



**CALIFORNIA**  
AIR RESOURCES BOARD

**CARB Approved**

**Installation, Operation and Maintenance Manual**

for

Executive Order

VR-202-Z

(Assist Phase II EVR System

Including

In-Station Diagnostic (ISD) Systems)

## NOTICE:

The **CARB Approved Installation, Operation and Maintenance Manual for VR-201 and VR-202** describes the tools, method and skill levels required to install both the **Assist Phase II EVR System Not Including ISD, CARB Executive Order VR-201** and the **Assist Phase II EVR System Including ISD Systems, CARB Executive Order VR-202**.

In addition to the training requirements below, the contractor is responsible for providing the warranty tag, included with each component, to the service station owner/operator at the time of installation. Additional certification may be required in accordance with local district requirements.

Unless specified otherwise, only skilled technicians that are trained, certified and licensed by Franklin Fueling Systems (i.e. Healy or INCON Certified Technicians) are able to perform installation, maintenance or repairs of components manufactured by Franklin Fueling Systems or warranty will be void. However, GDF Owner / Operator can remove and install hanging hardware (nozzle, curb hose, breakaway, flow limiter and whip hose).

It is the responsibility of each Healy Certified Technician to be familiar with the current requirements of state, federal, local codes and air district rules and regulations for installation and repair of gasoline dispensing equipment.

It is also the responsibility of the Healy Certified Technician to be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

Unless specified otherwise, only skilled technicians that are trained, certified and licensed by Veeder-Root are able to perform installation, maintenance or repairs of components manufactured by Veeder-Root, or warranty will be void.

It is the responsibility of each Veeder-Root technician to be familiar with the current requirements of state, federal, local codes and air district rules and regulations for installation and repair of gasoline dispensing equipment.

It is also the responsibility of the Veeder-Root technician to be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

It is the responsibility of each INCON Certified Technician to be familiar with the current requirements of state, federal, local codes and air district rules and regulations for installation and repair of gasoline dispensing equipment.

It is also the responsibility of the INCON Certified Technician to be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

It is the responsibility of each Certified Permeator Technician (CPT) to be familiar with the current requirements of state, federal, local codes and air district rules and regulations for installation and repair of gasoline dispensing equipment.

It is also the responsibility of the CPT to be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

Unless specified otherwise, only skilled technicians that are trained, certified and licensed by ARID Technologies, Inc. (ARID) are able to perform installation, maintenance or repairs of components manufactured by ARID or warranty will be void.

A copy of the Veeder-Root In-Station Diagnostic System Troubleshooting Guide can be found at

<http://www.veeder.com/object/577013-819.html>.

A Copy of the INCON VRM Troubleshooting and Diagnostics Guide can be found at

[http://www.franklinfueling.com/service/pdfs/fms/0000529\\_VRM\\_TroubleshootingGuide.pdf](http://www.franklinfueling.com/service/pdfs/fms/0000529_VRM_TroubleshootingGuide.pdf).

A copy of the Healy EVR Troubleshooting Guide can be found at

[http://www.franklinfueling.com/service/pdfs/dis/405274001\\_HealyEVR\\_TroubleshootingGuide.pdf](http://www.franklinfueling.com/service/pdfs/dis/405274001_HealyEVR_TroubleshootingGuide.pdf).

To confirm a Healy or INCON Certified Technician training status, a regulator can access a searchable database at the following web site:

<http://techlab.franklinfueling.com>

To confirm Veeder-Root TLS or ISD training a regulator should send an email to [technicaltraining@gilbarco.com](mailto:technicaltraining@gilbarco.com) with the name (and company) of the ASC to obtain verification of the ASC TLS/ISD training status or call 800-997-7725 and press “4” to get to the Veeder-Root menu and then “\*” to speak to a representative or sign on to the Gilbarco Learning Suite at

<http://wise.gilbarco.com>.

To confirm a CPT training status, a regulator can contact ARID Technologies, Inc. at 630-681-8500.

# TABLE OF CONTENTS

## Assist Phase II EVR System Installation, Operation and Maintenance Manual

<b>Component</b>	<b>IOM</b>	<b>Manufacturer/Model</b>
<b>Scheduled Maintenance</b>	1	Assist Phase II EVR System
<b>Nozzle</b>	2	Healy Model 900
<b>Pressure Management System Options</b> (only one per station allowed)		
<b>Option 1: Franklin Fueling Systems</b>	3	Healy Model 9961 and 9961H Clean Air Separator
<b>Option 2: ARID Technologies</b>	12	Permeator Model AT-150
<b>Inverted Coaxial Hoses</b>	4	Healy 75 Series Low Perm ContiTech Futura HVR Low Perm VST V34EV ENVIRO-LOC Low Perm
<b>Hose Adaptors</b>	5	Healy Model CX6 Series
<b>Re-connectable Breakaway Couplings</b>	6	Healy Model 8701VV Healy Model 807 Swivel Catlow Model CTMCA VST Model VST-HEVR-SBK VST Model VST-ISVR-SBK (M34 type)
<b>Flow Limiters</b>	7	Healy Model 1301 Healy Model 1302

**Dispensers with Healy Model VP1000  
Vacuum Pump**

- 8 Gilbarco Encore 300 & 500 Series  
Gilbarco GasBoy 9800 Series  
Wayne Harmony Series (Balance)  
Wayne Harmony Series (Assist)  
Wayne Ovation Series  
Wayne Vista Series  
Wayne Global Century  
Healy Universal Manual

<b>Liquid Condensate Trap<sup>1</sup></b>	9	
<b>In-Station Diagnostics (ISD) Systems<sup>2</sup></b>		
Veeder Root In-Station Diagnostics (ISD)	10	Veeder-Root ISD Install, Setup, & Operation Manual  Veeder-Root ISD Vapor Flow Meter Installation Manual  Veeder-Root ISD Pressure Sensor Installation Guide  Veeder Root TLS RF Wireless 2 Systems (W2) Installation and Maintenance Guide
INCON/FFS Vapor Recovery Monitoring (VRM)	11	INCON Vapor Recovery Monitoring (VRM) Installation, Operation, & Maintenance Manual  INCON Vapor Flow Meter (VFM) Installation Guide  INCON Vapor Pressure Sensor (VPS) Installation Guide  INCON Data Transfer Unit Dispenser Retrofit Manual  INCON Console DTU (Data Transfer Unit) Installation Instructions  INCON/FFS Thermal Printer Model TSSP- TMPTR Retrofit/Installation Instructions

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<sup>1</sup> Component optional for vapor recovery system configuration; other requirements may apply

<sup>2</sup> All components listed under ISD components of the Table of Contents are ONLY applicable to Executive Order VR-202 (Assist Phase II EVR System with In-Station Diagnostics Systems).

# Systems Scheduled Maintenance

## 1. Assist Phase II EVR System

Scheduled Maintenance Instructions for an Assist Phase II EVR System with VP1000 Vacuum Source and 900 Series EVR Nozzle.

Initial problems are usually caused by installation irregularities that are easily detected and repaired by performing the “VP1000 Vacuum Performance Test Procedure” located in the dispenser installation manual. Periodic maintenance described here will eliminate problems and maintain peak operation of the system.

**NOTE:** Only a Certified Technician can service any problems discovered while conducting the Weekly or Quarterly Inspection and Testing. Provided that there are no other local district requirements, a GDF Owner / Operator can remove and install nozzles, curb hoses, breakaways, flow limiters and whip hoses without a manufacturer certification. Additional certifications may be required in accordance with local district requirements.

### 1.1. Weekly Inspection and Testing

- 1.1.1. Inspect each nozzle, hose, and breakaway for damage, loose connections, or leaks. Inspect nozzles for damaged vapor boots or spouts. Any nozzle with a vapor collection boot which is missing, or which has one half of the mini-boot faceplate or greater missing should be replaced or repaired as soon as practicable. Spouts with visible damage must be replaced.

Inspect hoses for wear, severe kinks, cracks, and splitting. Replace if wire braid is visible.

- 1.1.2. Test the VP1000 Vacuum Pump for normal operation using the following test procedure:

- Normal operation will have the VP1000 Vacuum Pump running at low speed if only one side of a dispenser / pump is activated (ready to dispense fuel) and will run at full speed if both sides of the dispenser are activated (ready to dispense fuel). The VP1000 vacuum pump may continue to run for a few seconds after a nozzle is re-holstered.

**NOTE:** If any of the four bullets below cannot be achieved, tag out dispenser and call a Healy Certified Technician for service.

- The VP1000 vacuum pump should come on immediately when a nozzle is lifted and the dispenser is activated and ready to dispense fuel.
- Repeat for each nozzle on both sides of the dispenser being tested, one at a time, to verify the VP1000 vacuum pump is running after the dispenser is activated and ready to dispense fuel.

**NOTE:** For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the VP1000 activates for all grades on the same side.

- Leave one nozzle activated on the first side and with the pump running, lift a nozzle on the other side of the dispenser (activated as above) and listen for a change of speed (increase) in the pump motor. Return both nozzles to the dispenser.
- Repeat the above procedures to activate both sides of the dispenser, but start with the opposite side of the dispenser. If the above procedures can be confirmed by starting with the opposite side of the dispenser, the VP1000 vacuum pump is correctly installed. After the VP1000 vacuum pump gets to second speed, it will not drop back to single speed until one nozzle is reholstered.

**NOTE: In parts of the country where the outside temperature drops below 35°F, the VP1000 vacuum pump motor will automatically run at a very low RPM to prevent freezing. This is normal operation.**

## 1.2. Quarterly Inspection and Testing

- 1.2.1. Perform Weekly Inspection prior to Quarterly inspection.
- 1.2.2. Inspect the VP1000 vacuum pump for loose or damaged vapor line connections. If copper tubing is kinked or loose remove the dispenser from service and call a Healy Certified Technician for service.
- 1.2.3. Verify that the nozzle will not dispense fuel when the dispenser is authorized (ready to dispense fuel) and the boot is in a free state. To conduct this inspection, remove the nozzle from dispenser, authorize dispenser, hold nozzle into an approved container (do not compress the mini-boot in any manner) and actuate the nozzle lever. No fuel should dispense. Any nozzle that dispenses fuel with the miniboot in a free state condition, as determined by this inspection procedure, shall be removed from service until repaired or replaced.
- 1.2.4. Check product dispensing flow rate at maximum (handheld) dispensing position. Verify flow rate is between 6.0 gpm and 10.0 gpm.
  - Replace dispenser filters when flow rate is below 6.5 gpm and check flow rate again. If the flow rate does not increase after filter change, remove the fueling point from service.
  - If flow rates exceed 10.0 gpm, install either Healy Model 1301 or 1302 Flow Limiter and check flow rate again. If flow rate still exceeds 10.0 gpm, remove the fueling point from service.

**Note:**

If CAS is installed at GDF, conducted section 1.2.5 of Quarterly Inspection. If ARID Permeator AT-150 is installed at GDF, skip section 1.2.5 and proceed to section 1.2.6.

- 1.2.5. Check Clean Air Separator for proper operating configuration. See Figure 1-1 or 1-1H for guidance. Figure 1-1 applies to vertical CAS installations. Figure 1-1H applies to horizontal CAS installations.
- 1.2.6. Verify the total hours of Permeator AT-150 operation since the last oil change and



replace oil (or schedule oil maintenance from ARID Certified Permeator Technician) if oil change is warranted. The maintenance interval for draining and replacing the oil is every 5,000 hours (or once a year). If the oil level is low prior to the oil change interval, the owner/operator can 'top up' the oil level (See ARID Permeator AT-150 section of IOM for Procedure). Only ARID Part Number AT-11 oil is authorized for usage in the Permeator AT-150.

### 1.3. Annual Inspection and Testing to Be Performed By a Certified Technician.

The following procedures are recommended to be conducted in the order listed.

- 1.3.1. Perform weekly and quarterly inspection prior to Annual Inspection.
- 1.3.2. For GDF installations with CAS installed, conduct static pressure performance of the Healy Clean Air Separator (EO VR-201 or VR-202, Exhibit 4).
- 1.3.3. Conduct pressure decay test (TP-201.3 and EO VR-201 or VR-202, Exhibit 8).
- 1.3.4. For GDF installations with ARID Permeator AT-150 installed, conduct Permeator compliance procedure (EO VR-201 or VR-202, Exhibit 15).
- 1.3.5. Conduct dispenser vapor line integrity test (Section B-3 of the Start-up / New Installation / Warranty / Annual Testing Form) found in the Healy dispenser manual for each dispenser at GDF. Repair all leaks.
- 1.3.6. Conduct V/L test on all nozzles (EO VR-201 or VR-202, Exhibit 5 or a CARB approved alternate test procedure). Adjust and replace as necessary.

### 1.4. Procedure for Operator Reconnection of Breakaway and Testing Fueling Point after Drive-Off.

**Note:** The following reconnection procedure does not require a Certified Technician as long as the components pass inspections and tests. If any of the tests fail, requiring removal of the fueling point or dispenser from service, contact a Certified Technician for repairs. Breakaway reconnections and/or service by the GDF owner/operator or a Certified Technician shall be entered into the GDF Maintenance Log.

#### 1.4.1. **Inspection:**

After a Drive-Off, remove the dispenser from service and inspect the nozzle, hoses and breakaway for damage. If any of the components are damaged, replace them as necessary or contact a certified technician for repair. If the break-away has separated, proceed to the next section.

**Note:** For Healy breakaways only, verify that the tip of the shear screw installed prior to the Drive-Off is removed from the dispenser end body (inlet) of the breakaway. If the tip cannot be removed, the breakaway must be replaced.

#### 1.4.2. **Break-Away Reconnection:**

Reconnect the breakaway assembly per the procedure in the Re-connectable Breakaway Coupling section of the CARB Approved Installation, Operation and Maintenance Manual.

#### 1.4.3. **Liquid Leak and Meter Creep Test:**

Authorize the fueling position, purge any air from the fueling position by dispensing at least two gallons of product into an approved container, and then inspect the hanging hardware for liquid leaks and/or meter creep.

**Note:** With the fueling position still authorized and no product dispensing, the fueling position gallon display should not count up for at least two minutes while extending and twisting the hanging hardware to inspect for liquid leaks and/or meter creep.

If no liquid leaks or meter creep are observed, proceed to section 1.4.4 of this procedure. If liquid leaks or meter creep are observed the operator may replace the curb hose, and/or nozzle, and/or breakaway, and/or whip hose, using the installation procedures and functional tests specified in the applicable CARB Approved Installation, Operation and Maintenance Manual (IOM), and re-conduct the liquid leak and meter creep test. If liquid leaks or meter creep are observed after replacement of the equipment, leave the dispenser out of service and contact a Certified Technician for repairs.

#### 1.4.4. **Nozzle Bag Test:**

Conduct the Nozzle Bag Test using the procedure from Exhibit 7 of Executive Order VR-201 or VR-202. If the bag around the nozzle does not collapse, proceed to section 1.4.5 of this procedure. If the nozzle bag test fails, the operator may replace the nozzle using the installation procedures and functional tests specified in the IOM.

#### 1.4.5. **Insertion Interlock and Automatic Shutoff Tests:**

- Test the insertion interlock feature of the nozzle using the procedures outlined in Sections 1.1.7 and 1.1.8 in the Healy Model 900 Nozzle section of the IOM. If the nozzle fails either of these tests, the operator may replace the nozzle using the installation procedures and functional tests specified in the IOM.
- Test the automatic shutoff feature of the nozzle using the procedures outlined in Sections 1.2.8, 1.2.9 and 1.2.10 in the Healy Model 900 Nozzle section of the IOM. If the nozzle fails any of the tests, the operator may replace the nozzle using the installation procedures and functional tests specified in the IOM.

**FORM 1**

**VR-201 and VR-202 - Weekly Inspection and Testing Checklist (1.1)**

Checklist results may be used to assist with filling out GDF maintenance log.

Date: \_\_\_\_\_ Page \_\_\_\_ of \_\_\_\_

Section:		1.1.1			1.1.2	
Dispenser Number	Unihose or Fuel Grade (circle one)	Nozzle Inspection (circle one)	Hose Inspection (circle one)	Breakaway Inspection (circle one)	VP1000 Vacuum Pump Normal Operation (circle one)	
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No
	Unihose 87 89 91	Pass Fail	Pass Fail	Pass Fail	Yes	No

**FORM 2**

**VR-201 and VR-202 - Quarterly Inspection and Testing Checklist (1.2)**

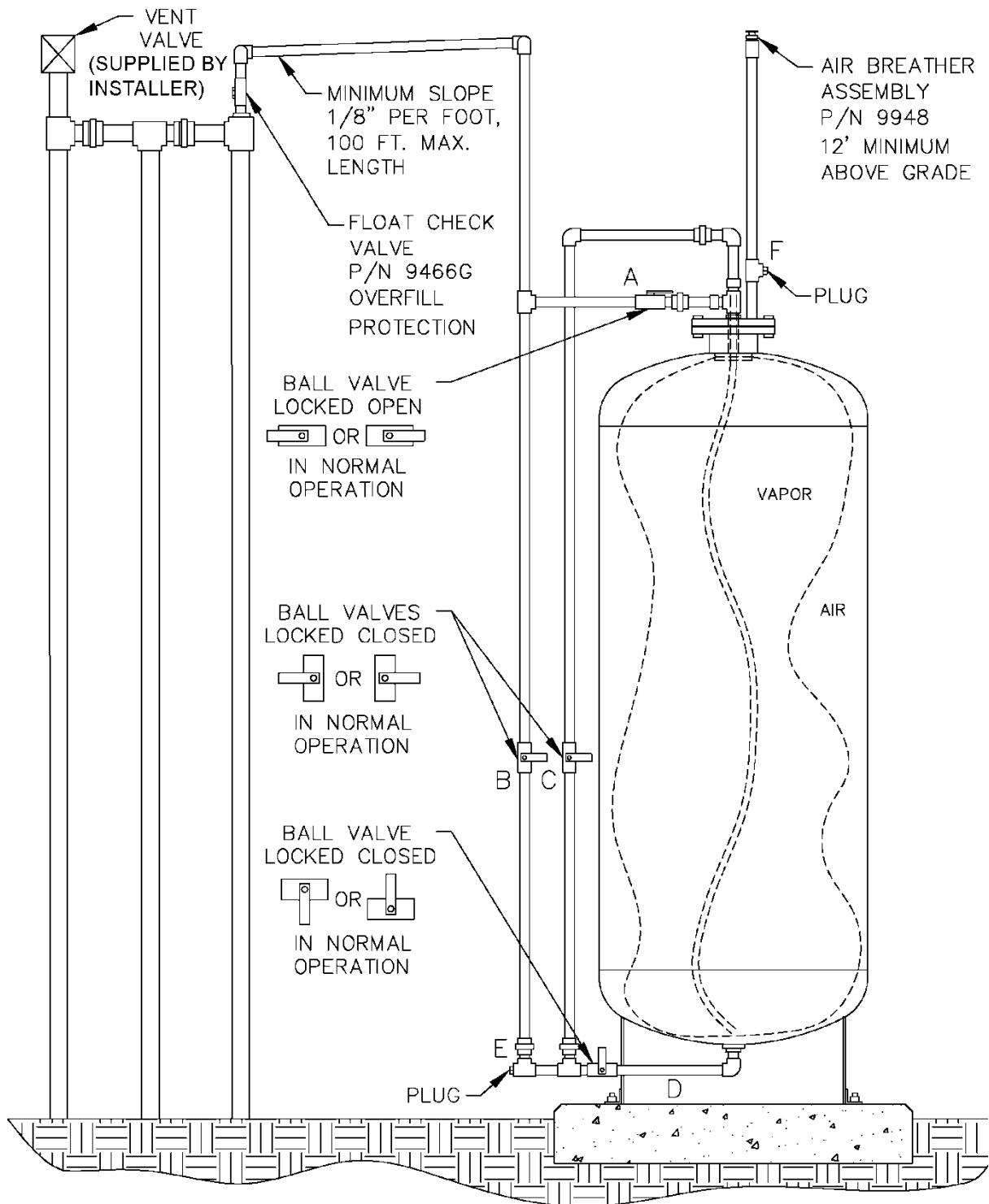
Checklist results may be used to assist with filling out GDF maintenance log.

Date: \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_

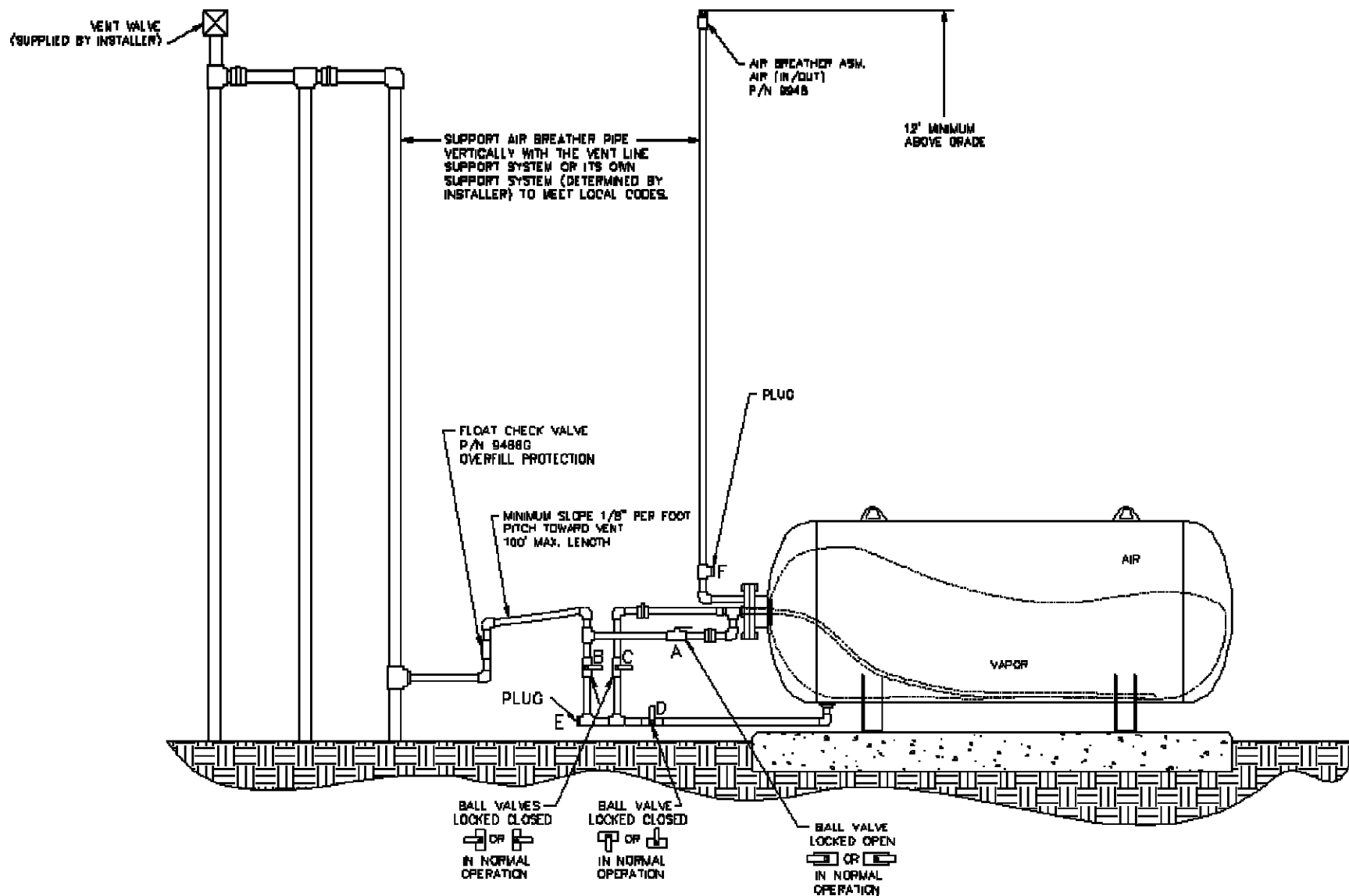
Section:		1.2.1	1.2.2	1.2.3	1.2.4	1.2.5			
Dispenser Number	Unihose or Fuel Grade (circle one)	Fuel Grade Tested (circle one)	Weekly Inspection Complete (circle one)	VP1000 Inspection (circle one)	Nozzle Dispensing Check (circle one)	Product Dispensing Rate	Clean Air Separator Configuration* (see FIGURES 1 and 1H)		
							Valve	(Circle one)	
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM	A	Open	Closed
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM	B	Open	Closed
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM	C	Open	Closed
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM	D	Open	Closed
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM	* Section 1.2.5 only Applicable for GDF with CAS Installed.		
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM	Plug	(Circle one)	
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM	E	Installed	Missing
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM	F	Installed	Missing
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM			
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM			
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM			
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM			
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM			
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM			
	Unihose 87 89 91	87 89 91	Yes No	Pass Fail	Pass Fail	GPM			

**FIGURE 1-1**  
**Normal Clean Air Separator Operating Configuration<sup>1</sup>**



<sup>1</sup> Vent stack configuration may be different than what is shown in this figure

**FIGURE 1-1H**  
**Normal Horizontal Clean Air Separator Operating Configuration<sup>2</sup>**



<sup>2</sup> Vent stack configuration may be different than what is shown in this figure

**FORM 3**

**VR-201 and VR-202 - Annual Inspection and Testing Checklist (1.3)**

Checklist results may be used to assist with filling out GDF maintenance log.

