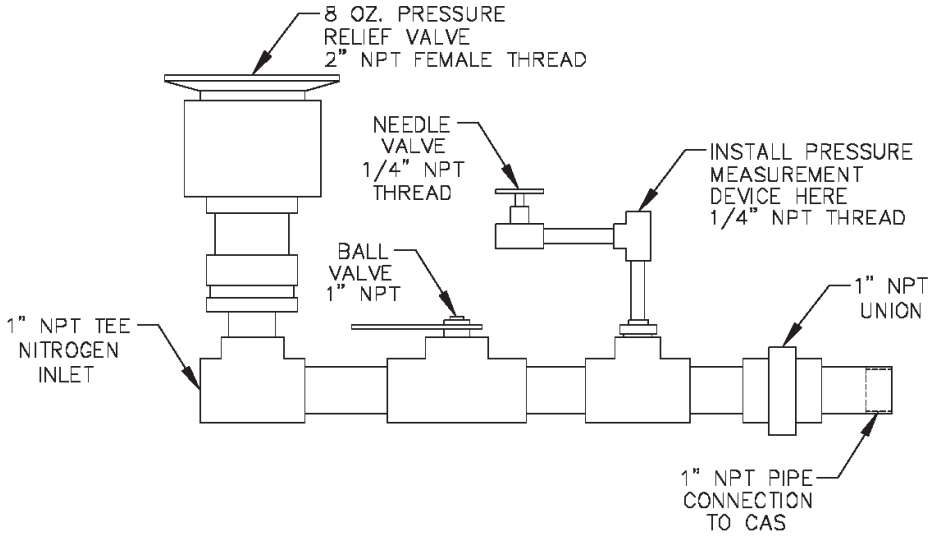
Use an electronic pressure measurement device to monitor the pressure decay in the Clean Air Separator. The pressure measurement device shall, at a minimum, be readable to the nearest 0.01” wc.

5.3 Test Port Assembly

Use a test port assembly constructed similar to the one in Figure A. The assembly should have an 8 oz. Pressure Relief valve, to ensure that the Clean Air Separator is not over pressurized. The Model 9968 Clean Air Separator Test Port Assembly can be purchased from Healy Systems, Inc.

Figure A

Clean Air Separator Test Port Assembly



5.4 Stopwatch

Use a stopwatch accurate to within 0.2 seconds.

5.5 Flow Meter

Use a flow meter to determine the required pressure setting of the delivery pressure gauge on the nitrogen supply pressure regulator. This pressure shall be set such that the nitrogen flow rate is between 2.0 CFM (120 CFH) and 4.0 CFM (240 CFH).

5.6 Leak Detection Solution

Any liquid solution designed to detect vapor leaks may be used to verify the pressure integrity of the test equipment prior to conducting the test.

5.7 Condensate Collection Vessel

A container approved for use with gasoline that can hold at least a half gallon of material.

5.8 Graduated Cylinder

A graduated cylinder suitable for use with gasoline capable of measuring to the nearest ounce or mL.

6 PRE-TEST PROCEDURES

6.1 The following safety precautions shall be followed:

6.1.1 Only gaseous nitrogen shall be used to pressurize the system.

6.1.2 An 8 oz. pressure relieve valve shall be installed on the Test Port Assembly to prevent the possible over-pressurizing of the Clean Air Separator.

6.1.3 A ground strap should be employed during the introduction of nitrogen into the system.

6.2 There shall be no Phase I bulk product deliveries into or out of the gasoline storage tank(s) within the three (3) hours prior to the test or during the performance of this test procedure.

6.3 All pressure measuring device(s) shall be bench calibrated using a reference standard. Calibration shall be performed at 20, 50, and 80 percent of full scale. Accuracy shall be within two percent at each of these calibration points. Calibrations shall be conducted on a frequency not to exceed 180 days. Calibration documentation shall be maintained with the equipment at all times.

6.4 Use the flow meter to determine the nitrogen regulator delivery pressures that correspond to nitrogen flow rates of 2.0 CFM (120 CFH) and 4.0 CFM (240 CFH). These pressures define the allowable range of delivery pressures acceptable for this test procedure. The flow meter shall be connected in-line between the nitrogen supply regulator and the Test Port Assembly during pressurization. The flow meter may be connected in-line between the nitrogen supply regulator and the Test Port Assembly during the test.