Date: \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_

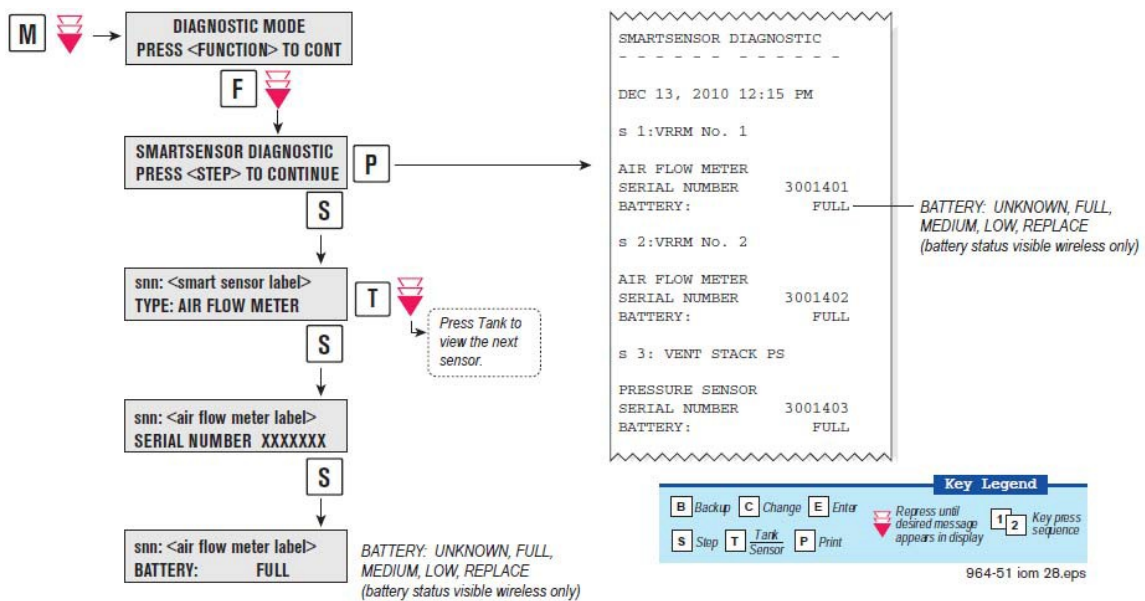
Section:	1.3.1	1.3.2 or 1.3.4	1.3.3	1.3.5			1.3.6			
		CAS, Exhibit 4 Or Permeator, Exhibit 15 (circle one)	Pressure Decay Test, TP-201.3 & Exhibit 8 (circle one)	Dispenser Number	Dispenser Vapor Line Tightness Test (circle one)	Fuel Grade Tested (circle one)			Nozzle V/L Test, Exhibit 5 (Circle one)	
<b>Complete Weekly Inspection Checklist</b>	<b>Complete Quarterly Inspection Checklist</b>	Pass	Pass		Pass Fail	87 89 91	Pass	Fail		
					Pass Fail	87 89 91	Pass	Fail		
					Pass Fail	87 89 91	Pass	Fail		
					Pass Fail	87 89 91	Pass	Fail		
					Pass Fail	87 89 91	Pass	Fail		
					Pass Fail	87 89 91	Pass	Fail		
					Pass Fail	87 89 91	Pass	Fail		
	Fail	Fail		Pass Fail	87 89 91	Pass	Fail			
				Pass Fail	87 89 91	Pass	Fail			
				Pass Fail	87 89 91	Pass	Fail			
				Pass Fail	87 89 91	Pass	Fail			
				Pass Fail	87 89 91	Pass	Fail			
				Pass Fail	87 89 91	Pass	Fail			
				Pass Fail	87 89 91	Pass	Fail			

## 2. VEEDER ROOT In-station System Diagnostic (ISD) System (only for VR-202)

### 2.1. Veeder-Root Wireless Sensor Annual Battery Check

You can get the battery status from the TLS-350 (with software Version 30A or higher). The battery status is displayed for the wireless sensors, from the Smart Sensor Diagnostics (see Figure below). The wireless sensors' battery status can also be printed from this screen. The battery status for the wireless sensors is reported as Full, Medium, Low or Replace.

**FIGURE 1-2  
Battery Check on the TLS Console**



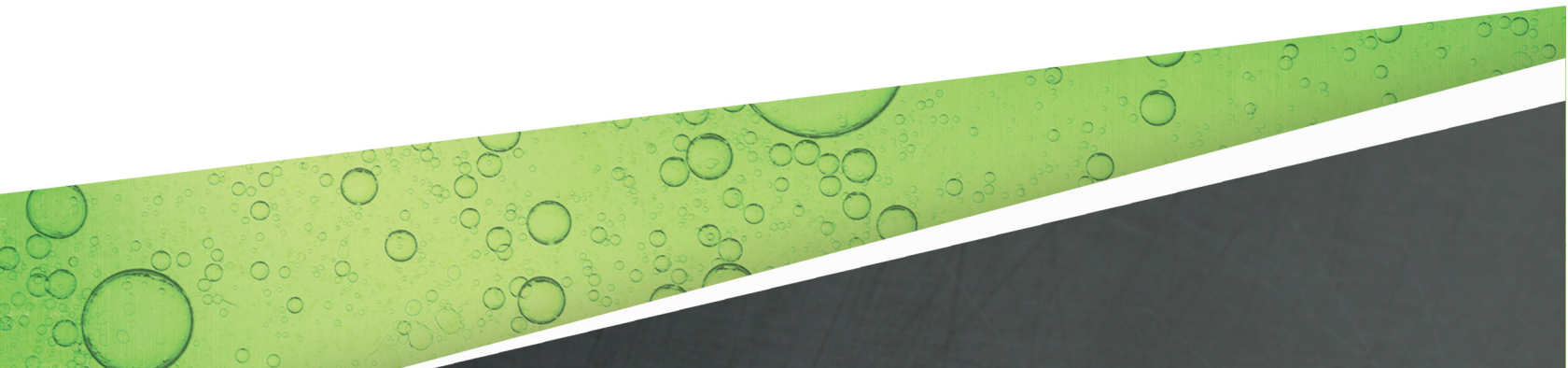
**FORM 4**

VR-202 Annual Battery Check for Veeder-Root Wireless Sensors (2.1)						
Date: _____						
Smart Sensor Device (S/N)			Battery Status			
No.	FLOW METER	PRESSURE SENSOR	FULL	MEDIUM	LOW	REPLACE



# HEALY™ 900 SERIES NOZZLE

## SERVICE GUIDE



The information in this publication is provided for reference only. While every effort has been made to ensure the reliability and accuracy of the information contained in this manual at the time of printing, we recommend that you refer to "franklinfueling.com" for the most current version of this manual. All product specifications, as well as the information contained in this publication, are subject to change without notice. Franklin Fueling Systems does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of, or in any way connected with, installation, operation, use, or maintenance by using this manual. Franklin Fueling Systems assumes no responsibility for any infringement of patents or other rights of third parties that may result from use of this manual or the products. We make no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

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China: +86.10.8565.4566

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# Contents

- Introduction .....1
- Conventions used in this manual .....1
- Questions and concerns .....1
- Operating precautions .....2
- Field repair procedures.....3
- Illustration and replaceable parts.....3
- Replacing the mini-boot .....4
- Removing the mini-boot.....4
- Installing the new mini-boot .....4
- Replacing the mini-boot for nozzles with EOR spouts .....5
- Replacing the spout assembly .....5
- Installing the new spout assembly .....5
- Testing the new spout assembly .....6
- Replacing the scuffguard .....6
- Replacing the handle cover .....7
- Replacing the handguard.....7
- Replacing the lever .....7
- Testing the vapor to liquid ratio.....9
- Test procedure .....10
- Adjusting the V/L ratio .....11

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# Introduction

## Conventions used in this manual

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This manual includes safety precautions and other important information presented in the following format:

**NOTE:** This provides helpful supplementary information.

**IMPORTANT:** This provides instructions to avoid damaging hardware or a potential hazard to the environment, for example: fuel leakage from equipment that could harm the environment.

**⚠ CAUTION:** This indicates a potentially hazardous situation that could result in minor or moderate injury if not avoided. This may also be used to alert against unsafe practices.

**⚠ WARNING:** This indicates a potentially hazardous situation that could result in severe injury or death if not avoided.

**⚠ DANGER:** This indicates an imminently hazardous situation that will result in death if not avoided.

## Questions and concerns

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In case of emergency, follow the procedures established by your facility. If you have questions or concerns about safety or need assistance, use the information below to contact Franklin Fueling Systems:

Web: [franklinfueling.com](http://franklinfueling.com)

Telephone:

USA and Canada: +1.608.838.8786, +1.800.225.9787

USA Technical Support: 1.800.984.6266

UK: +44 (0) 1473.243300

Mexico: 001.800.738.7610

France: +33 (0) 1.69.21.41.41

China: +86.10.8565.4566

## Operating precautions

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Franklin Fueling Systems (FFS) equipment is designed to be installed in areas where volatile liquids such as gasoline and diesel fuel are present. Working in such a hazardous environment presents a risk of severe injury or death if you do not follow standard industry practices and the instructions in this manual. Before you work with or install the equipment covered in this manual, or any related equipment, read this entire manual, particularly the following precautions:

**⚠ CAUTION:** Use only original FFS parts. Substituting non-FFS parts could cause the device to fail, which could create a hazardous condition and/or harm the environment.

**⚠ WARNING:** Follow all codes that govern how you install and service this product and the entire system. Always lock out and tag electrical circuit breakers while installing or servicing this equipment and related equipment. A potentially lethal electrical shock hazard and the possibility of an explosion or fire from a spark can result if the electrical circuit breakers are accidentally turned on while you are installing or servicing this product. Refer to this manual (and documentation for related equipment) for complete installation and safety information.

**⚠ WARNING:** Follow all federal, state, and local laws governing the installation of this product and its associated systems. When no other regulations apply, follow NFPA codes 30, 30A, and 70 from the National Fire Protection Association. Failure to follow these codes could result in severe injury, death, serious property damage, and/or environmental contamination.

**⚠ WARNING:** Always secure the work area from moving vehicles by using a service truck (or some other vehicle) to block access to the work area.

**⚠ WARNING:** Discharge static electricity from the product before you install it, and make sure it is properly grounded while in service.

**⚠ WARNING:** Make sure you check the installation location for potential ignition sources such as radio waves, ionizing radiation, and ultrasound sonic waves. If you identify any potential ignition sources, you must make sure safety measure are implemented.

# Field repair procedures

Only an FFS certified technician can service problems discovered while conducting the weekly or quarterly inspection and testing. Provided that there are no other local district requirements, a GDF owner/operator can remove and install nozzles, curb hoses, breakaways, flow limiters, and whip hoses without a manufacturer certification. Additional certifications may be required in accordance with local district requirements.

## Illustration and replaceable parts

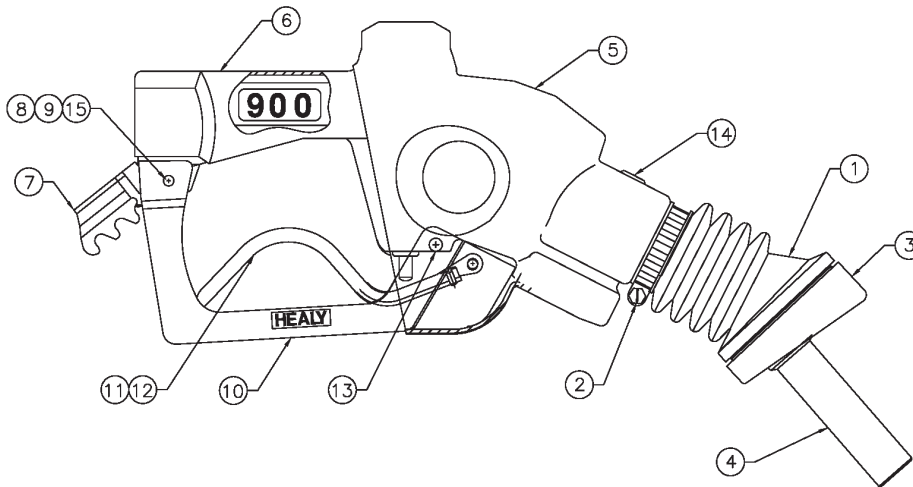


Image Reference	Part Number	Description
1	6395B (for use with 8155 spout)	900 Mini-Boot Assembly
	405219906 (for use with 405220901 spout)	
2	640956	Mini-Boot Clamp
3	279A	Face Seal Assembly with Wire
4	8155 or 405220901	Spout Assembly (Includes 900 mini-boot)
5	(Contact FFS Technical Support)	Scuffguard, Assorted Colors
6	469	Handle Cover
7	6238 (3-position) or 6238-2 (2-position)	Hold Open Clip*
8	239-L	Rear Guard Pin
9	6249	Spring*
10	6358	Handguard
11	235-C	Lever Cover
12	6130-4	Lever Assembly*
13	219	Front Guard Rivet*
14	6102A	Spout Screw & O-ring
15	240SS	Pal Nut

\* Order HEALY™ part number Z057 or Z058 Hold-Open Clip Kit. (This includes HEALY™ part numbers: 6238 (Z057) or 6238-2 (Z058) Hold-Open Clip, 239-L Rear Guard Pin, 6249 Spring, 6130-4 Lever Assembly, 240SS Pal Nut, and 219 Front Guard Rivet.)

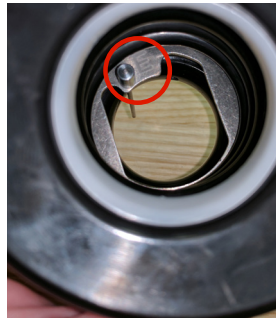
# Replacing the mini-boot

**NOTE:** There are two mini-boot and spout assemblies. These assemblies are not interchangeable! Please use the following table to install the correct mini-boot.

900 Mini-Boot Assembly	Spout Assembly
6395B	8155
405219906	405220901

## Replacing the mini-boot for nozzles with EOR spouts

The Mini-Boot Assembly for nozzles with the Enhanced ORVR Recognition (EOR) spout has part number 405219906. As shown below, the EOR spout has an elongated lower anchor, and the mini-boot has an "E" on the push plate inside the boot.



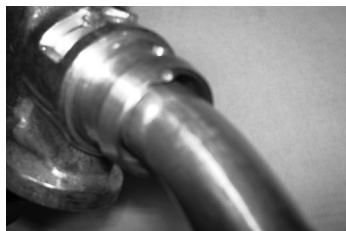
## Removing the mini-boot

1. To remove the old mini-boot, unscrew and remove the mini-boot clamp. (See image reference 2 in "Illustration and replaceable parts.")
2. Grip the mini-boot and rotate back and forth a maximum of 5 degrees in each direction while gently pulling to separate the mini-boot from the nozzle.

## Installing the new mini-boot

**NOTE:** Heating the mini-boot in water softens the material, making it easier to install.

1. Use a push rod checking tool (.050 hex wrench or 1/16" drill bit) to verify that a clear hole condition exists in the push rod hole of the spout body before proceeding.
2. Align the push rod extending from the nozzle end of the boot with the 1/16" hole in the spout body, and align the 3/16" hole in the mini-boot with the 3/16" pin on the spout body.





3. Start the push rod into the 1/16" hole and slide the boot axially into engagement with the spout body and the boot location pin while limiting angular rotation of the boot to 5 degrees in each direction to avoid bending the push rod.
4. Install the mini-boot clamp and tighten securely. Verify that the HEALY™ logo on the mini-boot is aligned with the top center of the nozzle.
5. Verify that the nozzle will not dispense fuel when the dispenser is authorized (ready to dispense fuel) and the boot is in a free state by holding the nozzle into an approved container (do not compress the mini-boot in any manner) and actuate the nozzle. No fuel should dispense. If fuel does not dispense, proceed to the next step. Any nozzle that dispenses fuel with the mini-boot in a free state condition must be repaired or replaced.
6. Verify that the nozzle will dispense fuel when the dispenser is authorized and the nozzle spout is inserted into a vehicle fill-pipe to a position 1/8" short of locking the spout anchor ring over the rim of the fill-pipe opening or manually held back while dispensing into an approved container. Any nozzle that does not dispense fuel must be repaired or replaced.

## Replacing the spout

---

**NOTE:** The following procedures require the Spout Assembly.

1. Use a Phillips screwdriver to remove the # 8 pan head spout screw and O-ring that hold the spout in place. (See image reference 14 in "Illustration and replaceable parts.")
2. With the screw removed, using a maximum twisting motion of 15 degrees in each direction, separate the nozzle body and the spout. Be sure that the three O-rings from the discarded spout assembly do not remain in the nozzle body. There is a fourth O-ring, furthest from the opening that remains inside the nozzle. Leave this O-ring in place.

### Installing the new spout

1. Install the new, pre-lubed O-rings (included with the Spout Assembly) on the new spout assembly.
2. Carefully insert the spout into the nozzle, lightly pushing together until the spout aligns itself and resistance is felt. Using a maximum twisting motion of 15 degrees and light pressure, slide the pieces together, seating the o-rings and aligning the screw threads in the spout housing with the hole in the nozzle casting.
3. Install the new # 8 panhead spout screw and O-Ring, and tighten securely to 12 inch/lbs.
4. Follow steps 5 and 6 in "Installing the new mini-boot" to test nozzle operation.

## **Testing the new spout assembly**

**IMPORTANT:** All spout replacements must be tested to ensure the installation has been completed correctly.

1. Dispense product into a container deep enough to cover the small hole near the tip of the spout and verify that the dispensing rate is between 6.0–10.0 gpm with the nozzle lever held in the full open (handheld) position. While dispensing, with the nozzle lever held in the full open (handheld) position, immerse the spout until the hole is covered. If shutoff does not occur, turn off the dispenser, remove the spout, and check the o-rings. Replace the O-rings (part number 6206-OR) as necessary and repeat step 4 of “Installing the new spout assembly,” and then repeat this step. If shutoff does occur, go to the next step.

**NOTE:** If repeated attempts to repair nozzle does not result in successful shut off, replace the nozzle. Contact FFS Technical Support for assistance.

2. Repeat the previous step twice (for a total of three tests) to ensure that the auto shutoff feature is working properly. There should be no hesitation to the shutoff; it should be quick and positive. If shutoff tests are successful, the nozzle can be put back into service. If either additional shutoff test fails, turn off the dispenser, remove the spout, and check the o-rings.
3. Replace the o-rings as necessary (part number 6206-OR). Repeat step 4 of “Installing the new spout assembly,” and then repeat the previous two steps.

**NOTE:** If repeated attempts to repair the nozzle does not result in successful shut off, take the nozzle out of service and replace it.

## **Replacing the scuffguard**

---

**NOTE:** The part number needed for the following procedure depends on the scuffguard color. Contact FFS Technical Support for the correct part number.

1. Use the instructions in “Removing the mini-boot” to remove the mini-boot.
2. Slide a long screwdriver under the scuffguard in the area of the main valve cap nut on the top of the nozzle. (See image reference 5 in “Illustration and replaceable parts.”)
3. Pry upward to clear the top of the main valve cap, and then pull steadily toward the spout to remove.
4. Installation is the reverse of this method. It works best with the butt of the nozzle held in a vise. In cold weather the scuffguard may not be pliable enough to use the above method, carefully (do not damage the nozzle) cut the old scuffguard off with a knife and replace it with a new, warmed, scuffguard by using the reverse of the previous step.
5. Use the instructions in “Installing the new mini-boot” to install the mini-boot and test nozzle operation.

## Replacing the handle cover

---

**NOTE:** The following procedure requires the Handle Cover (part number 469).

1. Grasp the lower edges of the handle cover, and pull the cover off with an upward motion. (See image reference 6 in “Illustration and replaceable parts.”)
2. Installation is the reverse of this procedure. Be sure the pointed wings on the front of the cover are slid under the scuffguard.

## Replacing the handguard

---

**NOTE:** The following procedure requires the Handguard (part number 6358).

1. This is best done with the nozzle detached from the hose. The front and rear guard pins must be removed. Back up the head side of the pin with a suitable socket and drive out the guard pins using a 3/32" drive pin punch or equivalent. The spring-loaded hold-open clip will pop out when the rear pin is removed. Be sure to observe the orientation of the spring so it can be properly reinstalled.
2. Remove the handguard carefully. (See image reference 10 in “Illustration and replaceable parts.”) The lever will drop down, and the lever pivot pin will be free and could possibly slide out. Place the new handguard in position and install a new front guard pin through the handguard. (See image reference 13 in “Illustration and replaceable parts.”) Do not peen at this time.
3. Position the hold-open clip over the handguard. (See image reference 7 in “Illustration and replaceable parts.”) Insert a new rear guard pin through one ear of the clip, handguard and approximately 1/8" through the casting. (See image reference 8 in “Illustration and replaceable parts.”) Slide the coil spring into position with the “hook” on the hold-open clip. (See image reference 9 in “Illustration and replaceable parts.”) Push in the spring so the pin passes through the coil and into the other ears on the casting, handguard, and clip. Be sure the hold-open clip is installed properly before peening-over the free ends of the two pins.

## Replacing the lever

---

**NOTE:** The following procedure requires the Lever Assembly (part number 6130-4).

1. Use the instructions in “Replacing the handguard” to remove the handguard and expose the lever. There is a washer around the plunger under the lever. Observe how these are installed and be sure to reuse them with the new lever.
2. With the lever released, the white plunger will pull back towards the casting and make it difficult to reinstall the pin on a new lever. Use a small screwdriver to reach through one mounting hole in the new lever and engage the hole in the plunger. Push the blade through the plunger, align the two holes, insert the pin, and remove the screwdriver to retain the lever.
3. Use the instructions in “Replacing the handguard” to reinstall the handguard.

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# Testing the vapor to liquid ratio

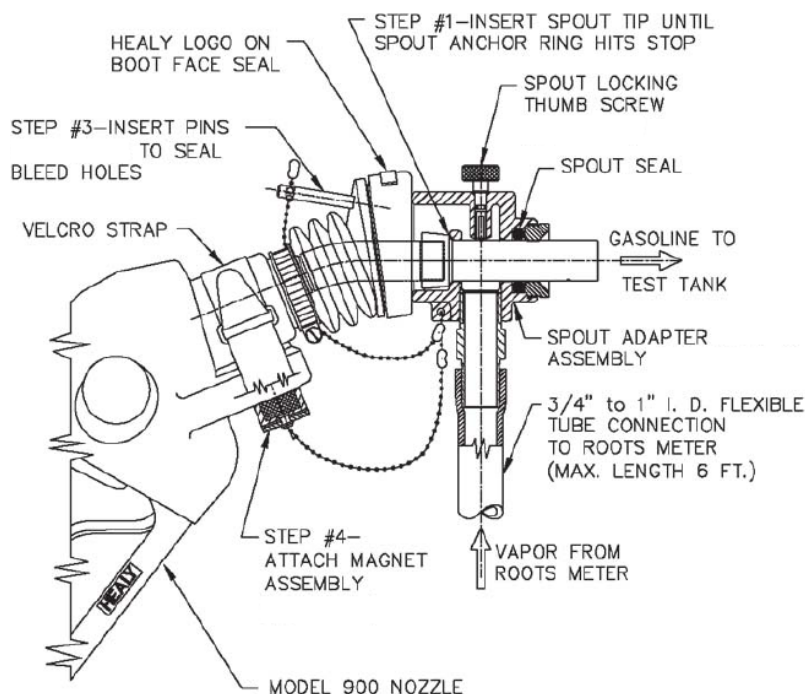
You must use an adaptor to determine the vapor to liquid (V/L) volume ration on the HEALY™ Model 900 Series Vapor Assist Nozzle. The adaptor is required to perform a V/L ratio test with Exhibit 5 of either Executive Order VR-201 or VR-202. A V/L ratio between 0.95 and 1.15 is required (at a flow rate between 6.0 gpm to 10.0 gpm).

There are three adaptors you can use to test the V/L ratio. Depending on the spout with which the nozzle you are testing is equipped, you can use the HEALY™ Adaptor Model 8034-1, the HEALY™ Adaptor Model 8034-3, or the Triangle Gold Adaptor. See the table below for correct combinations.

Nozzle	HEALY™ Adaptor Model 8034-1	HEALY™ Adaptor Model 8034-3	Triangle Gold Adaptor
HEALY™ Original Model 900	X	X	X
HEALY™ Model 900 with EOR Spout		X	X

Inspect the spout seal O-ring before you do a test. Any cuts or tears will allow air to be ingested and give an inaccurate reading.

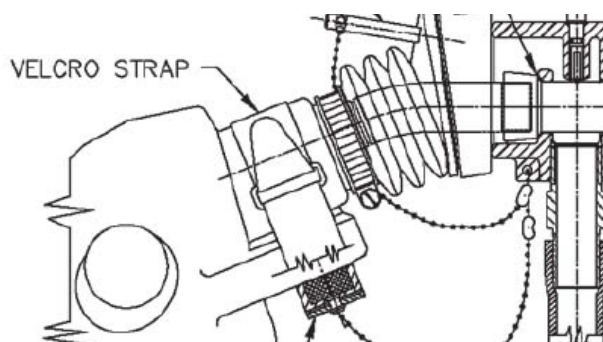
**NOTE:** Motor oil (any weight) is acceptable for lubricating the O-Ring. Contact FFS Technical Support with any questions about other lubricants you can use when you do this test.



## Test procedure

**NOTE:** Conduct all pre-tests and testing in accordance with Exhibit 5 of either Executive Order VR-201 or VR-202.

1. Slide the V/L adaptor over the spout tip and compress the boot until the spout anchor ring contacts stop in the V/L adaptor.
2. Hold the V/L adaptor in contact with the spout anchor ring and hand tighten thumbscrew to secure adaptor. The thumbscrew and HEALY™ logo on top of the nozzle boot face seal must be in vertical alignment to imitate fueling an unleaded vehicle.
3. Insert pins to seal the two bleed holes in the boot (directly behind the face seal assembly).
4. Hold the magnet assembly against the vinyl scuffguard directly below ORVR sensor housing and secure in place with the velcro strap as shown below. A vacuum level of 0.1" wc may activate the ORVR sensor, causing a substantial decrease (error) in the V/L ratio. The magnet locks out the ORVR sensor to avoid false results in V/L testing.



5. Check the strength of the magnet before fastening it to the nozzle. The magnet should be capable of holding about two pounds of weight.

**NOTE:** A typical gas cylinder safety cap weighs about 2 lbs.

6. Proceed with V/L test. If the grade point tested is not within the limit of the executive order, use the procedure in "Adjusting the V/L ratio" to adjust the V/L ratio.

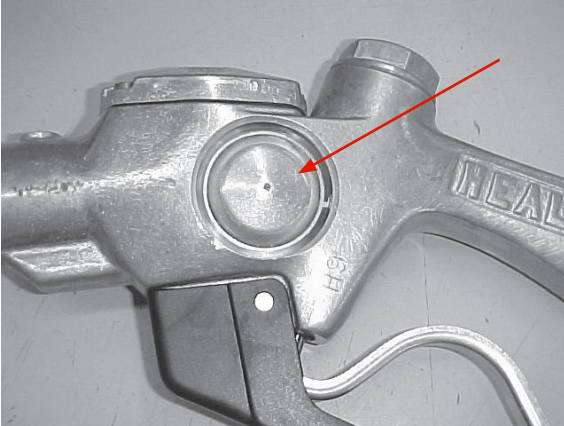
**NOTE:** If more than one nozzle share vacuum plumbing with the nozzle being tested, one troubleshooting method for a low V/L ratio is to seal all nozzles other than the nozzle being tested, using plastic bags and tape or rubber bands. If leaks in the nozzles/check valves served by a common vacuum pump cause the bags to deflate, the low V/L ratio may have been caused by a leak through an idle nozzle during the test. The V/L test to verify compliance, however, shall be conducted without "bagging" any of the nozzles.

7. Remove the seal pins and magnet assembly, loosen thumbscrew, and remove the V/L adaptor from the nozzle.

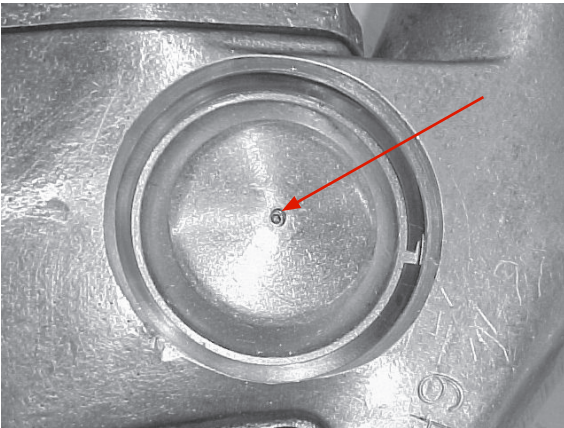
# Adjusting the V/L ratio

---

1. Remove, or pull forward, the scuffguard from the nozzle body.
2. Move the spout of the nozzle so that it faces to your left, and locate the vapor flow control valve on the side of the nozzle body. Do not remove the cover assembly.



3. Locate the opening in the center on the cover of the vapor flow control valve. Insert a .050 hex key into the center opening of the vapor valve cover assembly.



4. Turn the hex key clockwise to increase the V/L reading or counter-clockwise to decrease the V/L reading.
5. After making adjustments, the nozzle must be retested as specified in Exhibit 5, Section 7, of either Executive Order VR-201 or VR-202, for V/L readings. Repeat testing until the nozzle V/L is between 0.95 and 1.15.



# Franklin Fueling Systems



A Franklin Fueling Systems Brand

405201001 r6





# INSTALLATION INSTRUCTIONS for HEALY SYSTEMS, INC. CLEAN AIR SEPARATOR

The Model 9961 or 9961H, Healy Systems Clean Air Separator (CAS) consists of a 400 gallon steel vapor processor vessel that contains a fuel resistant bladder to hold excess gasoline vapors that may develop in gasoline storage tanks during idle periods of gasoline dispensing facility operation. Models and Drawings with a "H" suffix apply to horizontal CAS installations and those without a "H" suffix apply to vertical CAS installations. The CAS assembly weighs approximately 800 pounds which makes it necessary to have a power assisted lifting device available at the installation site to remove the CAS from the transportation vehicle and place it on the required concrete pad (see drawing 9900-9945 or 9900-9945H). The pad (level within 1/8"/foot) is located within 100 feet to the gasoline storage tank vent lines. The pad is a requirement of this installation. **DO NOT PLACE THE CLEAN AIR SEPARATOR DIRECTLY ON THE GROUND OR ASPHALT SURFACE.** NOTICE: The installer is responsible to ensure that the installation meets the latest edition requirements of NFPA 30A, Chapter 10. No electrical connections are required. The CAS securement method shown in drawing 9900-9945 or 9900-9945H shall be approved by the local authority having jurisdiction with respect to wind and seismic loading. Installer shall not loosen, rotate or remove factory installed fittings or flange as this may damage factory seals and void warranty.

In addition to the vapor processor vessel, there is a hardware kit that contains the following:

- 4 Locking 1" NPT Ball Valves
- 4 Pad locks (keyed alike)
- 1 Breather Assembly, Healy Model 9948
- 1 Float Check Valve Assembly, Model 9466G

Reference the appropriate Healy Systems installation drawing (9900-9942, 9900-9942H, 9900-9971, 9900-9971H, 9900-9972, 9900-9972H, 9900-9973 or 9900-9973H of this manual) for placement of the above parts for the vent stack configuration required by the local Authority Having Jurisdiction (AHJ) for the Underground Storage Tank (UST) system. **A flexible connection between the Clean Air Separator and the vent line(s) is allowable if required by the local Authority Having Jurisdiction (AHJ) to meet seismic requirements. Should the flex connection be installed such that it is not supported, the slope of the flex connection shall be greater than the 1/8"/foot slope required for the rest of the one inch galvanized piping.** The local contractor is responsible to provide all necessary, galvanized piping, non-hardening, UL classified pipe joint compound and plumbing fittings. Additional Pressure/Vacuum (P/V) vent valves to complete installation are not included in the hardware kit. Healy is not responsible for the warranty of any other P/V vent valve purchased to complete installation.

The CAS arrives at the site assembled and tested. All plumbing shall be done using 1" galvanized steel pipe (Schedule 40) and approved nipples, as called out in the installation drawing appropriate for the site installation. Mounting hardware shall be galvanized or stainless steel. Careful attention must be paid to the installation drawing appropriate for the site installation to assure proper operation of the bladder system. Do not inflate the bladder assembly after installation.

It is important that the CAS be secured to the concrete pad as shown in drawing 9900-9945 or 9900-9945H of this manual to prevent any unintentional repositioning of the CAS as the connecting plumbing to the vent system is accomplished.

## OPERATION AND PURGING

### NORMAL OPERATION:

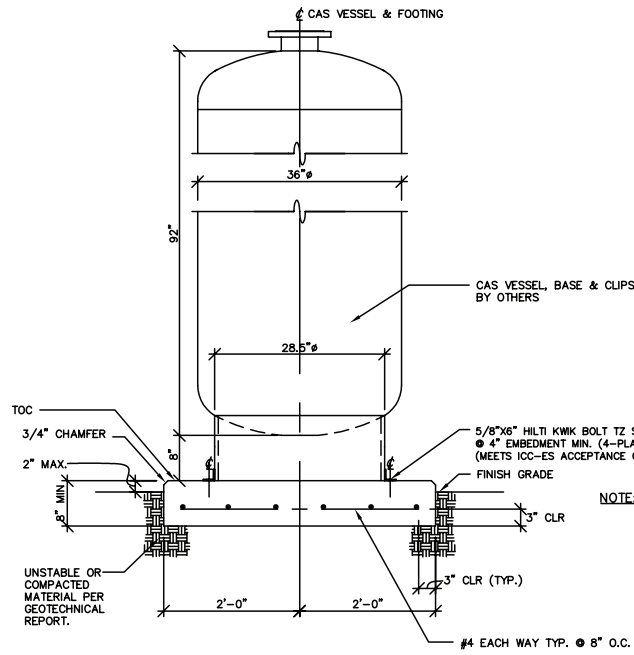
- There are four ball valves on the CAS. Each ball valve is to be installed so as to allow opening and closing with nothing obstructing the full range (90°) of movement. In normal operation, only the valve (A) at the top of the CAS shall be open – the other three valves (B, C and D) shall be closed. All four valves shall be locked in the above positions. The two plugs (E and F) should be installed using a non-hardening, UL classified pipe joint compound and tightened to 60 ft-lbs.

### DRAINING THE BLADDER:

- Any liquid coming over from the vent system would have collected above the valve (A) in the riser pipe before going into the bladder. An inspection of the need to drain the bladder is easily made by removing the plug (E) at the tee on the bottom plumbing of the CAS. Before removing this plug, open the valve (B) above the tee to release any liquid into the piping below. Wait approximately 30 seconds and then close the valve (B). Now, remove the plug (E) at the tee on the bottom plumbing of the CAS – be sure to have a container suitable for gasoline available to catch fluid. If liquid in excess of 16 ounces (473 ml) drains out, the bladder should also be drained.
- Should it be necessary to drain the bladder:
  1. Close the upper ball valve (A) (usually open) leading to the gasoline storage tank vent lines.
  2. Open the valve (C) that goes to the internal syphon tube. Be sure the other three ball valves (A, B and D) that connect to the vent lines and CAS are closed.
  3. Remove the plug (E) from the bottom tee and connect an explosion proof evacuation pump capable of handling liquid. Have a liquid tight, container suitable for gasoline positioned to receive any fluid that may exit the system and start the pump. If no liquid returns within 30 seconds, the bladder is dry – discontinue pumping, remove the pump, replace the plug (E) and return the ball valves to their normal, locked, positions.

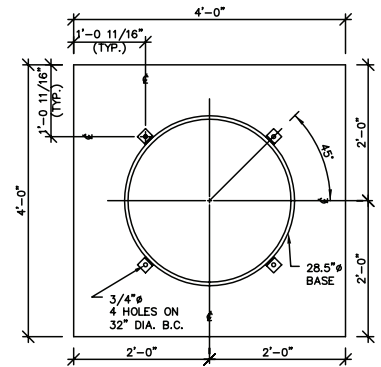
### DRAINING THE CAS:

- Should it be necessary to drain the CAS (between the bladder and steel wall):
  1. Close the ball valve at the top (A) of the CAS and also the two valves (B and C) on the vertical risers.
  2. Remove the plug (E) in the bottom tee and place a metal container below the pipe opening.
  3. Carefully open the ball valve (D) at the bottom of the CAS – observe that the container that is being drained into does not overflow – empty container as required until fluid no longer comes from the pipe when the valve is open.
  4. Close the ball valve (D) and replace the plug (E) into the tee.
  5. Return all ball valves to their normal locked positions.



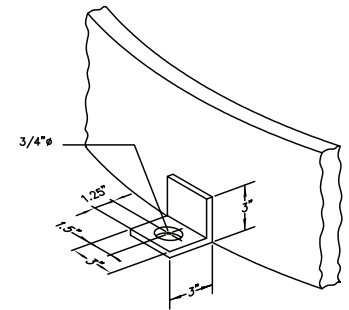
SECTION @ CAS SLAB  
SCALE = 3/4" = 1'-0"

**CRITERIA**  
 SOIL BEARING 1000 psf  
 BASIC WIND SPEED 100mph  
 SEISMIC  $S_s = 2g$   
 $S_n = 1g$   
 MIN. CONCRETE COMP STRENGTH,  $f'_c = 2500$  psi  
 MIN. REINF. YIELD STRENGTH,  $f_y = 40000$  psi



BASE PLAN  
SCALE = 3/4" = 1'-0"

**NOTE:**  $\Delta$  WHERE ICC-ES ACCEPTANCE CRITERIA IS NOT REQUIRED, 5/8" X 6" HILTI KWIK BOLT 3 @ 4" EMBEDMENT MIN. CAN BE USED (PER ESR-1385 REPORT, ISSUED 09/01/04).



TYPICAL HOLD DOWN CLIP  
SCALE = NONE

7	ADDED CAS DIMENSIONS, REVISED CRITERIA LIST	-	TF MB	01/02/08
6	KB-TZ SS WAS KB3, ESR-1917 WAS ESR-1385, ADDED NOTE 1	-	TF MB	12/21/07
REV	DESCRIPTION	ECN NO	BY	DATE

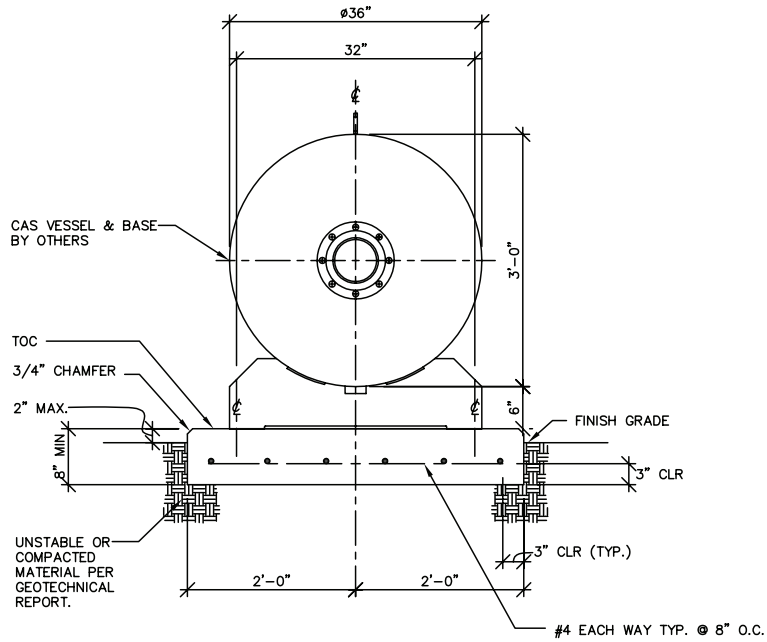
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	DO NOT SCALE DRAWING	.XX ± .02
	STANDARD INCH TOLERANCES (UNLESS OTHERWISE SPECIFIED)	.XXX ± .005 ANGULAR ± 1/2°
	SPECIAL DIST:	

**Franklin Fueling Systems**  
Madison, WI 53718

**TITLE:**  
CLEAN AIR SEPARATOR MOUNTING SLAB DETAILS

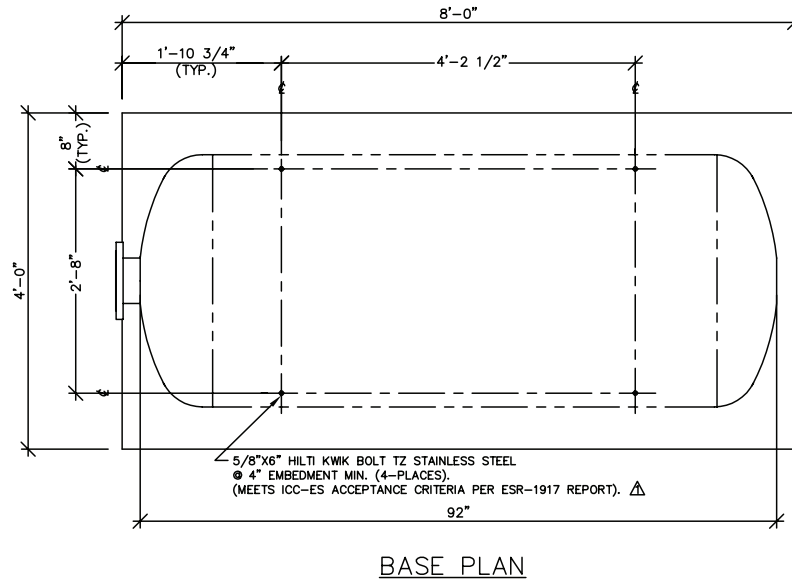
DRAWN: JWH	DATE: 07/31/02	DRW NO: 9900-9945	SUFFIX:
APPRVL:	DATE:	SCALE: 1/8	SHEET 1 OF 1

DRW NO: 9900-9945H



SECTION @ CAS SLAB

**CRITERIA**  
 SOIL BEARING 1000 psf  
 BASIC WIND SPEED 100mph  
 SEISMIC  $S_s=2g$   
 $S_{st}=1g$   
 MIN. CONCRETE COMP STRENGTH,  $f'_c = 2500$  psi  
 MIN. REINF. YIELD STRENGTH,  $f_y = 40000$  psi



BASE PLAN

**NOTE:**  $\Delta$  WHERE ICC-ES ACCEPTANCE CRITERIA IS NOT REQUIRED,  
 5/8" X 6" HILTI KWIK BOLT 3 @ 4" EMBEDMENT MIN.  
 CAN BE USED (PER ESR-1385 REPORT, ISSUED 09/01/04).

REV	DESCRIPTION	ECN NO	BY	DATE
5	ADDED CAS DIMENSIONS, REVISED CRITERIA LIST	-	TF MB	01/02/08
4	KB-TZ SS WAS KB3, ESR-1917 WAS ESR-1385, ADDED NOTE 1	-	TF MB	12/21/07

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**MATERIAL:**

DO NOT SCALE DRAWING	.XX ± .02
STANDARD INCH TOLERANCES (UNLESS OTHERWISE SPECIFIED)	.XXX ± .005
	ANGULAR ± 1/2°

**SPECIAL DIST:**

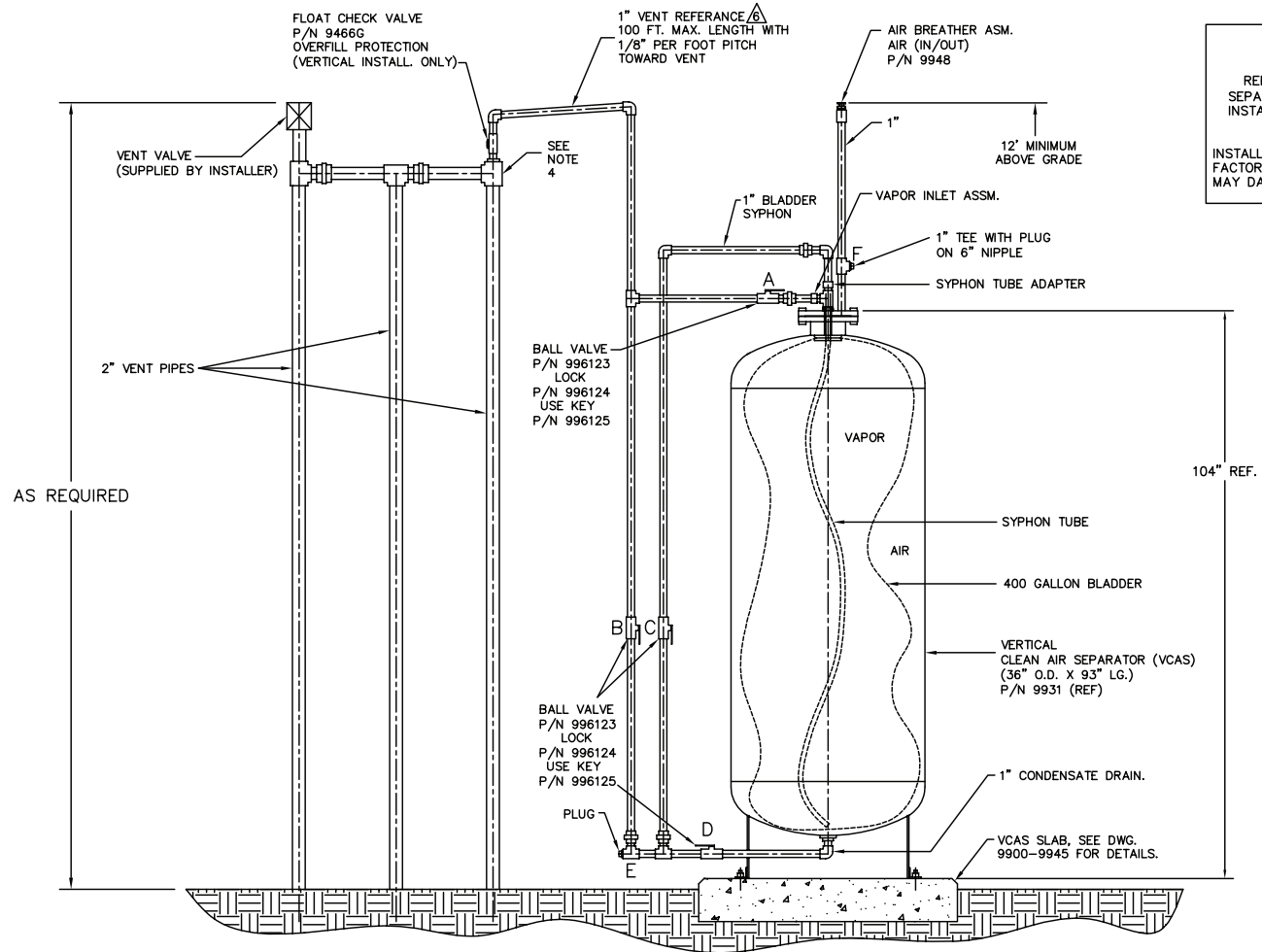
_____	_____
_____	_____



**Franklin Fueling Systems**

Madison, WI 53718

<b>TITLE:</b> CLEAN AIR SEPARATOR HORIZONTAL MOUNTING SLAB DETAILS			
<b>DRAWN:</b> TF	<b>DATE:</b> 05/22/07	<b>DRW NO:</b> 9900-9945	<b>SUFFIX:</b> H
<b>APPRVL:</b> MDB	<b>DATE:</b> 06/05/07	<b>SCALE:</b> 3/4"=1'	<b>SHEET</b> 1 <b>OF</b> 1



**NOTICE**

DRAWINGS ARE TWO DIMENSIONAL REPRESENTATION OF TYPICAL CLEAN AIR SEPARATOR (CAS) INSTALLATION. ACTUAL CAS INSTALLATIONS WILL VARY SLIGHTLY FROM THE REPRESENTATION SHOWN.