6.5 The electronic pressure measurement device shall be subject to warm-up and drift check before use; see Section 4.5.

6.6 The four ball valves used in the installation of the Clean Air Separator are lockable and shall be locked in the position shown in Figure 2B-6 or 2B-6H of Exhibit 2 and in Figure 1 or Figure 1H of this Exhibit during normal operation. Figure 1 and 2B-6 apply to vertical CAS installations and Figure 1H and 2B-6H apply to horizontal CAS installations. The four padlocks provided by Healy Systems, Inc. in their installation kit are keyed the same. However, it is possible that one or more of the padlocks on the Clean Air Separator could have been replaced (seizing, damage, broken key, etc.). Conducting this test will require a set of keys necessary to unlock all padlocks.

6.7 Verify that the Clean Air Separator is in its normal operating configuration by confirming that all components are as indicated (See Figure 1 or Figure 1H):

Valve “A” - Open
Valve “B, C and D” - Closed
Pipe End “E” - Plugged
Tee Branch “F” - Plugged

Figure 1

Normal Clean Air Separator Operating Configuration

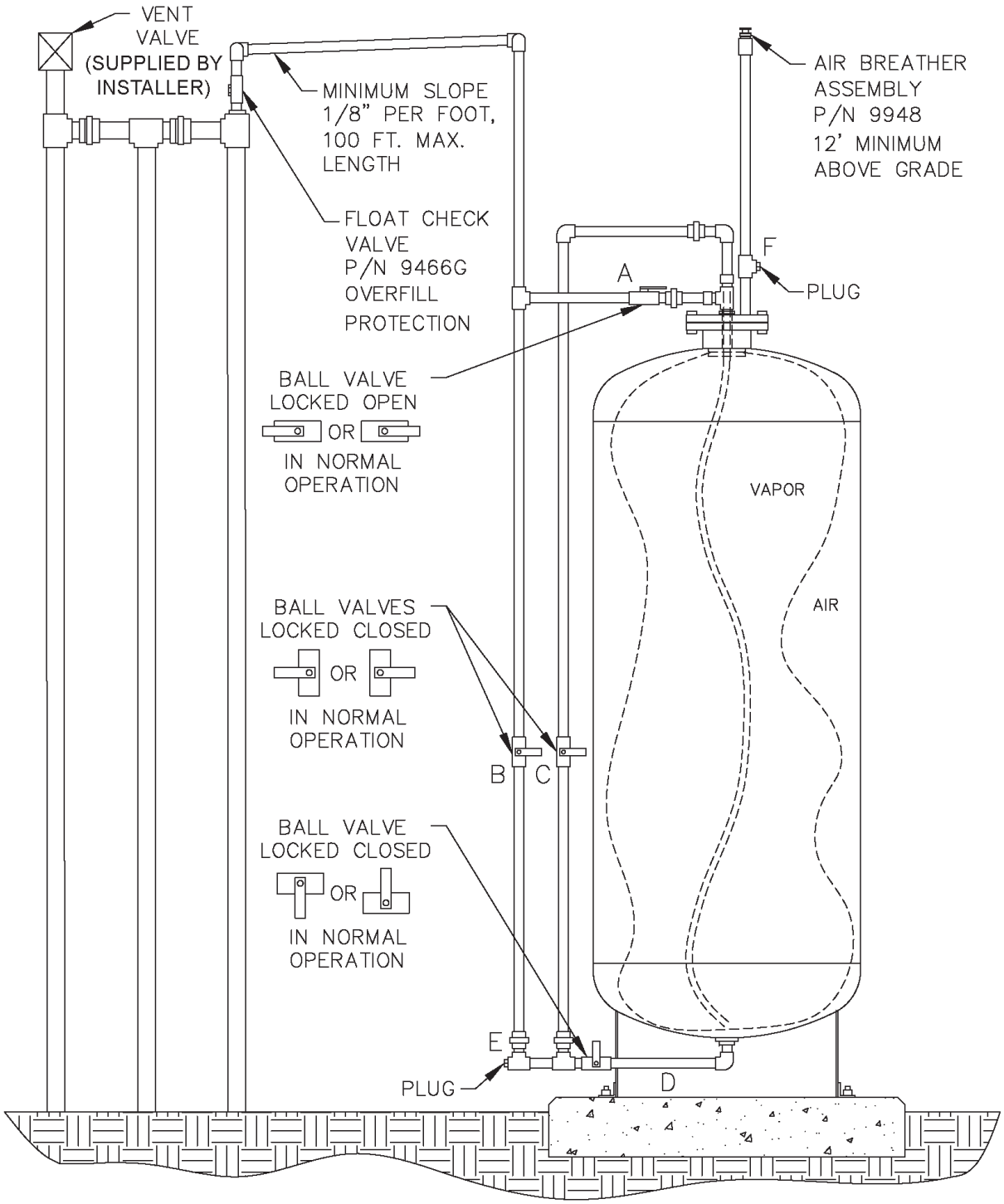
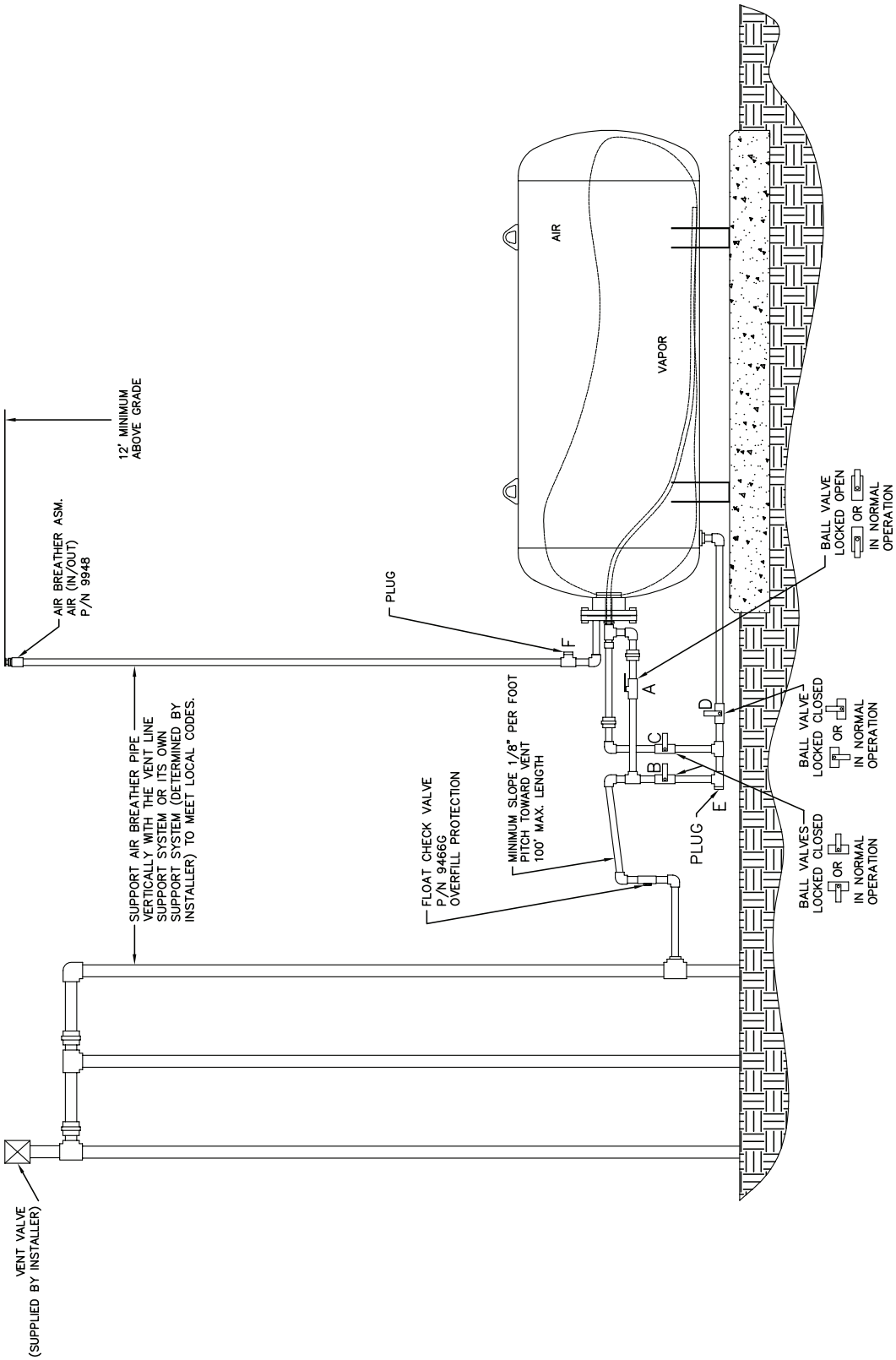