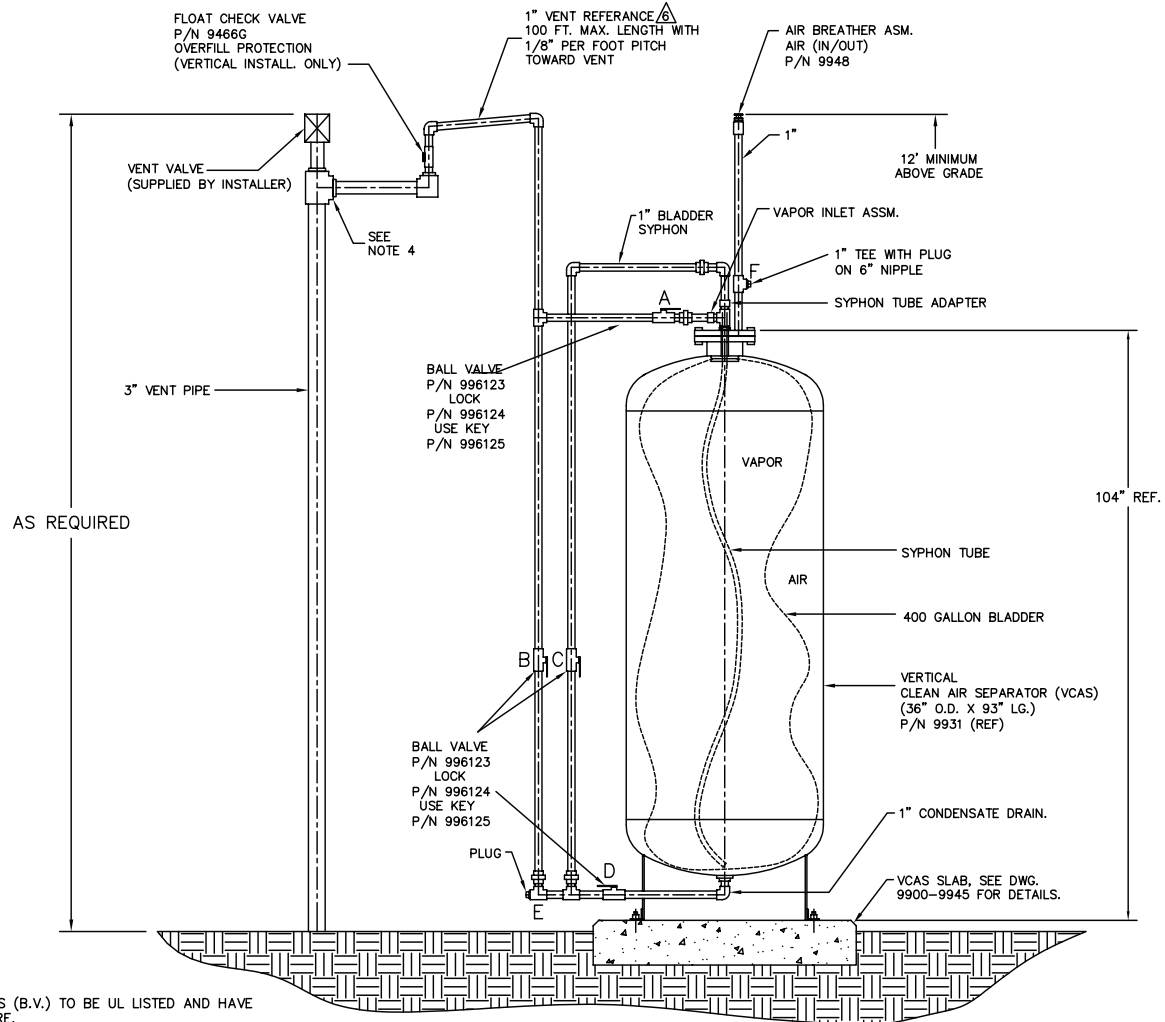
INSTALLER SHALL NOT LOOSEN, ROTATE OR REMOVE FACTORY INSTALLED FITTINGS OR FLANGE AS THIS MAY DAMAGE FACTORY SEALS AND VOID WARRANTY.

- NOTE:**
- 1 - ALL BALL VALVES (B.V.) TO BE UL LISTED AND HAVE PADLOCK FEATURE.
  - 2 - PASSIVE PRESSURE CONTROL-NO ELECTRICAL POWER REQUIRED.
  - 3 - AIR BREATHER MUST BE INSTALLED AT A MINIMUM HEIGHT OF 12' ABOVE GRADE.
  - 4 - VENT LINE TIE IN CAN BE INSTALLED ANYWHERE ALONG THE VENT STACK LINE PROVIDED THAT PIPE SLOPE IS MAINTAINED AND THE CHECK VALVE IS IN THE CORRECT VERTICAL INSTALLATION.
  - 5 - ONLY GALVANIZED PIPE IS TO BE USED FOR PIPING CONNECTIONS
- △** - A FLEXIBLE CONNECTION BETWEEN THE CLEAN AIR SEPARATOR AND THE VENT LINE(S) IS ALLOWABLE IF REQUIRED BY THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) TO MEET SEISMIC REQUIREMENTS. SHOULD THE FLEX CONNECTION BE INSTALLED SUCH THAT IT IS NOT SUPPORTED, THE SLOPE OF THE FLEX CONNECTION SHALL BE GREATER THAN THE 1/8" PER FOOT SLOPE REQUIRED FOR THE REST OF THE ONE INCH GALVANIZED PIPING.

15	ADDED NOTE 6	401666	TF	03/20/08
REV	DESCRIPTION	ECN NO	BY	DATE
<b>Franklin Fueling Systems</b> Madison, WI 53718				
TITLE: CLEAN AIR SEPARATOR VERTICAL INSTALLATION				
DRWN: JWH	DATE: 05/14/02	DRW NO: 9900-9942	SUFFIX:	
APPRV: MDB	DATE: 06/05/07	ACAD HLY	SCALE: N.T.S.	SHEET 1 OF 1

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MATERIAL:	
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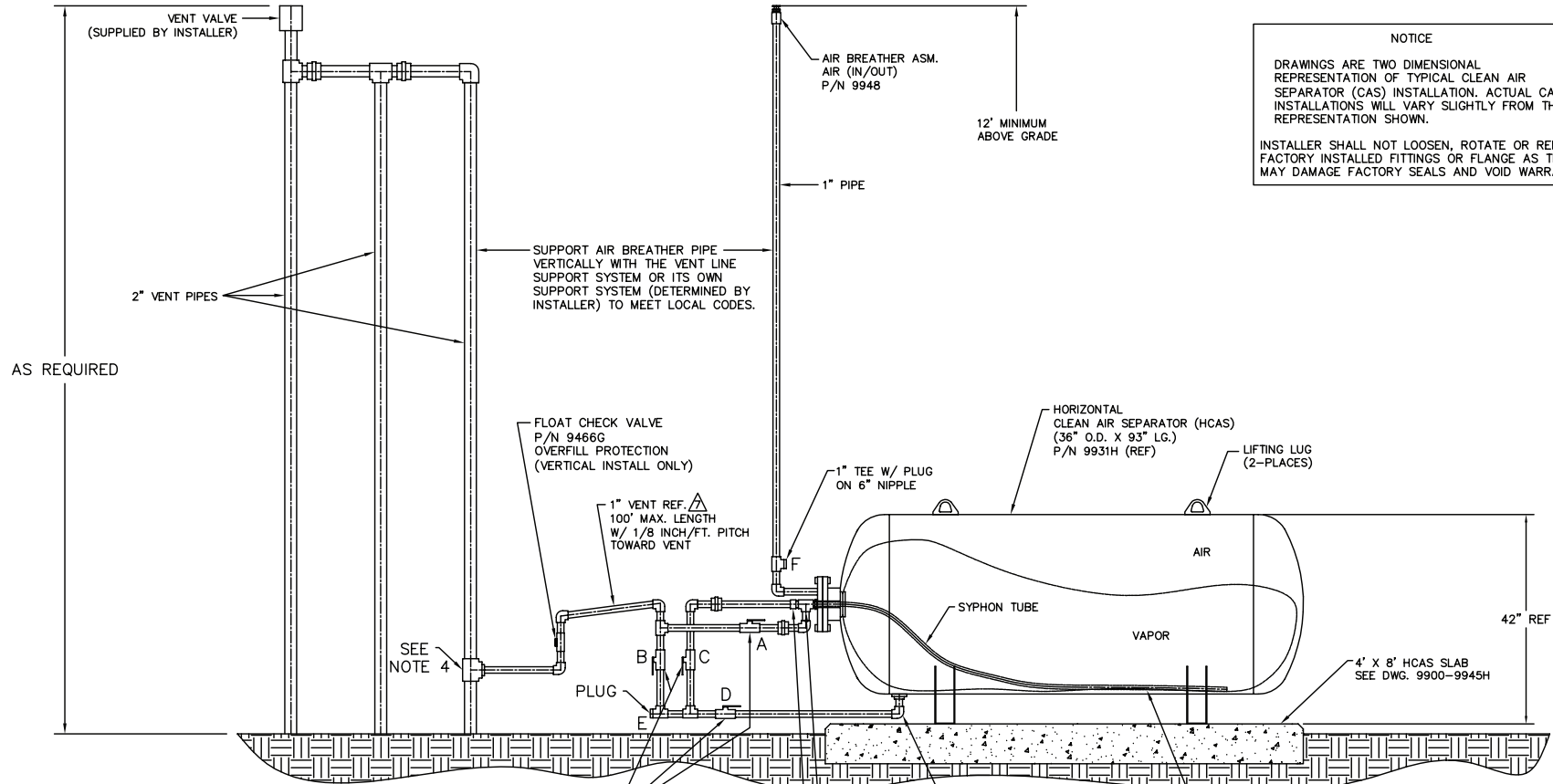
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8	ADDED NOTE 6	401666	TF	03/20/08
REV	DESCRIPTION	EON NO	BY	DATE
<b>Franklin Fueling Systems</b> Madison, WI 53718				
<b>TITLE: CLEAN AIR SEPARATOR VERTICAL INSTALLATION (1 VENT)</b>				
DRAWN: JWH	DATE: 05/14/02	DRW NO: 9900-9971	SUFFIX:	
APPRVL: MDB	DATE: 06/05/07	SCALE: ACAD HLY	N.T.S.	SHEET 1 OF 1



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BALL VALVE P/N 996123  
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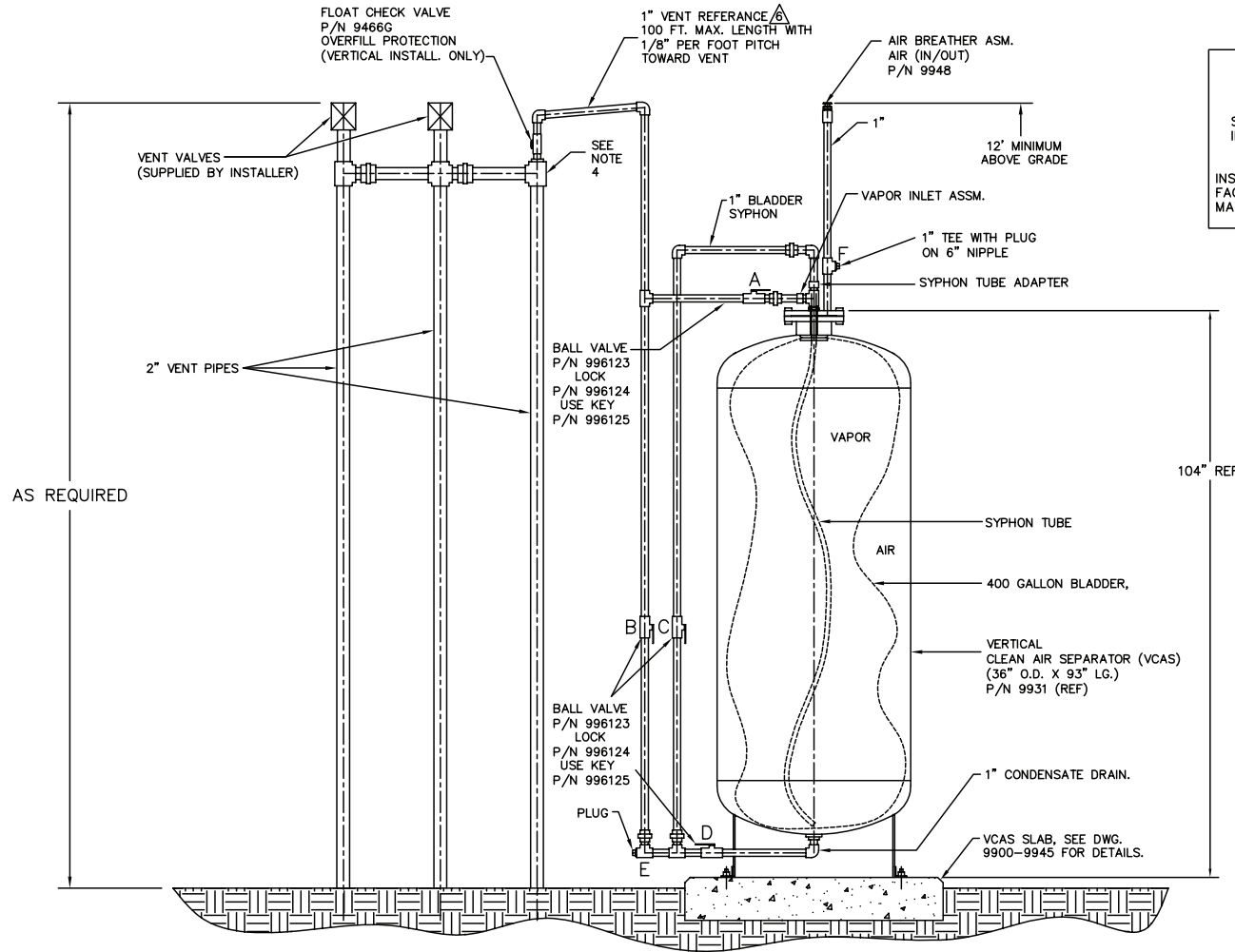
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<b>TITLE:</b> CLEAN AIR SEPARATOR HORIZONTAL INSTALLATION				
DRAWN:	DATE:	DRW NO:	SUUFFIX:	
TF	05/23/07	9900-9942	H	
APPRVL:	DATE:	SCALE:	N.T.S.	SHEET 1 OF 1
MDB	06/05/07			

DRW NO: 9900-9972



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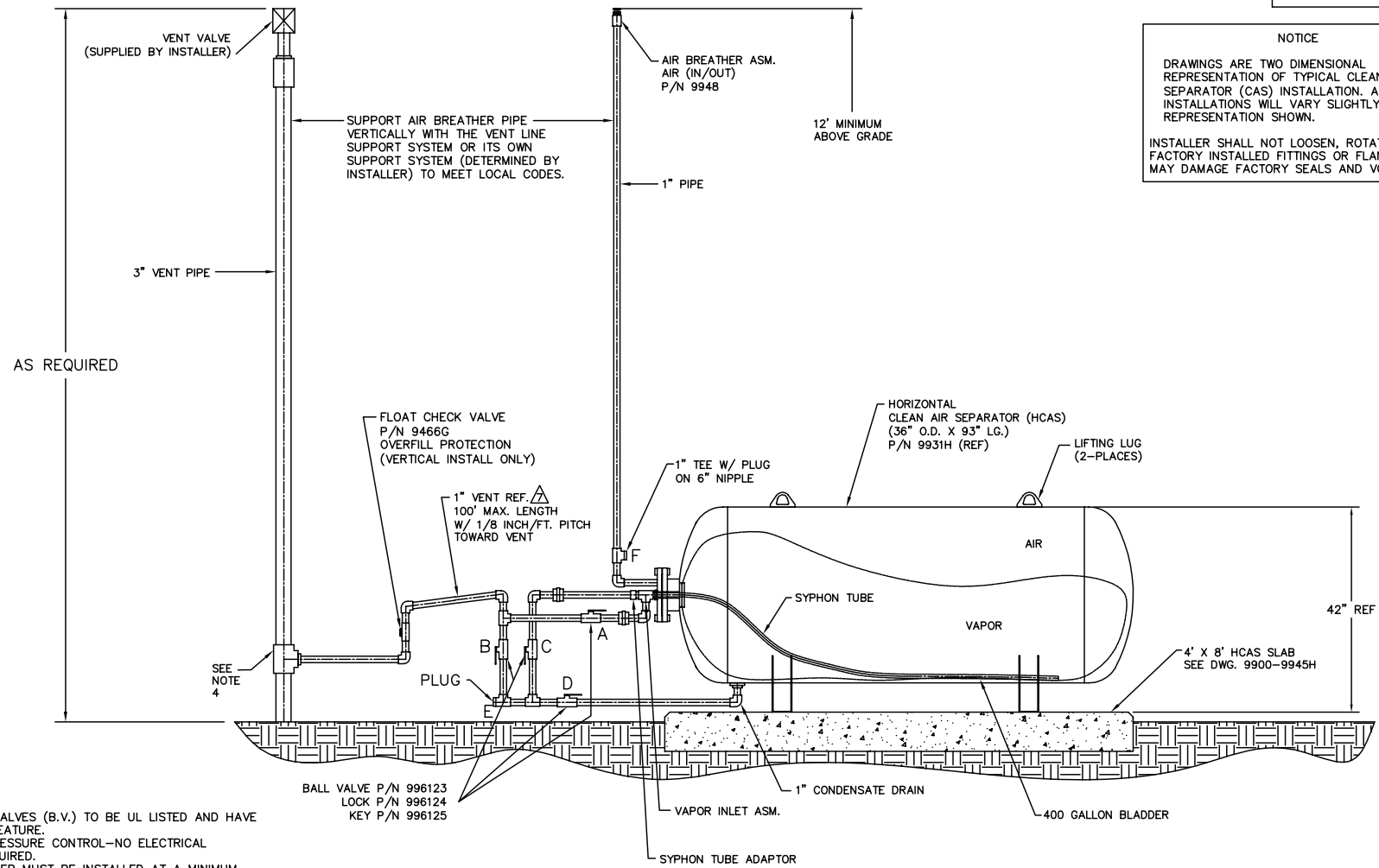
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TITLE: CLEAN AIR SEPARATOR VERTICAL INSTALLATION (2 VENT)					
DRAWN:	DATE:	DRW NO:	SUFFIX:		
JWH	05/14/02	9900-9972			
APPRVL:	DATE:	ACAD HLY	SCALE:	N.T.S. SHEET 1 OF 1	
MDB	06/05/07				

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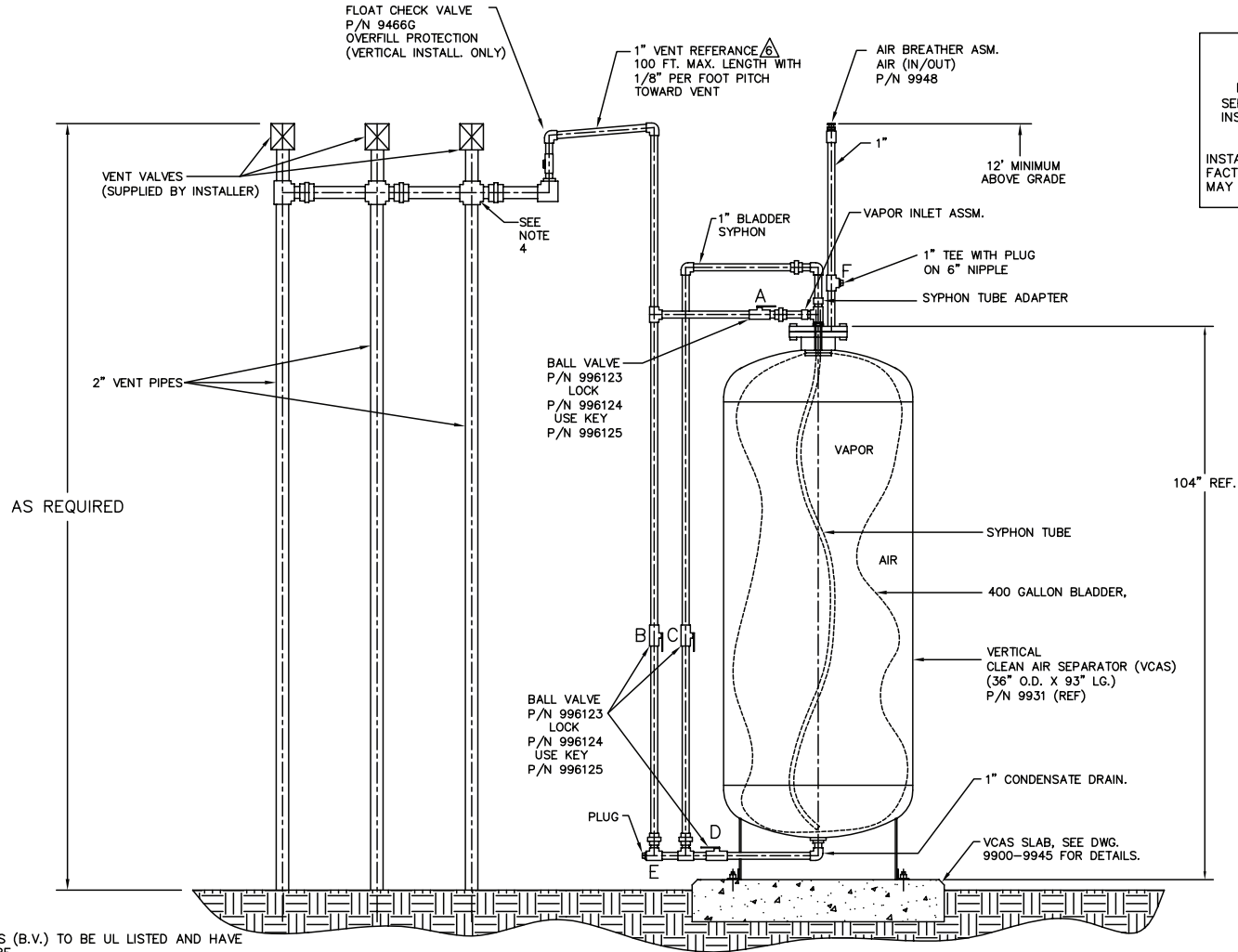
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REV	DESCRIPTION	ECN NO	BY	DATE	
<b>Franklin Fueling Systems</b> <small>Madison, WI 53718</small>					
<b>TITLE:</b> CLEAN AIR SEPARATOR HORIZONTAL INSTALLATION (1 VENT VALVE)					
<b>DRAWN:</b> TF	<b>DATE:</b> 05/22/07	<b>DRW NO:</b> 9900-9971	<b>SUFFIX:</b> H		
<b>APPRVL:</b> MDB	<b>DATE:</b> 06/05/07	<b>SCALE:</b> N.T.S.	<b>SHEET</b> 1	<b>OF</b> 1	



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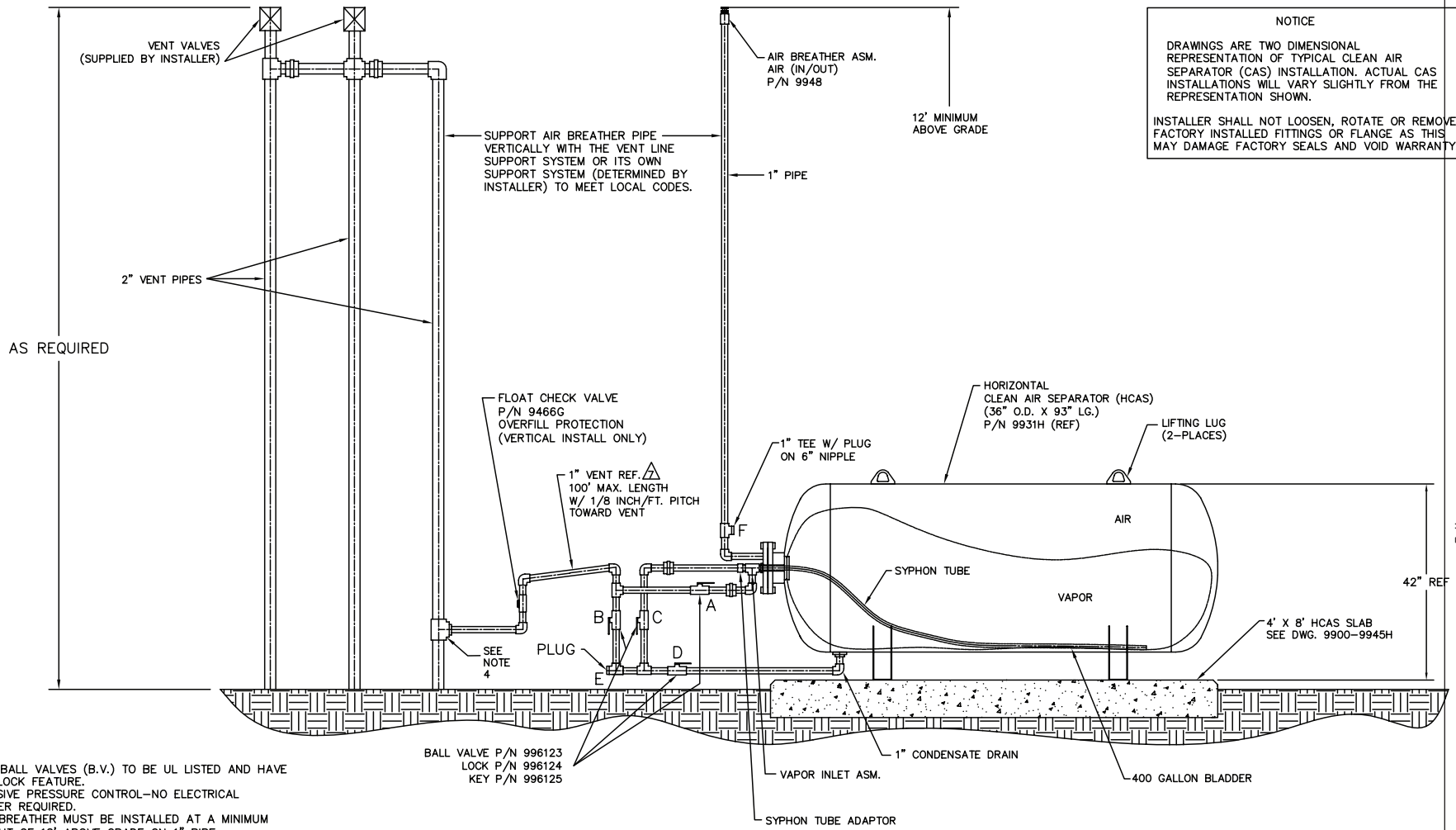
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REV	DESCRIPTION	ECN NO	BY	DATE
		Molokai, HI 53718		
TITLE:		DRW NO:	SUFFIX:	
CLEAN AIR SEPARATOR VERTICAL INSTALLATION (3 VENT)		9900-9973		
DRAWN:	DATE:	SCALE:		SHEET
JWH	05/14/02	ACAD HLY		1
APPRVL:	DATE:	SCALE:		SHEET
MDB	06/05/07	N.T.S.		1

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CARB Approved TDW 3 - Healy Clean Air Separator Model 9961 and 9961H - Executive Orders VR-201 and VR-202



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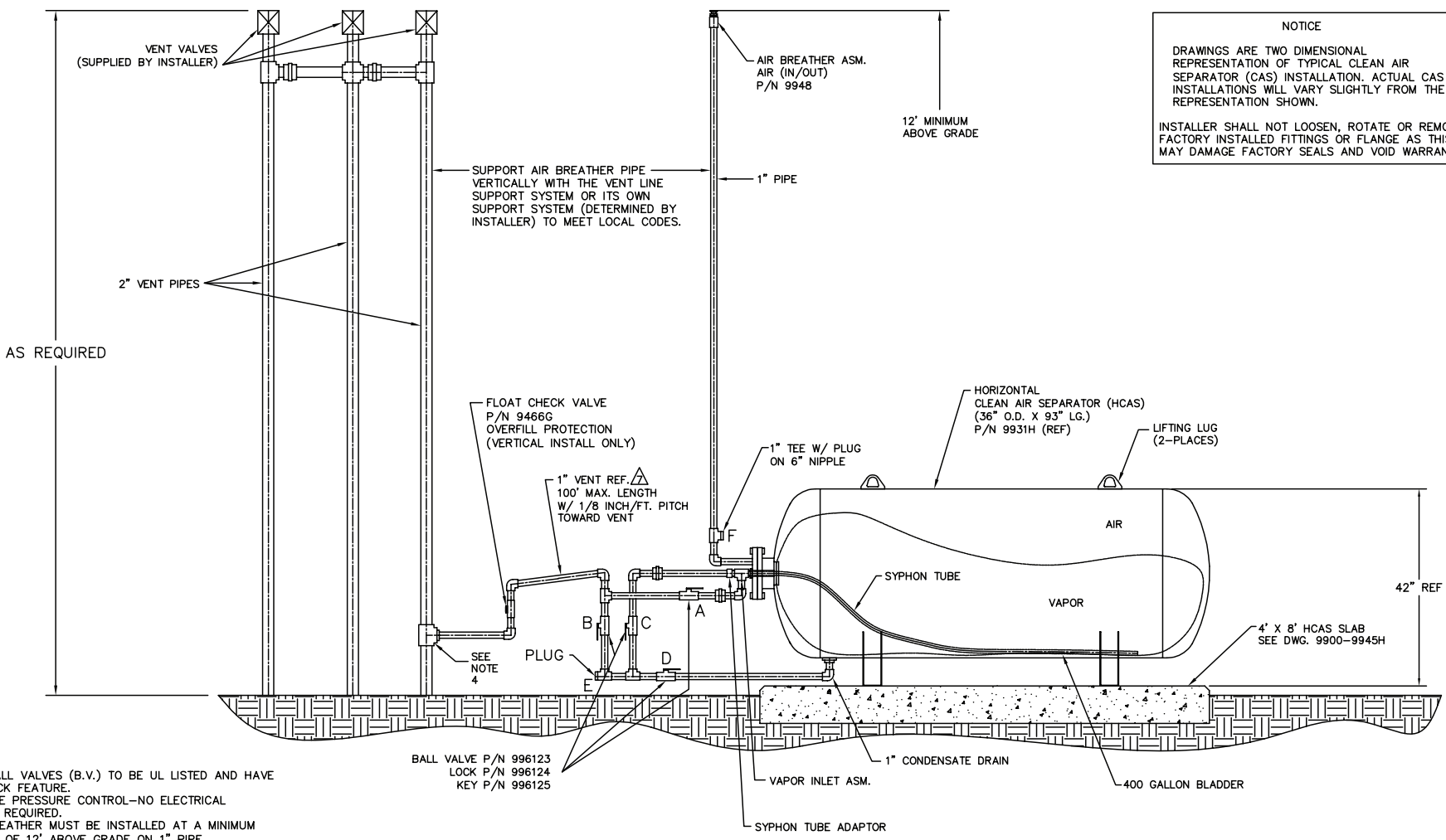
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<b>Franklin Fueling Systems</b> Madison, WI 53718				
<b>TITLE:</b> CLEAN AIR SEPARATOR HORIZONTAL INSTALLATION (2 VENT VALVE)		<b>DRW NO:</b> 9900-9972	<b>SUFFIX:</b> H	
<b>DRAWN:</b> TF	<b>DATE:</b> 05/22/07	<b>SCALE:</b> N.T.S.	<b>SHEET</b> 1 <b>OF</b> 1	
<b>APPRVL:</b> MDB	<b>DATE:</b> 06/05/07			

3-11  
CARB Approved TDW 3 - Heavy Clean Air Separator Model 9961 and 9961H - Executive Orders VR-201 and VR-202



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# Clean Air Separator


## Bladder Field Replacement




## Important Safety Messages


Franklin Fueling Systems (FFS) equipment is designed to be installed in association with volatile hydrocarbon liquids such as gasoline. Installing or working on this equipment means working in an environment in which these highly flammable liquids may be present. Working in such a hazardous environment presents a risk of severe injury or death if these instructions and standard industry practices are not followed. Read and follow all instructions thoroughly before installing or working on this, or any other related, equipment.


As you read this guide, please be aware of the following symbols and their meanings:


**Warning**  This symbol identifies a warning. A warning sign will appear in the text of this document when a potentially hazardous situation may arise if the instructions that follow are not adhered to closely. A potentially hazardous situation may involve the possibility of severe bodily harm or even death.

**Caution**  This is a caution symbol. A caution sign will appear in the text of this document when a potentially hazardous environmental situation may arise if the instructions that follow are not adhered to closely. A potentially hazardous environmental situation may involve the leakage of fuel from equipment that could severely harm the environment.

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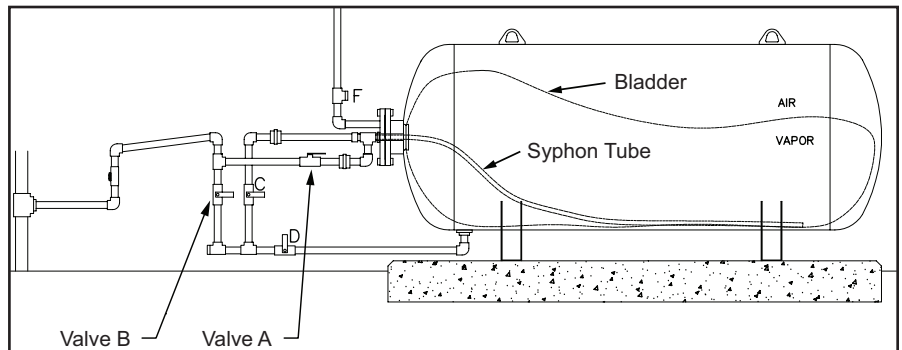
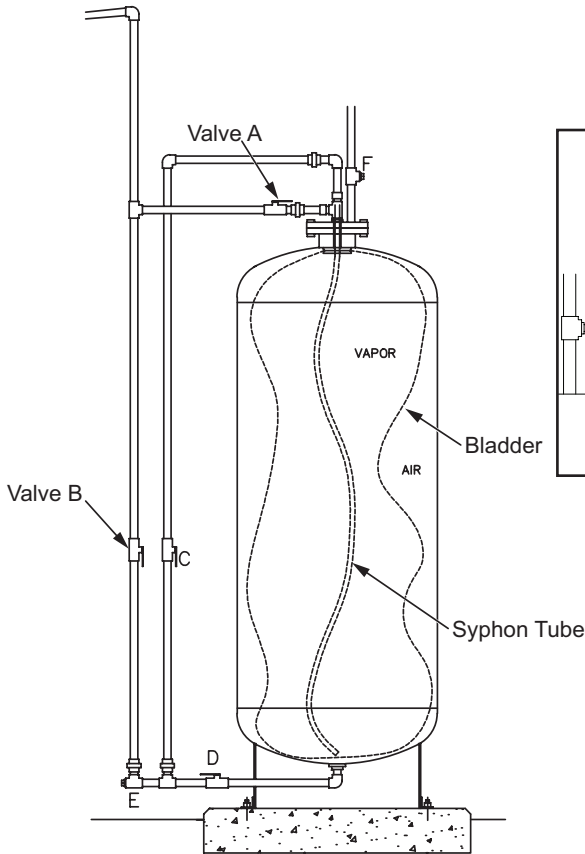
**Warning**  **Follow all applicable codes governing the installation and servicing of this product and the entire system. Always lock out and tag electrical circuit breakers while installing or servicing this equipment and any related equipment. A potentially lethal electrical shock hazard and the possibility of an explosion or fire from a spark can result if the electrical circuit breakers are accidentally turned on during installation or servicing. Please refer to the Installation and Owner's Manual for this equipment, and the appropriate documentation for any other related equipment, for complete installation and safety information.**

**Warning**  **Follow all federal, state and local laws governing the installation of this product and its associated systems. When no other regulations apply, follow NFPA codes 30A and 70 from the National Fire Protection Association. Failure to follow these codes could result in severe injury, death, serious property damage and/or environmental contamination.**

**Warning**  **Always secure the work area from moving vehicles. The equipment in this manual is usually mounted underground, so reduced visibility puts service personnel working on this equipment in danger from moving vehicles entering the work area. To help eliminate these unsafe conditions, secure the area by using a service truck to block access to the work environment, or by using any other reasonable means available to ensure the safety of service personnel.**

**Warning**  **Use circuit breakers for multiple disconnect to turn off power and prevent feedback from other dispensers.**

**Note:** Persons doing this bladder replacement must be trained by a FFS Field service engineer before attempting this procedure.




**Figure 1: Clean Air Separators: Component Locations**

**Replacement Bladder Part# 9943**

1. Close valves A & B, then disconnect piping from the Clean air Separator (CAS).
2. **It is highly recommended that Vertical Clean Air Separators be placed horizontally prior to repair.** (A powered lifting device will be needed).

**Note:** Lower the vertical CAS slowly and place cushioning (i.e. cardboard) under it to prevent scarring the surface.

3. Remove the syphon tube.
4. Deflate the bladder to ease its removal and to prevent damage during removal.

**Warning**  **Explosion potential. Assume gasoline vapors are present. Use an intrinsically safe or explosion-proof vacuum source to deflate the bladder.**

5. Remove the (8) 3/4" bolts securing the flange. Be aware that a thread-locking compound was used on the threads, and more force will be required to remove them.

**Note:** Account for all parts removed and reinstall in the same order.

6. Carefully remove bladder from the Clean Air Separator.

7. Remove the (6) 1/4-20 bolts from the bladder flange (9940).
8. Inspect bladder flange and nipple to ensure there are no sharp edges that could create a hole in the bladder.
9. Replace bladder by fitting the new bladder's end opening around the flange (Figure 2).



**Figure 2: Place Bladder on Flange**

10. Lower the Clamp Ring with lubricated O-ring to hold the bladder in position.
11. Install the (6) 1/4-20 bolts securing the clamp ring and bladder to the bladder flange.

**Note:** Using a couple 1" 1/4-20 bolts can help hold the flange components in position while the other bolts are secured.

12. Tighten all (6) screws to 65-88 in-lbs using torque wrench set to break at 80 in-lbs

13. Inflate bladder to 2" of water column and check for leaks in accordance with CARB exhibit 4.
14. Deflate bladder and fold into thirds lengthwise.
15. Feed bladder into the Clean Air Separator. Take care not to damage bladder as you feed it into CAS. Support the flange end so no additional stress is put on the bladder as you feed the bladder into the CAS. Best to use 2 people during this step
16. Align marks and secure the flange using the (8) ¾" bolts. Apply Loctite\* to bolts.



**Figure 3: Align Marks**

17. Torque bolts to 80 ft/pounds.

18. Inflate bladder to 2" of water column and install syphon tube (Figure 4).



**Figure 4: Install Syphon Tube**

19. Reinstall the Clean Air Separator per ARB Approved IOM - EO VR-201 and VR-202. Test the Clean Air Separator in accordance with Exhibit 4.

\* Loctite is a registered trademark of Henkel Corporation



**Franklin Fueling Systems**

[www.franklinfueling.com](http://www.franklinfueling.com)

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**Franklin Fueling Systems GmbH**  
 Rudolf-Diesel-Strasse 20 • 54516 Wittlich, GERMANY  
 Tel: +49-6571-105-380 • Fax: +49-6571-105-510









## Healy Model 75 Series Low Perm Hose Assemblies

**Warning**  Follow all federal, state, and local laws governing the installation of this product and the entire system. When no other regulations apply, follow NFPA 30, 30A, and 70 from the National Fire Protection Association. Failure to do so could result in severe injury, death, serious property damage and/or environmental contamination.

**Warning**  Highly flammable vapors or liquids may be present in the environment in which this equipment is installed or serviced. Installing or working on this equipment means working in an environment that presents risks of severe injury or death if instructions and standard industry practices are not followed. Follow all applicable codes governing the installation and servicing of this product and the entire system.

**Danger**  Always lock out and tag electrical circuit breakers while installing or servicing this equipment and related equipment. A potentially lethal electrical shock hazard and the possibility of an explosion or fire from a spark can result if the electrical circuit breakers are accidentally turned on during installation or servicing. Do not smoke while working on or near this equipment, and use only non-sparking tools.

Healy 75 Series Hoses and Hose Assemblies should be serviced by a Healy Certified Technician. However, GDF Owner / Operator can remove and install hanging hardware (nozzle, curb hose, breakaway, flow limiter and whip hose). Hoses should be inspected for kinks, flat spots, abraded outer cover (wire strands visible) and leaking fittings on a weekly basis.

**Note:** It is the responsibility of the installer to be familiar with the current requirements of state, federal, local codes and air district rules and regulations for installation of gasoline dispensing equipment. It is the responsibility of the installer to be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

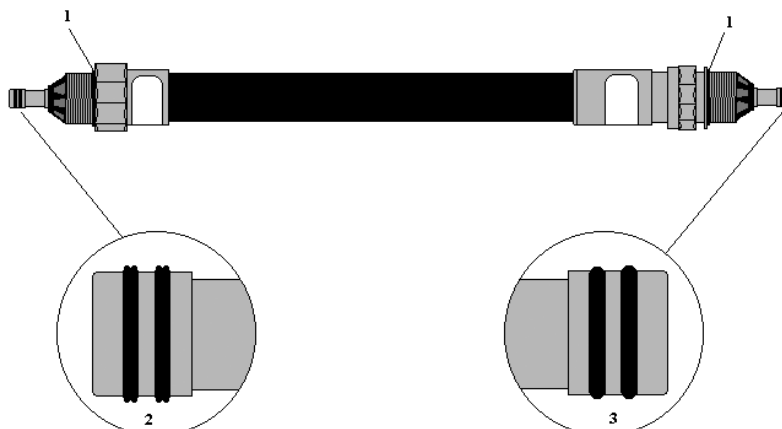
The warranty sheet provided with the component is to remain with the component, and must be provided to the end-user.

### 1. Hose Length

Select the correct whip hose and curb hose by selecting the correct thread type and hose length. The maximum length of the hose assembly shall not exceed eighteen (18) feet. Lengths greater than eighteen (18) feet are permitted if acceptable to authorities having jurisdiction.

### 2. Installation Instructions

- 2.1 Lubricate any O-rings or Quad Seals before installing the hose assembly into an adaptor, breakaway or nozzle assembly to make it easier to install and prevent the seal from getting cut. Motor oil (any weight) is acceptable for lubricating an O-ring or Quad Seal.
- 2.2 Connect hose assembly to nozzle, hose adaptor, breakaway, or flow limiter (if equipped).
- 2.3 Tighten hose connections between 35 to 70 foot pounds.



**Rule of Thumb: O-rings (item 3) to Nozzle and Hose Adaptor  
Quad Seals (item 2) to Breakaway (or Flow Limiter)**

### 3. Hose Installation Functional Check

**Note:** The following checks shall be conducted after installation or repair of the hose assembly with the dispenser authorized and ready to dispense fuel.

- 3.1 Liquid Leak – Liquid gasoline visible on the hose assembly indicates a damaged or improperly installed O-ring, Healy Part No. HB-2 (item 1 in figure above). This O-ring seals the hose fitting to the nozzle and the adaptor. Replace the O-ring(s) if necessary.
- 3.2 Meter Creep – Dispenser gasoline display counting up when the nozzle is not dispensing gasoline indicates a damaged or improperly installed quad seals. The quad seals (2) are used on the end of the hose vapor tube that attaches to the breakaway assembly (or flow limiter, if equipped). Healy Part No. HB-4 (item 2 in figure above). Replace the quad seal(s) if necessary.
- 3.3 Meter Creep – Dispenser gasoline display counting up when the nozzle is not dispensing gasoline indicates a damaged or improperly installed O-ring seals (2) on the end of the hose vapor tube that connects to the nozzle. Healy Part No. 291 (item 3 in figure above). Replace these O-ring(s) if necessary.

### 4. Inspection and Maintenance

- Hose assemblies should be inspected weekly.
- Check/Inspect the hose assembly for leaks, kinks, blisters, bulges, flattened areas, soft spots, or any cuts, cracks or gouges deep enough and large enough to visibly expose the wire strands reinforcement beneath the cover of the hose.
- Hose assemblies showing signs of any of these issues should be replaced. **Follow Safety/ Lockout procedure.**



**Franklin Fueling Systems**

[www.franklinfueling.com](http://www.franklinfueling.com)

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**Franklin Fueling Systems GmbH**

Rudolf-Diesel-Strasse 20 • 54516 Wittlich, GERMANY

Tel: +49-6571-105-380 • Fax: +49-6571-105-510



# ContiTech Low Permeation Coaxial Hose

## 1.0 Low Permeation Coaxial Hose

- 1.1 Select the correct whip hose and curb hose by selecting the correct thread type and hose length. The maximum length of the hose assembly shall not exceed eighteen (18) feet. Lengths greater than eighteen (18) feet are permitted if acceptable to authorities having jurisdiction.
- 1.2 This assembly has straight threads and is sealed by an o-ring. Do not use thread sealing compounds on straight threads.
- 1.3 Lubricate any o-ring before installing the hose assembly into an adapter, breakaway or nozzle. Motor oil of any weight can be used for lubricating an o-ring.
- 1.4 Tighten threaded connections to 35 - 50 ft-lbs.
- 1.5 Hose assemblies should be inspected weekly. Check the hose assembly for leaks, kinks, blisters, bulges, flattened areas, soft spots, or any cuts or gouges deep enough to expose the wire reinforcement beneath the cover of the hose. Hose assemblies showing signs of any of these issues should be replaced.

**Note:** It is the responsibility of the installer to be familiar with the current requirements of state, federal, local codes and air district rules and regulations for installation of gasoline dispensing equipment.

It is also the responsibility of the installer to be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

The warranty tag provided with the component is to remain with component, and must be provided to the end-user.

ContiTech USA, Inc.  
703 S. Cleveland Massillon Rd.  
Fairlawn, OH 44333 USA  
Telephone:1-800-235-4632



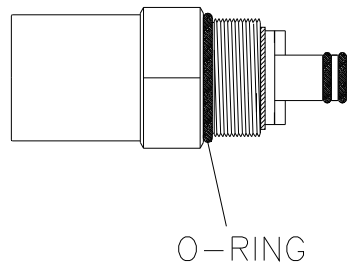
ContiTech

## 2.0 Field Serviceable Hose Components

**Note: The following procedures shall be conducted after installation or repair, with the dispenser authorized and ready to dispense fuel.**

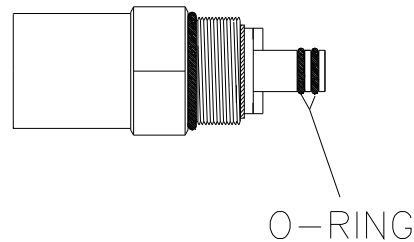
- 2.1 Liquid gasoline visible on the outer hose indicates a damaged or improperly installed o-ring. Replace the o-ring if necessary.

<u>Fitting Threads</u>	<u>O-ring Part #:</u>
M34 x 1.5	173537188
1-1/4"-18	173537203
1-7/8"-12	173537202



- 2.2 Meter creep (gallons dispensed display on dispenser is counting up when the nozzle is not dispensing gasoline), indicates a damaged or improperly installed o-ring. Replace the o-ring if necessary.

O-ring Part #: 173537082



**Note:** Contact your local distributor or Customer Service for replacement o-rings.

ContiTech USA, Inc.  
703 S. Cleveland Massillon Rd.  
Fairlawn, OH 44333 USA  
Telephone: 1-800-235-4632



ContiTech

# VST Installation Procedure for Phase II EVR Vacuum Assist Low Permeation Fuel Hoses

Part Number Series: V34EV



**Vapor Systems Technologies, Inc.**

650 Pleasant Valley Drive  
Springboro, Ohio 45066 (USA)

Toll Free: 1-888-878-4673

Phone: 937-704-9333

Fax: 937-704-9443

www.vsthose.com

## GENERAL INFORMATION

If hanging hardware components are involved in a drive-off or incur other customer abuse, each individual component must be functionally tested prior to customer dispensing activities.

## INSTALLATION PREPARATION

This procedure must be followed to ensure leak-proof installation and operation of these hose products.