Figure 1H

Normal Clean Air Separator Operating Configuration



6.8 Installing the Test Port Assembly

6.8.1 Open the ball valve marked “B”, shown in Figure 1 or Figure 1H. This ensures that if there is any condensate in the primary connection line to the Clean Air Separator it will drop down into the lower section of the piping configuration, so that it can be measured. Close the valve after approximately 30 seconds.

6.8.2 Position the condensate collection vessel below plug “E” prior to removing it. Remove the 1” plugs from locations “E” and “F” from Figure 1 or Figure 1H. Transfer the collected condensate into the graduated cylinder. If there is more than 16 oz. (473 mL) of liquid condensate, the bladder and vapor processor vessel must be drained. Conduct the bladder and vessel draining procedures from the Clean Air Separator section of the ***ARB Approved Installation, Operation and Maintenance Manual***.

Note: Depending upon the size of the graduated cylinder and the amount of condensate, it may take multiple transfers from the condensate collection vessel to get the total condensate measurement.

6.8.3 Install the Test Port Assembly to the Clean Air Separator at location “E”. See Figure 2 or Figure 2H. Figure 2 applies to vertical CAS installations and Figure 2H applies to horizontal CAS installations.

6.8.4 Connect the gaseous nitrogen supply to the Test Port Assembly. See Figure 2 or Figure 2H.

6.8.5 Check the test equipment and piping isolated from normal Clean Air Separator operation by the ball valves “B, C and D” by pressurizing with nitrogen to a pressure of 4” wc ± 1” wc and closing the ball valve on the Test Port Assembly. Use leak detection solution. Tighten as necessary. The test equipment shall have no leaks.

6.8.6 Open the needle valve on the Test Port Assembly to bleed the pressure off the equipment. Keep ball valve on Test Port Assembly closed.