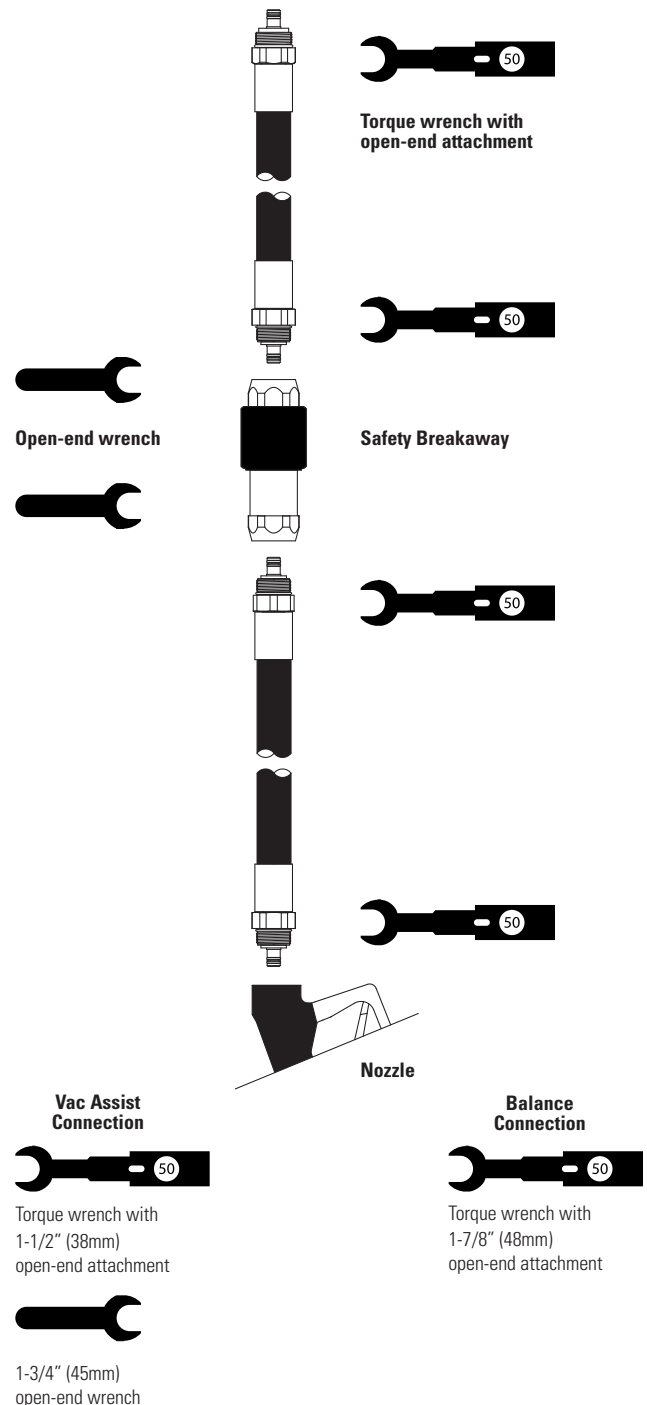
1. Turn off and tag the power to the dispenser. Dispenser must be de-energized prior to service to avoid personal injury.
2. Barricade work area to block vehicle access to the dispenser.
3. Close the dispenser shear valve prior to removing hanging hardware (hoses, safety breakaways, and nozzles).
4. Drain liquid product from the hanging hardware set into an approved container prior to replacing any hanging hardware components.
5. Remove hanging hardware from the dispenser prior to making replacement component assembly connections. VST recommends connecting the whip hose to the dispenser as the last connection during the hanging hardware assembly.

## INSTALLATION

1. The maximum length of the hose assembly shall not exceed eighteen (18) feet. Lengths greater than eighteen (18) feet are permitted if acceptable to authorities having jurisdiction.
2. Initial inspection:
  - a. Carefully unpack hose from shipping carton.
  - b. Inspect ALL O-Rings on each end of the hose to determine that they are present and undamaged.
  - c. Inspect hose exterior for any damage.
  - d. Inspect coupling threads for any damage.
3. Lightly lubricate ALL O-Rings on mating connections with petroleum jelly or other suitable lubricant. DO NOT USE pipe dope or thread sealant.
4. Insert the hose coupling into the mating connection and hand-tighten.
5. Tighten all the hose-joint connections to 50 ft.-lbs. of torque. DO NOT OVER TIGHTEN. Use a torque wrench with an open-end attachment to fit the hose couplings and an open-end wrench to properly tighten coupling connections. DO NOT USE channel-locks or pliers to tighten hose joints. Proper ft.-lbs. torque may not be achieved with these tools.
6. Purge air from the system by pumping one-tenth (1/10) to two-tenths (2/10) of a gallon of fuel into an approved container. Inspect

**Figure 1.**

EVR Vacuum Assist Hanging Hardware Assembly



# VST Installation Procedure for Phase II EVR Vacuum Assist Low Permeation Fuel Hoses

Part Number Series: V34EV



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Springboro, Ohio 45066 (USA)

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Phone: 937-704-9333

Fax: 937-704-9443

[www.vsthose.com](http://www.vsthose.com)

each hose joint connection for liquid leaks and meter creep. Make proper adjustments at the hose connection if necessary.

7. Check the nozzle shut-off action by dispensing fuel into an approved container at least three times to assure proper automatic operation. To test, operate the nozzle and submerge the spout tip in fuel until the fuel level covers the vent hole. The main valve of the nozzle automatically shuts off when liquid covers the vent hole at the end of the spout. The dispenser should deliver a minimum of 3 gpm. Hold open latch will disengage automatically when liquid covers the vent hole in the spout.
8. Measure the resistance between the dispenser outlet casting and the tip of the nozzle spout. Use an electronic multimeter set on the high range of the ohmmeter function. Resistance should not indicate more than 70,000 ohms per foot of the hose. Example: The measured resistance of a 12 foot hose must not exceed 840,000 ohms (840 kilohms).

## **MAINTENANCE**

Inspect hoses regularly for damage, loose connections, leaks, kinks, blisters, bulges, flattened areas, soft spots, or any cuts/gouges deep enough to expose the reinforcement beneath the hose cover. Replace as necessary. Subject to customer abuse, hoses should be replaced when damaged.

The hose is designed and constructed to give lasting service if properly handled and maintained. If for any reason it should need attention, contact your VST distributor for proper disposition.

## **NOTE**

Due to the abuse, misuse, changing gasoline formulas, variation in maintenance practices, environmental conditions, and /or conditions beyond the manufacturer's control, dispensing equipment may need replacement before five (5) years. Inspections and proper maintenance procedures should be followed by the station manager to determine if replacement is required before five (5) years.

## **WARNING**

Unauthorized rebuilding or modifying of hoses voids ALL approvals and warranties. VST products must be used in compliance with applicable federal, state, and local laws and regulations.

# Healy Model CX6 Series Hose Adaptors

The Healy CX6-A is a cast aluminum adaptor fitting which is used to adapt a gasoline dispenser (pump) to accept a Healy Phase (Stage) II inverted coaxial vapor recovery hose. Only a Healy Certified Technician shall perform installation, maintenance and repair of model CX6 series hose adapters.

## Before Installation:

- Read these instructions before installing the adaptor.
- Close crash (shear) valves in the dispenser and make sure electrical is shut off and locked out.

## Tools Required:

- 15" adjustable wrench
- 1-1/2" open end wrench
- UL listed pipe sealant
- Torque wrench

## Caution:

The adaptor has 1" female pipe thread on one end (to be attached to the dispenser product outlet via a 1" male pipe thread fitting) and 1-1/4-18 female straight thread on the other (for attachment of the Healy coaxial hose).

## Installation:

- Apply pipe sealant to the 1" male pipe thread end of the piping fitting to be installed to the adaptor and attach to the 1" female pipe thread end of the adaptor.
- Apply pipe sealant to the other male pipe thread end of the pipe fitting to be installed to the dispenser outlet and install assembly to the dispenser.
- Tighten adapter and pipe fitting assembly into dispenser outlet to 80 foot pounds.
- Select the Healy coaxial hose for assembly to adapter outlet and connect per hose instructions.

Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



**Franklin Fueling Systems**





# Healy Model 8701VV Breakaway

**HEALY STAGE II VAPOR RECOVERY  
PART NO. 8701VV BREAKAWAY (HOSE BREAK)  
ASSEMBLY & INSTALLATION INSTRUCTIONS**

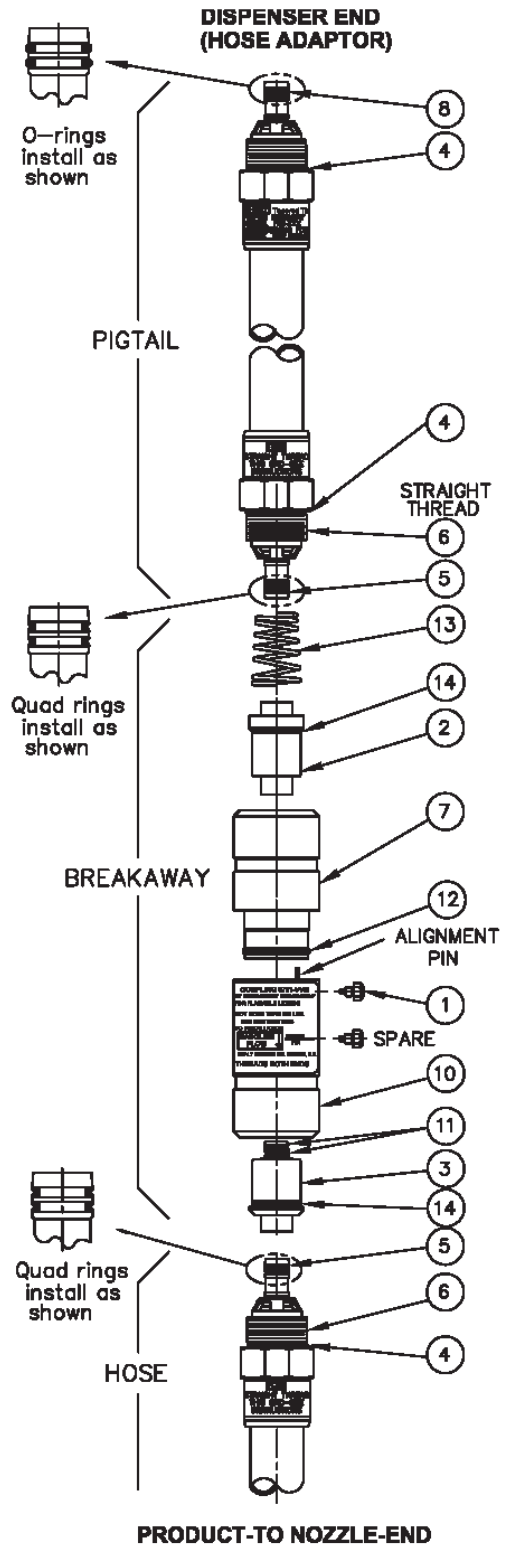
- The Healy Breakaway is delivered loosely assembled. Handle carefully to avoid dropping and/or losing the precision parts.
- Failure to remove the Shear screw (Item 1) as described in Step 1 below could result in fracturing or shearing of the screw. The Shear screw will require replacement if damaged.
- Be sure to assemble parts in the exact sequence as shown below.
- Be sure to lubricate all o-rings and quad seals where indicated. Use of ordinary motor oil is sufficient.
- Do not use thread-sealing compounds on straight threads.

**ASSEMBLY INSTRUCTIONS**  
(refer to diagram at right)

1. Remove the Shear Screw (Item 1) and the packing materials. Separate the halves of the breakaway assembly, retaining the loose internal valves, (Items 2 & 3) and the spring (Item 13) inside the upper half.
2. Select the pigtail, (whip hose) assembly. Lubricate the quad and o-ring seals (Items 4, 5, 8, & straight thread, Item 6). Assemble the pigtail to the input half of the Breakaway (Item 7) being sure that the larger end of the conical spring is centered in the groove on the white valve. Tighten hose to Breakaway at 35 to 70 foot pounds. Be sure the vapor tube fitting slides easily into item 2 before final tightening.
3. Select the delivery hose, lubricate the o-ring (Item 4), the quad seal (Item 5) and straight thread (Item 6). Assemble the end with the quad seal to the output half of the Breakaway (Item 10), install the secondary hose and tighten to 35 to 70 foot pounds. Be sure the vapor tube fitting slides easily into item 3 before final tightening.
4. Carefully fit both halves of the Breakaway together. Utilizing the alignment pin, fully compress both halves and insert the Shear Screw (Item 1) and hand tighten. Final tighten to 20 inch pounds. Tools should not be necessary to initially start the screws.

14	2	1-117	O-RING, PRECISION #8727	708
13	1	A8701-752	SPRING, CONICAL	752
12	1	1-122	O-RING, PRECISION #8727	709
11	2	78-312	O-RING, PRECISION #8727	75414
10	1	CB701-750-2	BODY, NOZZLE END	750-2
8	2	1-012	O-RING, PRECISION #5747	291
7	1	CB701-748	BODY, DISPENSER END	748
6	2		HOSE FITTING	
5	4	4012	QUAD-RING S14GJ	HB4
4	4	1-025	O-RING, PRECISION #5747	HB2
3	1	BB701-781	VALVE, NOZZLE END	781
2	1	BB701-748	VALVE, DISPENSER END	748
1	2	BB701-716	SHEAR, SCR.	787
ITEM NO.	QTY	DWG NO.	DESCRIPTION	P/N

LIST OF MATERIAL



## DRIVE-OFF BREAKAWAY RECONNECTION PROCEDURE

Use this procedure to either reconnect or disconnect (reverse order) the Healy 8701VV Breakaway as part of Section 1.4 Procedure for Reconnecting Breakaway and Testing Fueling Point after Drive-Off in the Assist Systems Scheduled Maintenance.

**NOTE: Breakaway Reconnections must be logged in the GDF Maintenance Log.**

---

### Reconnection Procedure Option

I. HEALY BREAKAWAY RECONNECTION CLAMP .....	1
II. EASYGRIP RECONNECTION TOOL .....	3

---

## I. HEALY BREAKAWAY RECONNECTION CLAMP

### TOOLS NEEDED:

- Healy Breakaway Reconnection Clamp, Part No. 795
- 8mm Hex Head Socket
- Torque wrench
- Safety glasses

### RECONNECTION PROCEDURE

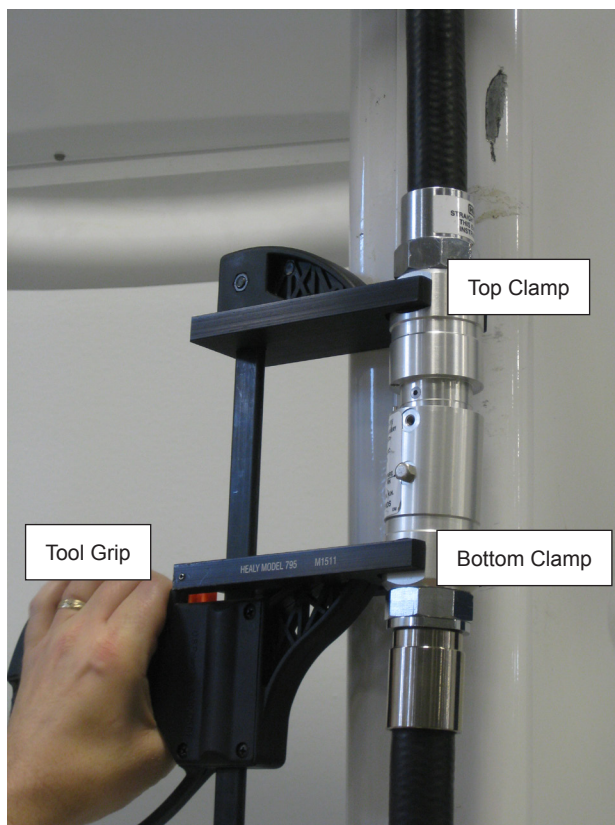
1. Inspect each half of the separated breakaway for obvious damage to the outer-shell, plastic inserts or o-rings; including cracks, chips or tears that may effect reconnecting the two halves.
2. Check the shear pin bushing hole (see Figure 2) located in the top half of the breakaway for any part of the pin left behind at separation. A gentle tap on the opposite side of the breakaway should eject the pin.
3. After completing inspection, lightly lubricate the main o-ring on the top half of the breakaway. Any weight motor oil is acceptable.
4. Slide the top clamp of the Breakaway Reconnection Clamp onto the two flat surfaces on the top half of the breakaway (See Figure 1) installed on the dispenser (attached to whip hose).
5. Slide the separated bottom half of the breakaway (with hose and nozzle attached) onto the bottom clamp of the Breakaway Reconnection Clamp and begin squeezing the grip to slowly bring the two halves together. Check the main o-ring for position as the top and bottom of the breakaway come together.
6. Align the dowel pin in the bottom half of the breakaway with the dowel pin guide located in the

top half of the breakaway. When dowel pin and guide are aligned, continue squeezing tool grip until the breakaway halves join together.

**CAUTION:** Reconnection can cause a small amount of gasoline to leak out of the breakaway. A towel wrapped loosely around the breakaway can help to minimize fuel spills.

7. Remove the shear pin (#787) located in the spare shear pin location of the breakaway and install in place of the original.
8. Torque the shear pin to 20 inch-pounds (~ 1.5 ft-lbs). **DO NOT OVER-TIGHTEN.**
9. If available, install a shear pin (#787) in the spare shear pin location.
10. Remove the Breakaway Reconnection Clamp.
11. Proceed with the tests outlined in Section 1.4 of the Healy Systems Scheduled Maintenance.

**Figure 1**



**Figure 2**



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3760 Marsh Road  
Madison, Wisconsin 53718 USA  
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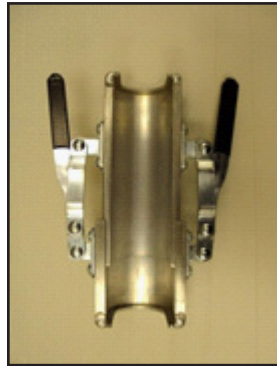
Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



## II. EASYGRIP BREAKAWAY RECONNECTION CLAMP

### TOOLS NEEDED:

- EasyGrip Reconnection Clamp



- 8 mm Hex Head Socket
- Torque wrench
- Safety Glasses

### RECONNECTION PROCEDURE

**NOTE:** Additional information on the EasyGrip operation can be found by viewing a video clip on their website at <http://www.simplegrip123.com/>

1. Inspect each half of the separated breakaway for obvious damage to the outer-shell, plastic inserts or o-rings; including cracks, chips or tears that may effect reconnecting the two halves.
2. Check the shear pin bushing hole, (See Figure 1) located in the top half of the breakaway for any part of the pin left behind at separation. A gentle tap on the opposite side of the breakaway should eject the pin.



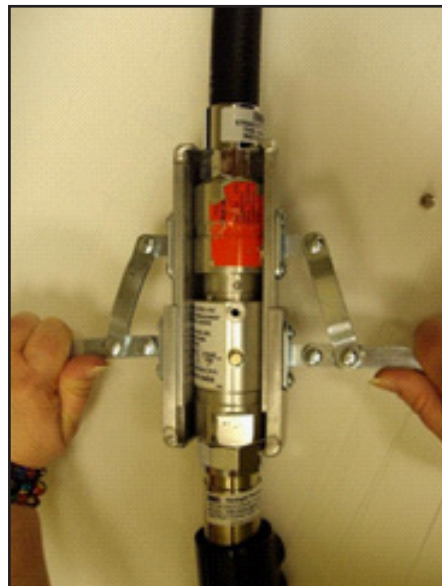
**Figure 1**

3. After completing inspection, lightly lubricate the main o-ring on the top half of the breakaway (See Figure 1). Any weight motor oil is acceptable.
4. With the EasyGrip in its full open position, place the top portion of the breakaway into the top side of the EasyGrip and the bottom portion of the breakaway into the bottom side (See Figure 2).



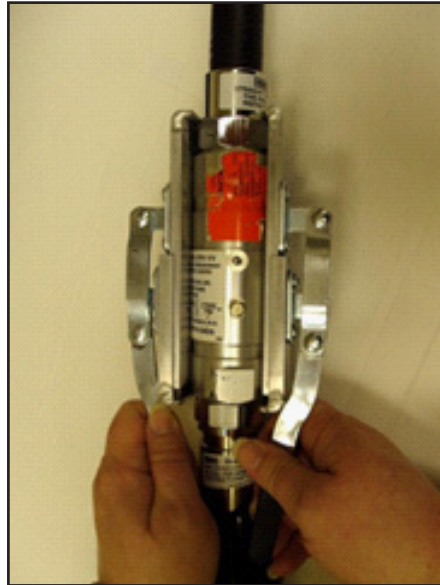
**Figure 2**

5. Pull the two handles of the Easy Grip down at the same rate to slowly bring the two halves together. Check the main o-ring for position as the top and bottom of the breakaway come together. See Figure 3.



**Figure 3**

- Align the dowel pin in the bottom half of the breakaway with the dowel pin guide located in the top half of the breakaway. When the dowel pin and guide are aligned, continue squeezing tool grips until the breakaway halves come together. See Figure 4



**Figure 4**

**CAUTION:** Reconnection can cause a small amount of gasoline to leak out of the breakaway. A towel placed in front of the reconnection zone of the breakaway can help to minimize fuel spills.

- Remove the shear pin (#787) located in the spare shear pin location of the breakaway and install in place of the original. See Figure 5



**Figure 5**

8. Torque the shear pin to 20 inch-pounds (~ 1.5 ft-lbs).  
DO NOT OVER-TIGHTEN
9. If available, install a shear pin (#787) in the spare shear pin location.
10. Remove the Easygrip.
11. Proceed with the tests outlined in Section 1.4 of the Healy Systems Scheduled Maintenance.

# Healy Model 807 Swivel Breakaway

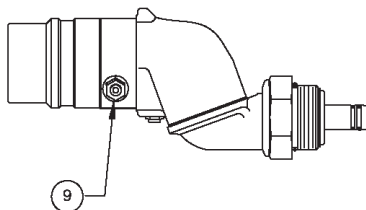
**IMPORTANT: This sheet must be left with service station manager.**

## HEALY STAGE II VAPOR RECOVERY MODEL 807 SWIVEL BREAKAWAY (HOSE BREAK) ASSEMBLY & INSTALLATION INSTRUCTIONS

- The Healy Swivel Breakaway is delivered loosely assembled. Handle carefully to avoid dropping and/or losing the precision parts.
- Failure to remove the Shear screw (Item 9) as described in Step 1 below could result in fracturing or shearing of the screw. The Shear screw will require replacement if damaged.
- Be sure to assemble parts in the exact sequence as shown below.
- Be sure to lubricate all o-rings and quad seals where indicated. Use of ordinary motor oil is sufficient.
- Do not use thread-sealing compounds on straight threads.
- This Breakaway shall be installed between the product hose and the nozzle end (threaded onto nozzle).

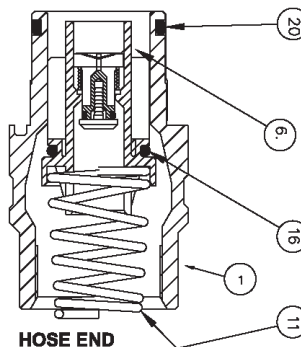
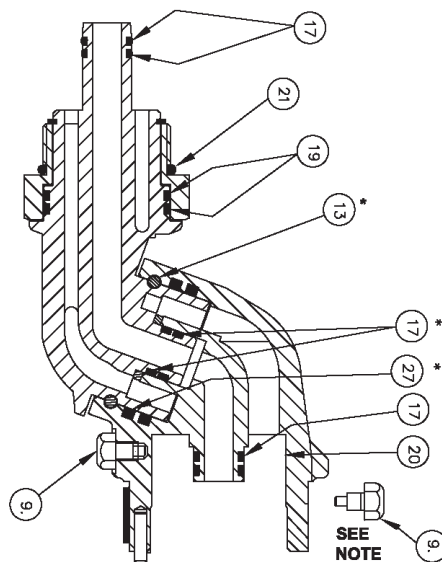
### ASSEMBLY INSTRUCTIONS (refer to diagram at right)

1. Remove the Shear Screw (Item 9) and the packing materials. Separate the halves of the breakaway assembly, retaining the loose internal valve, (Item 6) and the spring (Item 11) inside the halves.
2. Install the male threaded half of the 807 into the Healy Nozzle. Lubricate the o-ring seals (Items 17 & 21) and tighten to 35 to 70 foot pounds. Be sure the vapor tube fitting slides easily into the nozzle before final tightening.
3. Select the delivery hose, lubricate the o-ring seals and straight thread. Assemble the non-swivel end of the Breakaway on the hose. Tighten to 35 to 70 foot pounds. Be sure the valve and spring (items 6 & 11) are in place before final tightening.
4. Carefully fit both halves of the Breakaway together. Utilizing the alignment pin, fully compress both halves and insert the Shear Screw (Item 9) and hand tighten. Final tighten to 20 inch pounds. Tools should not be necessary to initially start the screws.