Figure 2

Clean Air Separator in Configuration to Conduct Test

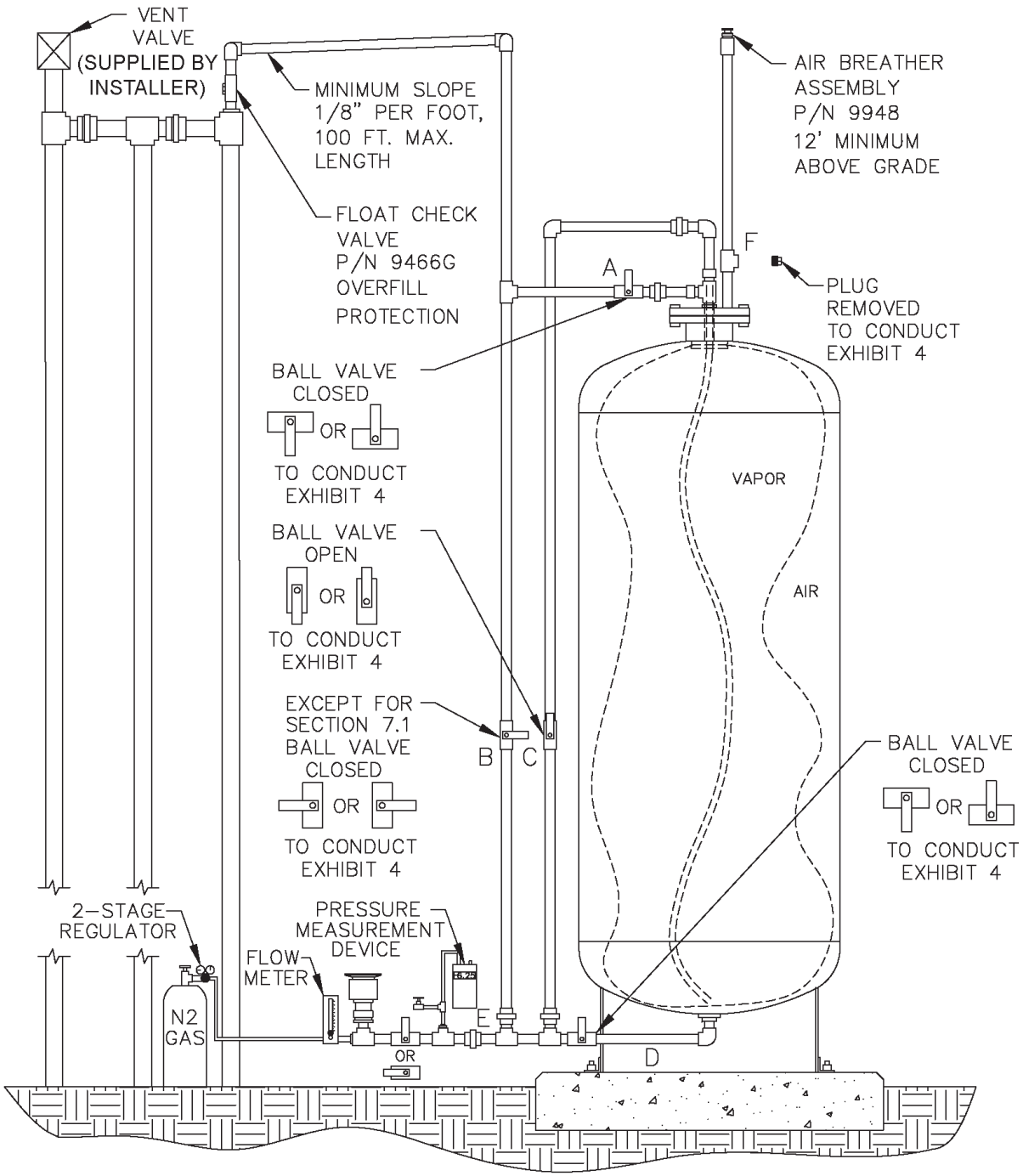
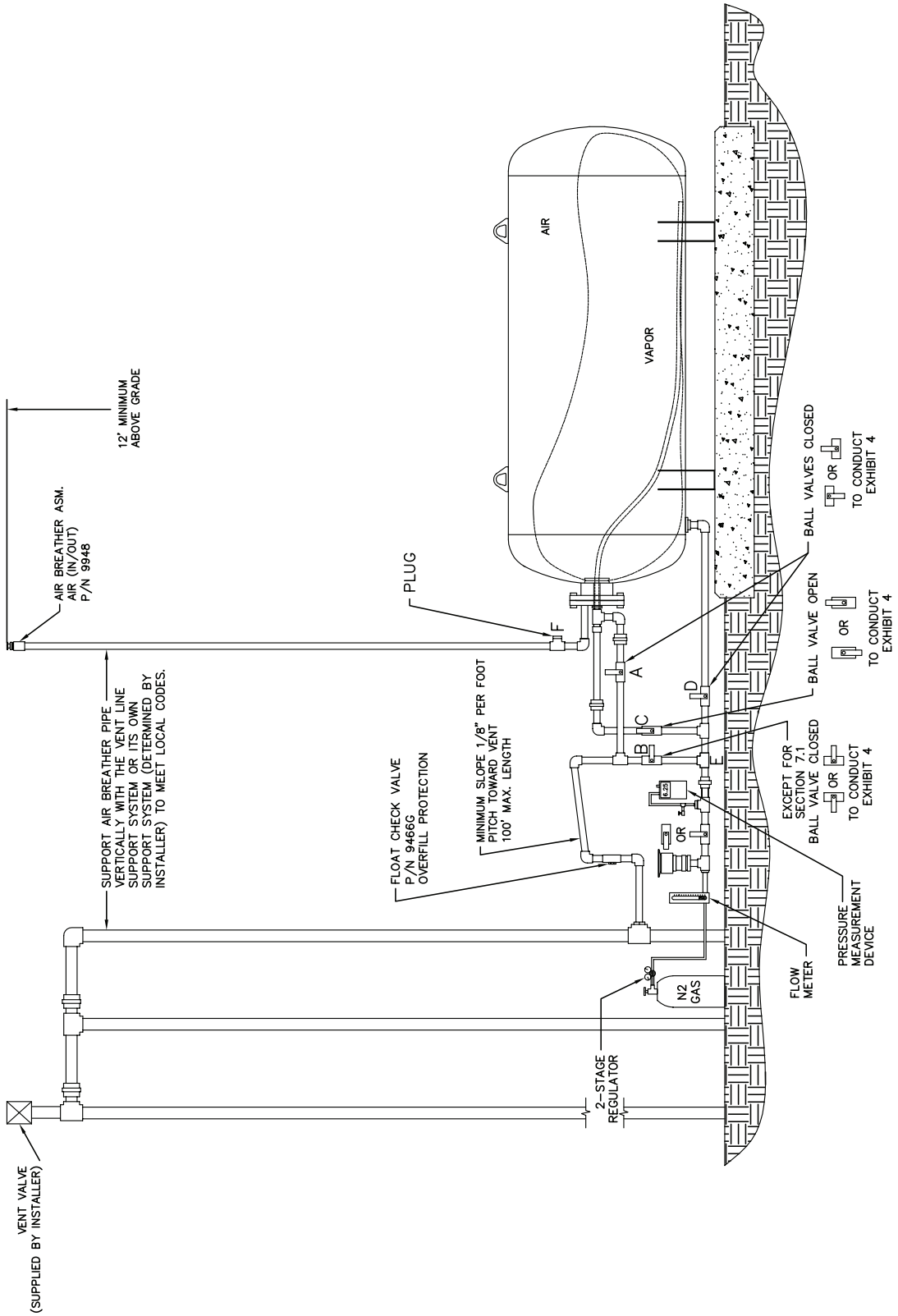


Figure 2H

Clean Air Separator in Configuration to Conduct Test



7 TESTING

7.1 Open the ball valve marked “B” from Figure 2 or Figure 2H. The pressure measurement device installed on the Test Port Assembly should now be reading UST and Clean Air Separator ullage pressure (or vacuum).

7.2 If the station vacuum is greater than (more negative) than -2.00” wc, then proceed to Section 7.2.1. If less than –2.00” wc, then proceed to Section 7.3:

7.2.1 Close the ball valves marked “A” and “B” from Figure 2.

7.2.2 Open the ball valve marked “C” from Figure 2 and wait one minute.

7.2.3 If necessary, use the needle valve on the Test Port Assembly to bleed air into the bladder until the vacuum level reaches as close to a whole number on the pressure measurement device as the accuracy of the device will provide (ie. -2.00, -3.00, -4.00, -5.00, -6.00, -7.00, -8.00). Make sure the needle valve is closed. Record this vacuum and start the stop watch to begin a 5 minute decay.

7.2.4 Record the vacuum at one-minute increments up to 5 minutes.

7.2.5 Using the information from Table 1, verify that the vacuum after 5 minutes is equal to or greater than the allowable minimum for the initial vacuum recorded from Section 7.2.3.

7.2.6 If the vacuum is greater than the allowable minimum, the Clean Air Separator passed the test.

7.2.7 If the vacuum is less than the allowable minimum, the Clean Air Separator failed the test.

TABLE 1
Allowable 5 Minute Vacuum Decay for Clean Air Separator

Vacuum at Start of Test (inches wc)	Allowable Minimum Vacuum after 5 min. (inches wc)
8.0	5.5
7.0	4.7
6.0	3.8
5.0	3.0
4.0	2.2
3.0	1.5
2.0	0.8

7.3 If the station vacuum is less than –2.00” wc (from Section 7.2), or at the direction of district (refer to Section 2.2), conduct the following:

7.3.1 Close the ball valves marked “A” and “B” from Figure 2.

7.3.2 Open the ball valve marked “C” from Figure 2.

7.3.3 Open the ball valve of the Test Port Assembly and flow nitrogen into the Clean Air Separator bladder at a flow rate between 2 and 4 CFM until the pressure in the bladder reaches 2.20” wc.