**NOTE: SHEAR SCREW INSTALLS 45° FROM SPARE.**

### NOZZLE END



\* NOT FIELD REPLACEABLE

*	27	2	4125-514GJ	QUAD RING, MINNISOTA RUBBER	80727
	21	1	1-025	O-RING, PRECISION #5747	HB-2
	20	1	1-122	O-RING, PRECISION #9727	709
	19	2	1-024	O-RING, PRECISION #5747	MPD-5
	18	1	1-117	O-RING, PRECISION #9727	70B
*	17	6	1-012	O-RING, PRECISION #5747	75414
	16	1	1-009	O-RING, PRECISION #9727	753
	11	1	A8701-752	SPRING, CONICAL	752
	9	2	B8701-787	SCREW, SHEAR	787-1
	6	1	A8701-748	VALVE, DISPENSING END	748
	4	1	B8701-810	BUSHING	810
	2	1	C8701-805	SWIVEL, FEMALE, (MACHINED)	805
	1	1	C8701-809	BODY, DISPENSER END	809
ITEM NO.	QTY	DWG NO.	DESCRIPTION		P/N

LIST OF MATERIAL

### HEALY SYSTEMS, INC.

18 Hampshire Drive \* Hudson, New Hampshire 03051  
(603) 882-2472 Telephone\* (603) 882-5189 FAX

healy  
... the SMART Stage II solution

**A8701-807-INST-M**

11/15/00 REV. M



## DRIVE-OFF BREAKAWAY RECONNECTION PROCEDURE

Use this procedure to either reconnect or disconnect (reverse order) the Healy 807 Swivel Breakaway as part of Section 1.4 Procedure for Reconnecting Breakaway and Testing Fueling Point after Drive-Off in the Healy Systems Scheduled Maintenance.

### TOOLS NEEDED:

- Healy Breakaway Reconnection Clamp, Part No. 795
- 8mm Hex Head Socket
- Torque wrench
- Safety glasses

1. Inspect each half of the separated breakaway for obvious damage to the outer-shell, plastic insert or o-rings; including cracks, chips or tears that may effect reconnecting the two halves.
2. Check the shear pin bushing hole (see Figure 3) located in the half of the breakaway attached to the hose for any part of the pin left behind at separation. A gentle tap on the opposite side of the breakaway should eject the pin.
3. After completing inspection, lightly lubricate the main o-ring on the half of the breakaway that's attached to the hose and the two small o-rings inside the half of the breakaway attached to the nozzle. Any weight motor oil is acceptable.
4. Remove the black handle cover from the nozzle (See Figure 1).
5. Slide the top clamp of the Breakaway Reconnection Clamp above the two flat surfaces on the nozzle (See Figure 2).
6. Slide the half of the breakaway that's attached to the hose onto the bottom clamp of the Breakaway Reconnection Clamp and begin squeezing the grip to slowly bring the two halves together. Check the main o-ring for position as the top and bottom of the breakaway join together (See Figure 2).
7. Align the dowel pin in the top half of the breakaway with the dowel pin guide located in the bottom half of the breakaway (See Figure 3). When dowel pin and guide are aligned, continue squeezing tool grip until the breakaway halves come together (See Figure 4).

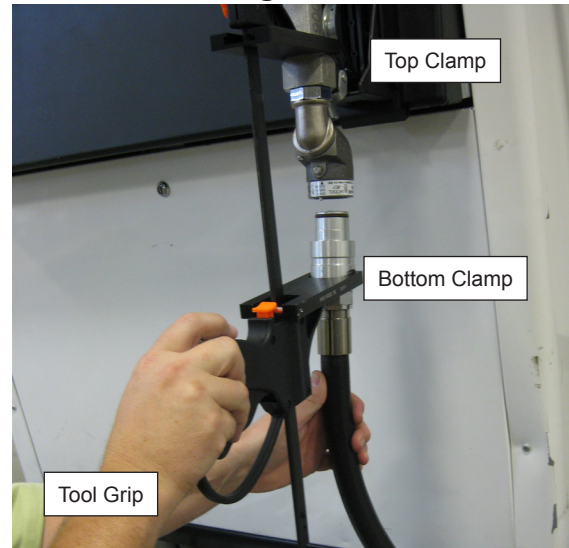
**Caution:** Reconnection can cause a small amount of gasoline to leak out of the breakaway. A towel wrapped loosely around the breakaway can help to minimize fuel spills.

7. Remove the shear pin (#787-1) located in the spare shear pin location of the breakaway and install in place of the original.
8. Torque the shear pin to 20 inch-pounds (~ 1.5 ft-lbs). **DO NOT OVER-TIGHTEN.**
9. If available, install a shear pin (#787-1) in the spare shear pin location.
10. Remove the Breakaway Reconnection Clamp.
11. Proceed with the tests outlined in Section 1.4 of the Healy Systems Scheduled Maintenance.

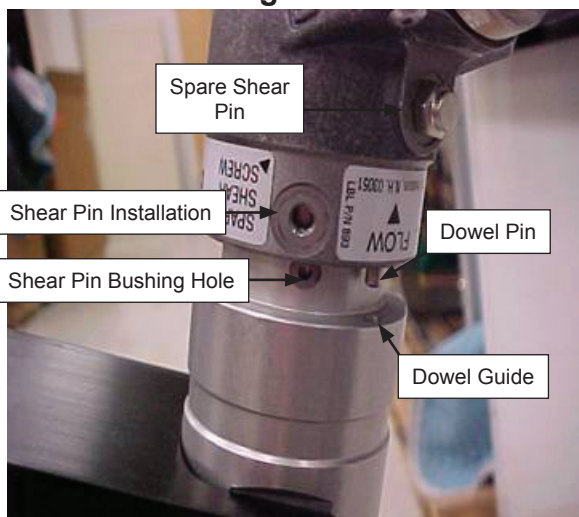
**Figure 1**



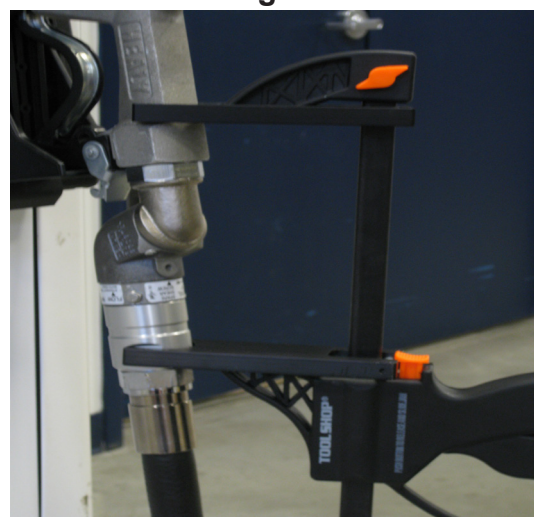
**Figure 2**



**Figure 3**



**Figure 4**



Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



**Franklin Fueling Systems**





# Recommended Instructions Installation, Maintenance, Inspection

## CATLOW CTMCA Breakaway

577014-071  
DATE 03/2016

### VERY IMPORTANT READ THIS BEFORE INSTALLING YOUR BREAKAWAY



**WARNING: USE ONLY ON SYSTEMS RATED AT 50 PSI MAXIMUM**  
**USE ON SYSTEMS HAVING HIGHER STATIC PRESSURE MAY CAUSE PEMATURE SEPARATION**  
  
**ALWAYS CHECK FOR ELECTRICAL CONTINUITY FOLLOWING PETROLEUM EQUIPMENT INSTITUTE (PEI) RECOMMENDED TEST PROCEDURE (PEI/RP400-02)**

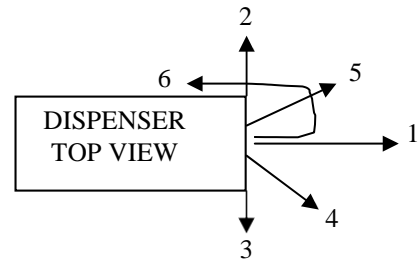
**PRIOR TO INSTALLATION:** Refer to the model of breakaway for the maximum pull force before you proceed with the instructions

Caution must be used when testing to prevent damage to the dispenser or personal injury.

**ALL DISPENSERS MUST BE BOLTED TO THE ISLAND.** (NFPA 30A 6.3.4 and PEI/RP500-11 2.2)

**CONFIRM DISPENSER IS SECURE.**

- Attach a spring scale to the dispenser where the breakaway will be installed.
- Apply a 350 lbs pull force at various angles and check the emergency valves, Dispenser and hose assembly. (UL STANDARD 567)
- Release the load and complete the installation of the breakaway.



**CTMCA INSTALLATION KIT - P/N 4037**

Qty.	P/N	Description
1 ea.	CTMCA	Cam Twist Magnetic Breakaway
2 ea.	M3418	CTMCA Hose Adapter

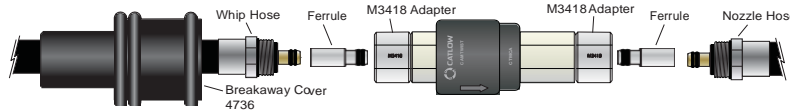
### INSTALLATION NOTES

- The CATLOW in-line breakaway must always be installed between two hose sections (example: whip & main hose)
- On side hose connections install the breakaway between the nozzle and the hose retractor (NFPA 30A 6.5.3)  
**DO NOT INSTALL THE BREAKAWAY ON THE DISPENSER SIDE OF THE HOSE RETRACTOR**
- On an overhead hose connection, install the short section of whip hose then the breakaway, hose and nozzle

### INSTALLATION INSTRUCTIONS FOR THE CTMCA BREAKAWAY

**NOTE: Catlow recommends using a swivel end hose in proximity to the CAM TWIST**

1. Isolate/turn the dispenser OFF and relieve the line pressure from the system by opening the nozzle and allowing the system to drain into an approved metal container.
2. Observe the flow direction arrow on the breakaway and install with the flow arrows pointing toward the nozzle.
3. Use thread sealant recommended by UL for petroleum products on pipe thread connections.
4. Use oil or grease on straight or metric thread o-ring fittings - **DO NOT USE TEFLON TAPE.**
5. When replacing the CTMCAs with M3418 adapters on both ends, there are special precautions that must be observed. When replacing CTMCA, ensure the M3418 ferrule stays with each hose and does not get discarded along with the discarded CTMCA.



6. Re-attach the hose to the M3418 adapter and tighten to 50 ft-lbs torque. **CAUTION: Torque adjacent parts only (e.g., hose and adapter to which it connects).** Slide plastic cover 4736 over the breakaway as far as it will go (for retrofit instructions see page 2).
7. Activate/turn the dispenser ON and purge the hoses and nozzles of air into an approved metal container.
8. Check the system for leaks, replace any item that exhibits signs of leakage.



Use Only UL Listed  
Paste Type Thread  
Sealant



Hoses should not be long enough that a vehicle could drive over the hose resulting in a direct pull on the retractor cable or dispenser and bypass the breakaway



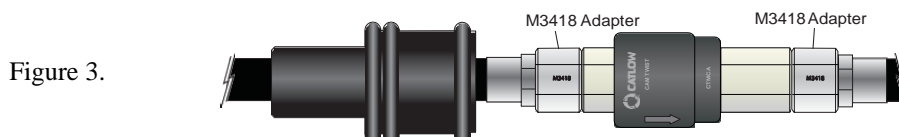
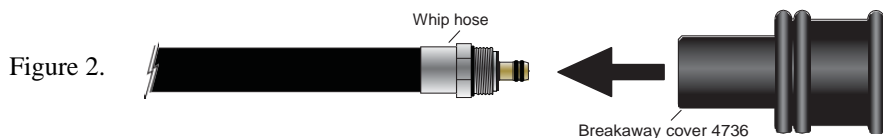
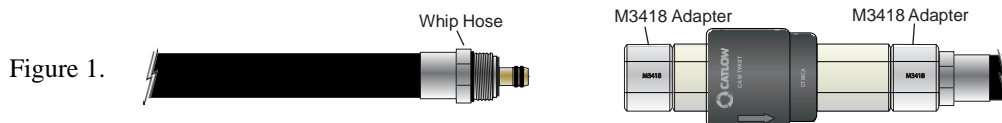
Always Refer To Your  
Local City, State Or Federal  
Testing Regulations

**CAM TWIST MAGNETIC BREAKAWAY**
**Model: CTMCA**
**IF SEPARATION OCCURS**

1. Isolate/turn off dispenser, relieve line pressure from the whip hose and the nozzle hose. Drain fuel into an approved metal container.
2. Inspect the entire system for damage and/or leaks. Replace any damaged components in the system (*PEI/RP500-11 9.2.2*).
3. **Clean the magnet surfaces** on both the male and female couplings and inspect for damage.
4. Replace damaged o-rings using CATLOW repair kit.  
**Lubricate the o-rings and the mating male and female surfaces with oil or grease.**
- 4a On Model CTMCA, O-rings must be replaced using CATLOW repair kit P.N.#2977.
5. Align the flow arrows and push the halves together engaging the coupling mechanism until a noticeable snap is felt and the etched guide mark above the letters CTMCA on the nozzle half of the breakaway is not visible (see illustrations on page 3).
6. Test the reconnection by pulling on the hose just below the breakaway.
7. Activate/turn on the dispenser and purge the hose and nozzle of air into an approved metal container.
8. With the system pressurized, check for leaks around the breakaway, nozzle, both hoses and all joints.
9. Replace any item that exhibit signs of leakage.

**RETROFITTING PLASTIC COVER 4736 ONTO BREAKAWAY**

1. Disassemble the whip hose from the breakaway (see Figure 1 below). NOTE: After disconnecting the whip hose from a CTMCA with M3418 adapters, ensure the ferrule does not get discarded (if it should come out of the breakaway when the hose is disconnected). Refer to the illustration in Step 5 of the **INSTALLATION INSTRUCTIONS FOR THE CTMCA BREAKAWAY** on page 1.
2. Slide breakaway cover 4736 onto the whip hose ( see Figure 2 below).
3. Re-attach the hose to the M3418 adapter and tighten to 50 ft-lbs torque ( see Figure 3 below). **CAUTION: Torque adjacent parts only (e.g., hose and adapter to which it connects).**
4. Slide down the cover onto the breakaway as far as it will go (see Figure 4 below).



**Isolate fuel pressure/flow from the system. If dispenser is off and depressurized, o-rings can be safely replaced WITHOUT draining the hose assembly. Always lubricate o-rings before installing and reconnecting. An o-ring pick or small stiff wire will be useful to remove old o-rings.**

### CTMCA O-RING REPLACEMENT

The CTMCA has four (4) O-rings that can be serviced or replaced in the field. These are used to seal liquid (Qty. 2), vapor (Qty. 1) and dirt (Qty. 1). **To Replace these O-rings use CATLOW PN #2977.**



#### SEPARATES IN ONE DIRECTION ONLY

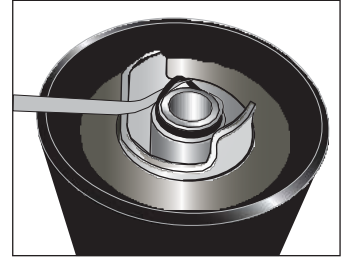
Use two open end wrenches and apply in a clockwise rotary torque



When the two halves of the breakaway are correctly connected, the guide mark (see adjacent Dirt and Liquid drawings to the right) etched above the letters CTMCA on the nozzle half of the breakaway will not be visible.

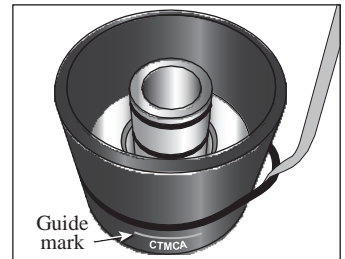
#### VAPOR VAPOR VAPOR VAPOR

The Vapor o-ring is the smallest o-ring in the repair kit. It is located in the upper section of the breakaway. This will need to be replaced if meter creep is observed.



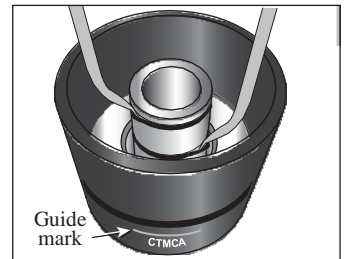
#### DIRT DIRT DIRT DIRT

The largest o-ring is used to keep dirt out of the nylon covers and breakaway assembly. Replace if missing or damaged.



#### LIQUID LIQUID LIQUID LIQUID

Occasionally during a drive-off or reconnection, the liquid o-ring gets pinched or cut. If a breakaway leaks after reconnection, replace the liquid o-ring. Reach inside the lower section of the breakaway, squeeze the o-ring and remove it.



### ALWAYS LUBRICATE WITH OIL OR GREASE BEFORE RECONNECTION



### REPAIR KIT

PN	DESCRIPTION
2977	Repair Kit CTMCA



**EQUIPMENT WARRANTY**

Veeder-Root warrants that this product shall be free from defects in material and workmanship and is compliant with all applicable performance standards and specifications for which it has been certified, for a period of one (1) year from date of installation when proof of the date of install is provided. Or fifteen (15) months from date of manufacture (see terms below) when proof of date of installation is not provided.

Date of manufacture: \_\_\_\_\_

\*Product S/N: \_\_\_\_\_

\*Date of installation: \_\_\_\_\_

\*Technician number: \_\_\_\_\_

*\*Required Information*

\*Installation Address:

Street: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_

Phone: \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

This component was tested at the time of manufacture and meets all the applicable performance standards and specification to which it was certified: E.O. VR-201 and VR-202.

For detailed warranty terms see EO warranty exhibits (VR-201/VR-202 Exhibit 6) on the ARB Web site at:  
<http://www.arb.ca.gov/vapor/eo-evrphasell.htm>

# VST Installation Procedure for Phase II EVR Vacuum Assist Safety Breakaway Devices

Part Number Series:  
VST-HEVR-SBK;  
VST-ISVR-SBK



**Vapor Systems Technologies, Inc.**  
650 Pleasant Valley Drive  
Springboro, Ohio 45066 (USA)  
  
Toll Free: 1-888-878-4673  
Phone: 937-704-9333  
Fax: 937-704-9443  
www.vsthose.com

## APPLICATION

These VST Safety Breakaway devices are intended to prevent damage to the dispenser and hose in the event of a vehicle drive off. These devices separate at pull forces up to 350 lbs. You will need to determine that 350 lbs. of pull force will not damage the dispenser.

After verifying that the dispenser is securely bolted to the island, it can be tested by using a spring scale and a length of rope. The rope must be connected at the dispenser outlet casting, which may require a threaded bushing with a hole for attaching the rope. Attach the scale to the rope and pull to 350 lbs. in several directions. Be sure to avoid damaging the dispenser.

## NOTE

- The whip hose **ALWAYS** attaches to the dispenser. If a retractor is being used, the retractor clamp **MUST** be between the breakaway and dispenser.
- VST hoses are made to withstand 350 pounds tensile pull without damage. If another brand of hose is present at the dispenser, VST recommends that you contact the hose manufacturer regarding the compatibility with this breakaway device.

## GENERAL INFORMATION

If hanging hardware components are involved in a drive-off or incur other customer abuse, each individual component must be functionally tested prior to customer dispensing activities.

## INSTALLATION PREPARATION

These procedures must be followed to ensure leak-proof installation and operation of these safety breakaway products.

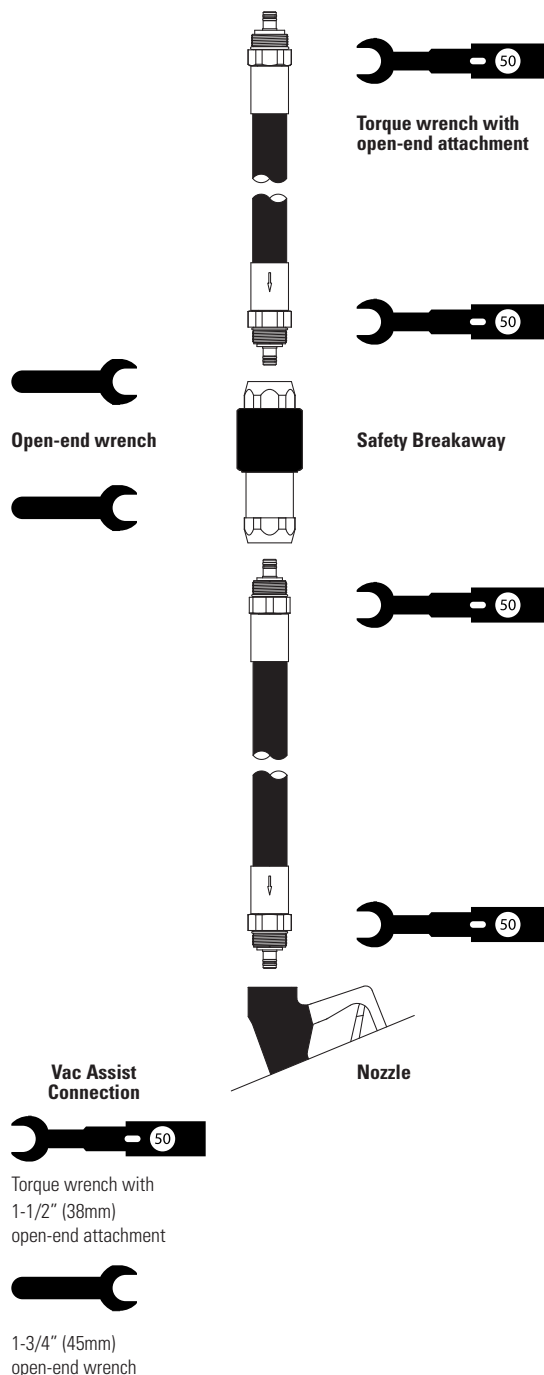
- Turn off and tag the power to the dispenser. Dispenser must be de-energized prior to service to avoid personal injury.
- Barricade work area to block vehicle access to the dispenser.
- Close dispenser shear valve prior to performing any service work with the hanging hardware (hoses, safety breakaways, and nozzles).
- Drain liquid product from the hanging hardware set into an approved container prior to replacing any hanging hardware component.
- When not using the VST Breakaway Assembly Tool (VST-BAT-200), remove hanging hardware from the dispenser prior to making replacement component assembly connections. VST recommends connecting the whip hose to dispenser as the last connection during hanging hardware assembly.

## INSTALLATION AND FUNCTION TESTS

- Initial inspection:
  - Carefully unpack safety breakaway from shipping carton.
  - Inspect safety breakaway for any damage to threads, O-rings, exterior, etc.
- Lightly lubricate **ALL** O-rings on mating connections with petroleum jelly or other suitable lubricant. **DO NOT USE** pipe dope or thread sealant.
- Attach breakaway on mating connection and tighten by hand. **NOTE FLOW DIRECTION ARROW** (where applicable). Use the hex on the breakaway body to tighten. **DO NOT USE** the breakaway body to tighten the unit.

**Figure 1.**

EVR Vacuum Assist Hanging Hardware





# VST Installation Procedure for Phase II EVR Vacuum Assist Safety Breakaway Devices

Part Number Series:

VST-HEVR-SBK;

VST-ISVR-SBK

4. Tighten breakaway connection to 50 ft.-lbs. of torque. **DO NOT OVER TIGHTEN.** Use the hex on the breakaway body to tighten. Use a torque wrench with an open-end attachment to fit the hose couplings and an open-end wrench to properly tighten breakaway connections. **DO NOT USE** channel-locks or pliers to tighten connections. Proper ft.-lb. torque may not be achieved with these tools.
5. Purge air from the system by pumping one-tenth (1/10) to two tenths (2/10) of a gallon of fuel into an approved container. Inspect each breakaway joint connection for liquid leaks and meter creep. Make proper adjustments at the breakaway connection if necessary.
6. Check the nozzle shut-off action by dispensing fuel into an approved container at least three times to assure proper automatic operation. To test, operate the nozzle and submerge the spout tip in fuel until the fuel level covers the vent hole. The main valve of the nozzle automatically shuts off when liquid covers the vent hole at the end of the spout. The dispenser should deliver a minimum of 3 gpm. Hold open latch will disengage automatically when liquid covers the vent hole in the spout.

**Figure 2.**

VST Breakaway Assembly Tool



7. Measure the resistance between the dispenser outlet casting and the tip of the nozzle spout. Use an electronic multimeter set on the high range of the ohmmeter function. Resistance should not indicate more than 70,000 ohms per foot of hose. Example: The measured resistance for a 12-foot hose must not exceed 840,000 ohms (840 kilohms).