7.3.3.1 Depending upon the nitrogen flow rate used, the bladder could take up to 30 minutes to fill completely.

7.3.3.2 Because of the close proximity of the pressure measurement device to the nitrogen inlet of the Test Port Assembly, the pressure measurement device may read a higher pressure when nitrogen is flowing. The pressure measurement device is usually steady, but will start to increase rapidly when the bladder is getting full.

7.3.3.3 Periodically stopping nitrogen flow will provide an accurate reading of the pressure in the bladder.

7.3.4 Once the pressure reaches 2.20” wc, shut off the flow of nitrogen to the Clean Air Separator bladder and close the ball valve of the Test Port Assembly.

7.3.5 Wait 5 minutes or until pressure stabilizes above 2.00” wc. If the pressure does not stabilize, repeat steps 7.3.3 and 7.3.4.

7.3.6 Use the needle valve on the Test Port Assembly to bleed off the nitrogen until the pressure reaches 2.00” wc. Make sure the needle valve is closed. Record the pressure.

7.3.7 Start the stop watch to begin a 5 minute decay.

7.3.8 Record the pressure in one-minute increments up to 5 minutes.

7.3.9 If the pressure in the bladder is greater than 1.77” wc at the end of 5 minutes, then the Clean Air Separator passed the test.

7.3.10 If the pressure in the bladder is less than 1.77” wc at the end of 5 minutes, then the Clean Air Separator failed the test.

7.4 If the bladder was evaluated using the vacuum procedure (Section 7.2), close the ball valve “C” to keep it in a vacuum condition. If the bladder was evaluated using the pressure procedure (Section 7.3), open the needle valve on the Test Port Assembly to bleed off all pressure from the bladder.

7.5 Close the ball valve marked “C”, if not already done.

7.6 Remove the Test Port Assembly from location “E” and install the 1” pipe plug. Use a pipe sealant approved for use with gasoline on the threads and tighten to 60 ft-lbs.

7.7 Install the 1” pipe plug to location “F”. Use a pipe sealant approved for use with gasoline on the threads and tighten to 60 ft-lbs.

7.8 Open the ball valve marked “A”. Lock all ball valves using the padlocks.

7.9 The Clean Air Separator should now be in normal operation configuration. Verify this by using the outline from Section 6.7 and Figure 1 or Figure 1H.

8 REPORTING

8.1 Record test data on the form shown in Figure 3. Districts may require the use of an alternate form, provided that the alternate form includes the same minimum parameters as in Figure 3.

Figure 3

Data Form for Determination of Static Pressure Performance of the Healy Clean Air Separator for Executive Order VR-209-A

SOURCE INFORMATION	
GDF Name and address _____ _____ _____	GDF Represenative and title _____ _____ GDF Phone No. _____
Date and Time of Last Fuel Drop to GDF: _____ Date of Last Calibration of Pressure Measurement Device: _____	P/O #: _____ A/C#: _____ District Test Witness: _____

VACUUM TEST (Section 7.1 through 7.2.7)	
Vacuum at start of test, inches water column (7.2.3)	_____
Vacuum at one minute, inches water column	_____
Vacuum at two minutes, inches water column	_____
Vacuum at three minutes, inches water column	_____
Vacuum at four minutes, inches water column	_____
Final vacuum at five minutes, inches water column	_____
Allowable minimum vacuum, inches water column (from Table 1)	_____

POSITIVE PRESSURE TEST (Section 7.3 through 7.3.9)	
Pressure at start of test, inches water column (7.3.6)	_____
Pressure at one minute, inches water column	_____
Pressure at two minutes, inches water column	_____
Pressure at three minutes, inches water column	_____
Pressure at four minutes, inches water column	_____
Final pressure at five minutes, inches water column	_____
Allowable final pressure, inches water column (7.3.9)	1.77

Healy Certified Technician Name, Certification Number and Expiration Date	Test Company	Date Test Conducted