## BREAKAWAY REATTACHMENT PROCEDURES

These VST reattachable breakaways can be reconnected in either one of two methods:

**METHOD 1:** Use of the VST Breakaway Assembly Tool (VST-BAT-200) with the appropriate reassembly plates for this breakaway.

1. Follow **INSTALLATION PREPARATION** steps 1 - 3.
2. Inspect both safety breakaway halves for damage that may have occurred during separation. Include looking for external damage to the product, damaged threads, damaged O-rings, missing O-rings, proper placement of O-rings, etc. **If damage is detected, replace with new product.**
3. Prior to reassembling, be sure the mating parts are undamaged and clean.
4. Lightly lubricate **ALL** O-rings on mating connections with petroleum jelly or other suitable lubricant.
5. Utilize the VST Breakaway Assembly Tool with the appropriate reassembly plates to reassemble the breakaway. The tool is used to provide appropriate leverage for the ease of reassembly of the breakaway. This can be done without disassembling the hoses from the breakaway halves. **See Figure 2.**
6. Press the button on the VST Breakaway Assembly Tool to spread the end clamps apart. This will allow for the two separated breakaway halves to fit between the top and bottom clamps.
7. Slide the top clamp of the VST Breakaway Assembly Tool behind the hex on the breakaway half still connected to the whip hose. **See Figure 2.**
8. Slide the separated bottom half of the breakaway, with curb hose and nozzle attached, onto the bottom clamp of the VST Breakaway Assembly Tool. **See Figure 2.**
9. Slowly squeeze the VST Breakaway Assembly Tool trigger to bring the breakaway halves together.
10. Carefully align the two breakaway halves.
  - a. Align the anti-rotation studs (2) inside the breakaway half on the curb hose with the slots (2) on the other half of the breakaway attached to the whip hose. **See Figure 3.**
11. Continue squeezing the VST Breakaway Assembly Tool trigger to finish reassembly.
12. The two aligned breakaway halves need to be assembled concentrically (properly aligned) until they snap into place.
  - a. Listen for a “click” to indicate that the two halves have been properly reattached.
  - b. If the two breakaway halves become cocked (misaligned) or otherwise do not snap together easily, pull them apart and repeat steps 7 - 12.

**CAUTION:** Reconnection can cause a small amount of gasoline to leak out of the breakaway. A towel wrapped loosely around the breakaway can help to minimize spills.

# VST Installation Procedure for Phase II EVR Vacuum Assist Safety Breakaway Devices

Part Number Series:  
VST-HEVR-SBK;  
VST-ISVR-SBK

13. After the two breakaway halves are properly snapped together, remove the VST Breakaway Assembly Tool (press the button on the tool to allow it to release), and give the reassembled breakaway a strong pull to verify that it is properly connected.
14. Perform Section 1.4 – Procedure for Operator Reconnection of Breakaway and Testing Fueling Point after a Drive-Off in the Assist Systems Scheduled Maintenance.

**METHOD 2:** Without the use of the VST Breakaway Assembly Tool.

1. Follow **INSTALLATION PREPARATION** steps 1 - 5.
2. Disconnect hoses from the safety breakaway halves.
3. Inspect both safety breakaway halves for damage that may have occurred during separation. Include looking for external damage to the product, damaged threads, damaged O-rings, missing O-rings, proper placement of O-rings, etc. **If damage is detected, replace with new product.**
4. Prior to reassembling, be sure the mating parts are undamaged and clean.

**Figure 3.**  
Anti-Rotation Studs and Slots



5. Lightly lubricate **ALL** O-rings on mating connections with petroleum jelly or other suitable lubricant.
6. Carefully align the 2 breakaway halves.
  - a. Align the anti-rotation studs inside the breakaway half on the curb hose with the slots on the other half of the breakaway -inside the breakaway half on the whip hose. **See Figure 3.**
7. The two aligned breakaway halves need to be assembled concentrically (properly aligned) until they snap into place.
  - a. Listen for a “click” to indicate that the two halves have been properly reattached.
  - b. If the two breakaway halves become cocked (misaligned) or otherwise do not snap together easily, pull them apart and start over.
8. After the two breakaway halves are properly snapped together, give the reassembled breakaway a strong pull to verify that it is properly connected.
9. Perform Section 1.4 – Procedure for Operator Reconnection of Breakaway and Testing Fueling Point after a Drive-Off in the Assist Systems Scheduled Maintenance.

## MAINTENANCE

Inspect breakaways regularly for damage, loose connections or leaks. Replace as necessary. Subject to customer abuse, breakaways should be replaced when damaged.

The breakaway is designed and constructed to give lasting service if properly handled and maintained. If for any reason it should need attention, contact your VST distributor for proper disposition.

## NOTE:

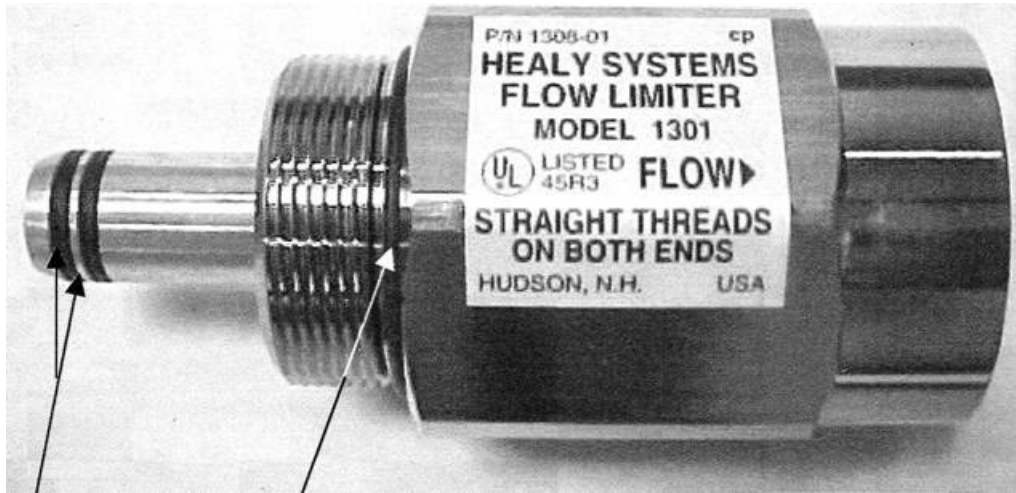
Due to abuse, misuse, changing gasoline formulas, variation in maintenance practices, environmental conditions and/or conditions beyond the manufacture’s control, dispensing equipment may need replacement before five (5) years. Inspections and proper maintenance procedures should be followed by the station manager to determine if replacement is required before five (5) years.

## WARNING

Unauthorized rebuilding or modifying of breakaways voids ALL approvals and warranties.

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

# Healy 1301 Flow Limiter



Quad Rings  
P/N HB4

O-ring  
P/N HB2

**The Healy Model 1301 Flow Limiter** is designed for installation into the lower half of the Healy P/N 8701VV breakaway before installation of a Healy Systems primary hose. The flow limiter reduces the product dispenser rate to conform to the U.S. EPA 10.0 gpm maximum dispensing limit.

**Installation Instructions:** Lubricate the quad rings and O-ring before assembly with oil or grease. **Do not use pipe sealant or tape on threads or seals.** Install the male end of the flow limiter into the breakaway as shown below and tighten to 35 to 70 foot pounds. Install the primary hose and nozzle according to their instructions. Make sure all fittings are tight, test for any leaks and check to be sure the flow does not exceed 10.0 gpm with the nozzle fully open (lever held all the way up).

Field replaceable parts are limited to replacement of the Quad Rings or O-ring. There is no maintenance required of the internal parts.



Dispenser

Whip  
Hose

8701VV  
Breakaway

Flow  
Limiter

Primary  
Hose

Nozzle

Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

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Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



**Franklin Fueling Systems**



## Healy 1302 Flow Limiter



Quad Rings  
P/N HB4

O-ring  
P/N HB2

**The Healy Model 1302 Flow Limiter** is designed for installation into the female end of the Healy P/N 807 swivel breakaway before installation of a Healy Systems primary hose. The flow limiter reduces the product dispenser rate to conform to the U.S. EPA 10.0 gpm maximum dispensing limit.

**Installation Instructions:** Lubricate the quad rings and O-ring before assembly with oil or grease. **Do not use pipe sealant or tape on threads or seals.** Install the male end of the flow limiter into the swivel breakaway as shown below and tighten to 35 to 70 ft-lbs. Install the primary hose and nozzle according to their instructions. Make sure all fittings are tight, test for any leaks and check to be sure the flow does not exceed 10.0 gpm with the nozzle fully open (lever held all the way up).

Field replaceable parts are limited to replacement of the Quad Rings or O-ring. There is no maintenance required of the internal parts.



Nozzle

807 Swivel  
Breakaway

Flow  
Limiter

Primary  
Hose

Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



**Franklin Fueling Systems**



**GILBARCO ENCORE™ 300 & 500 SERIES  
DISPENSER RETROFIT with VDC control valves  
for HEALY SYSTEMS, INC. MODEL VP1000  
VAPOR RECOVERY ASSIST SYSTEM  
(KIT Z082 & Z083)**

**OUTLINE**

**Notice: USE THIS PROCEDURE IF CONVERTING A BALANCE OR GILBARCO VaporVac™  
VAPOR RECOVERY SYSTEM TO A HEALY VAPOR RECOVERY ASSIST SYSTEM**

This Manual is to be used for new, replaced, retrofitted, or reconditioned dispensers/pumps.

**See Section 15 For Dispensers With VaporVac™ Systems**

- 1. Purpose**
- 2. Safety**
- 3. Models Covered**
- 4. Parts Lists**
- 5. Tools Required**
- 6. Dispenser Access**
- 7. Survey Scope of Work**
- 8. Installing The Healy VP1000 System (For installations w/ ISD, see Section 18 regarding VP1000 position)**
- 9. Installing The Sealed Nipple Assembly**
- 10. Wiring Inside The Electronics Compartment**
- 11. Connecting Healy Systems Dispensing Equipment**
- 12. VP1000 Theory Of Operation**
- 13. Testing The System**
- 14. Trouble Shooting The VP1000**
- 15. VaporVac™ Removal**
- 16. Nozzle Hook Adjustment**
- 17. VP1000 Vane & Rotor Service & Replacement Guide**
- 18. Location Change of Healy VP1000 on Encore Series ISD Enabled Dispensers  
Start-up/ New Installation/ Warranty/ Annual Testing Form**

## 1. PURPOSE:

This procedure describes the tools, methods and skill levels required to install a Healy Systems, Inc. Model VP1000 Vapor Recovery pump in vapor ready Gilbarco Encore™ 300 and 500 series gasoline dispensers. Only Healy trained and certified contractors will be able to perform these retrofits or warranty will be void. The installer shall be a skilled petroleum technician and thoroughly familiar with the requirements of State, Federal and local codes for installation and repair of gasoline dispensing equipment. Also, they shall be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation. NOTE: All electrical and hydraulic plumbing fittings referred to in these instructions must be UL “listed” or “recognized” for the purpose.

**Note:** Installations of vapor piping into the inlet side of the vacuum pump should be sloped such that the natural flow direction is toward the vacuum pump. However, it is permissible to have a piping slope tilted away from the vacuum pump provided that all other applicable tests (Dispenser integrity and V/L) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

**Note:** For installations with In-Station Diagnostics (ISD), the vapor flow meter shall be installed on the down stream side of the vacuum pump. Every effort shall be made to install the vapor flow meter so that vapor piping between the vacuum pump and the vapor flow meter is sloped such that the natural flow direction is toward the vapor flow meter. However, it is permissible to have the piping slope away from the vapor flow meter provided that all other applicable tests (Dispenser integrity, V/L and ISD Operability) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

## 2. SAFETY:

Before installing the equipment, read, understand and follow:

- The National Electrical Code (NFPA 70)
- The Automotive and Marine Service Code (NFPA 30A)
- Any national, state and local codes that may apply.

The failure to install the equipment in accordance with NFPA 30A and 70 may adversely affect the safe use and operation of the system.

Accurate, sound installations reduce service calls: Use experienced, licensed contractors that practice accurate, safe installation techniques. Careful installation provides a sound troubleshooting framework for field repairs and can eliminate potential problems.

1. Read all instructions before beginning.
2. Follow all safety precautions:
  - ❑ Barricade the area.
  - ❑ Do not allow vehicles or unauthorized people in the area.
  - ❑ Do not smoke or allow open flames in the area.
  - ❑ Do not use power tools in the work area.
  - ❑ Wear eye protection during installation.



3. Use circuit breakers for multiple disconnects to turn off power and prevent feedback from other dispensers.

### 3. MODELS COVERED:

Gilbarco 300 and 500 Encore™ series dispensers with VDC control valves, all options except non-vapor ready. The addition of the Healy Systems VP1000 to the Encore dispenser will increase the current draw of the dispenser by 2 amps. Use the label supplied to note this change.

### 4. PARTS LISTS: (See Photo A)

- 1 VP1000 Vacuum Pump
- 1 1373A Wire Harness / MC100 Series Interface Module Assembly
- 1 Interrupt jumper

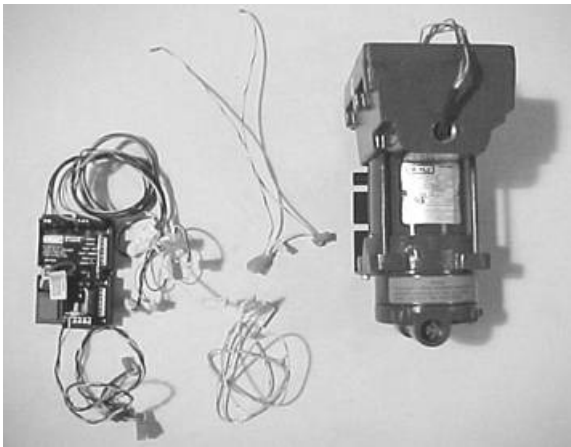


Photo A

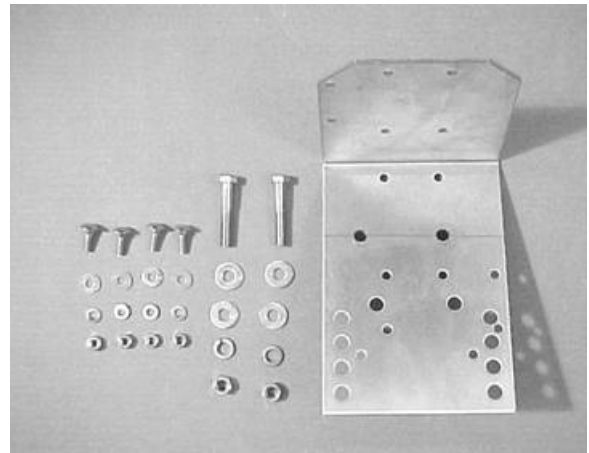


Photo B

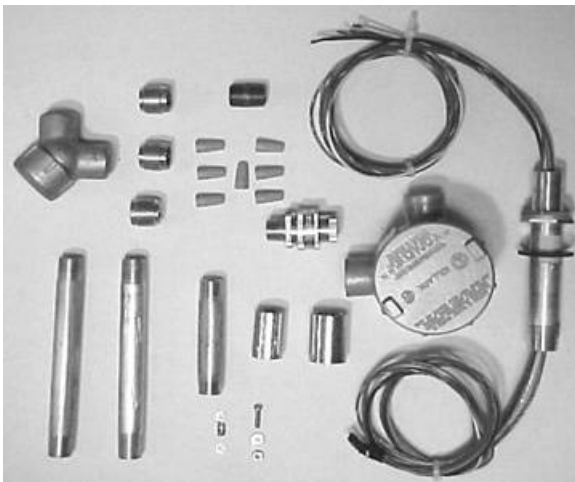


Photo C



Photo D

### **HARDWARE KIT Z082H: (See Photo B)**

- 2 3/8 - 16 x 2" bolts with nuts and washers
- 1 1310 Mounting bracket
- 4 1/4 - 20 bolts, washers, lock washers and nuts

### **ELECTRICAL KIT Z082E: (See Photo C)**

- 1 Current change label (p/n 1405)
- 7 Wire nuts
- 1 8-32 x 5/8" machine screw, washer and nut
- 1 #1316 potted conduit nipple
- 1 #8 ring tong terminal and star washer
- 1 Notice label (p/n 1406)
- 1 UL Listed label (p/n 1410)
- 1 1/2" electrical union
- 3 1/2" x 3/4" electrical reducing bushing
- 1 Explosion proof junction box
- 1 1/2" capped elbow (electrical)
- 1 3/4" coupling (electrical)
- 2 1/2" x 7" electrical nipple
- 1 1/2" x 4" electrical nipple
- 1 1/2" electrical close nipple
- 1 1/2" electrical coupling

### **VAPOR KIT Z082V: Vapor ready only (See Photo D) See photo U for Z083V VaporVac™ Kit**

- 2 1/2 " NPT X 5/8" flair straight fittings
- 3' 5/8" OD copper tube, type 'L'
- 1 1" x 1/2 " reducing bushing
- 2 1/2 " close nipple
- 1 1/2 " x 1/2 " x 1/2 " tee
- 1 1/2" x 1/4" reducing bushing
- 1 1/2 " ball valve
- 1 1/4 " pipe plug
- 4 5/8" flare nuts
- 1 1/2" street elbow

- 2 1/2" NPT x 5/8" flair elbow fitting
- 1 1" x 1/2" bell reducer

**MATERIALS SUPPLIED BY INSTALLER:**

- Thread Sealing Compound – non-Setting, UL Classified for use on all tapered threads, non-electrical, plumbing fittings.
- Oil and gasoline compatible PTFE tape

**5. TOOLS REQUIRED:**

- 1/2" or 3/8" ratchet set w/ sockets 1/4" through 9/16" + 3" extension
- 9" lineman's pliers
- Assorted open end wrenches 1/4" through 3/4"
- Wire cutters/strippers 18 AWG and 26 AWG
- Assorted screwdrivers (flat blade-one must be 1/8" wide and Phillips)
- 5/8" & 1/2" copper tube bending tool
- 5/8" & 1/2" copper tube flaring tool
- Copper tubing cutter
- Electrical multi-Oeter
- Small hand brush (1-1/2" wide, for clearing chips)
- 12" adjustable wrench
- 10" pipe wrench
- Tape measure
- Allen wrenches

**6. DISPENSER ACCESS:**

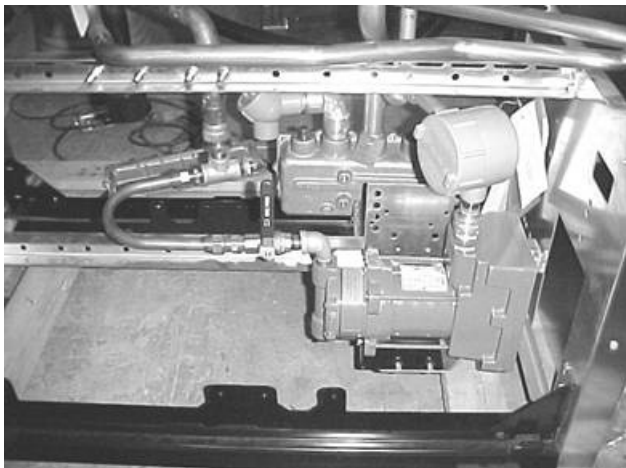
- Secure Dispenser Access keys from Station Management.
- Remove lower cabinet panels and open upper access doors.
- Lock-out and tag-out all electrical power to dispenser being modified.

Refer to manufacturer's manual to determine 'A' side and 'B' side of dispenser.

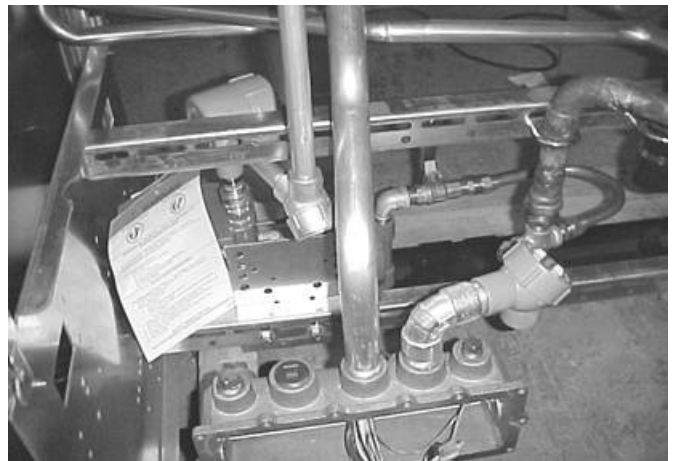
**7. SURVEY – Scope of Work: *Perform this step before beginning steps 8 thru 12.***

Read and familiarize yourself with the theory of operations sheet and wiring instructions for the VP1000 Vapor Pump. The installation of the pump is on a metal bracket mounted to the center cross bar, behind the main electrical 'J' box, see photo E. This is the opposite side that the 1" vapor tube terminates from the upper vapor manifold, see photo F. From this survey, you will have an indication of where the vapor plumbing fittings need to go. In the electronics compartment, locate the sealed electrical nipple coming up from the hydraulics compartment, near the center of the dispenser. In this area, there are a series of electrical knockouts, one of which needs to be removed to install the 1316 sealed nipple assembly for the Healy VP1000 electrical connections. The electrical interface module will be mounted on the cross rail near the place where the sealed nipples come from below. See Section 11.

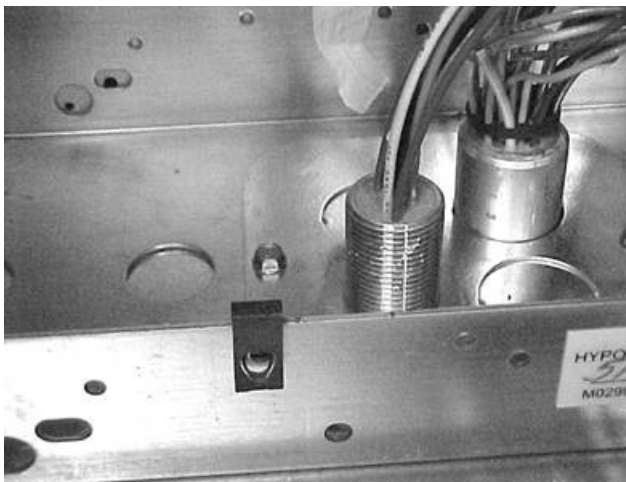
**CAUTION: ALL POWER TO DISPENSER UNDER MODIFICATION SHOULD BE COMPLETELY DISCONNECTED AND CAPPED OFF AT JUNCTION BOX TO AVOID UNINTENTIONAL FEEDBACK FROM OTHER DISPENSERS!!**



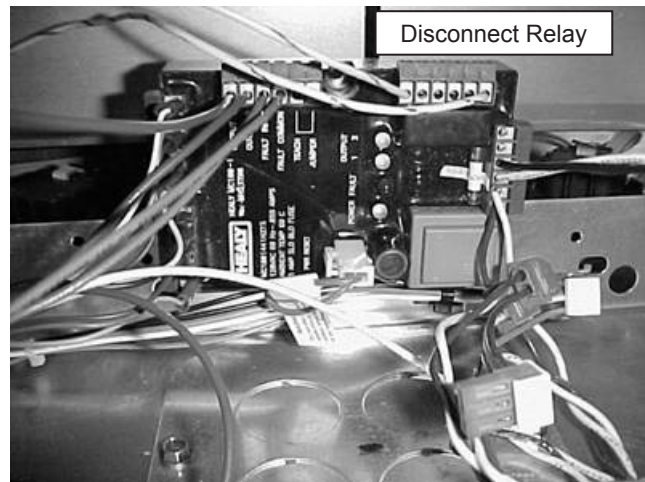
**Photo E**



**Photo F**



**Photo G**



**Photo H**

## 8. INSTALLING THE HEALY VP1000 SYSTEM:

- Get the VP1000 mounting bracket and install to the center cross rail from the non- electrical J-box side, using two 3/8 – 16 x 2” bolts, nuts, flat and lock washers. Using the 2nd and 3rd holes from the right on the cross rail, select the bolt holes in the bracket that places the shelf of the bracket about 2” below the bottom of the cross rail. This position assures that the plumbing is self-draining and avoids traps in the vapor line. Do not completely tighten the hardware, see photo J.

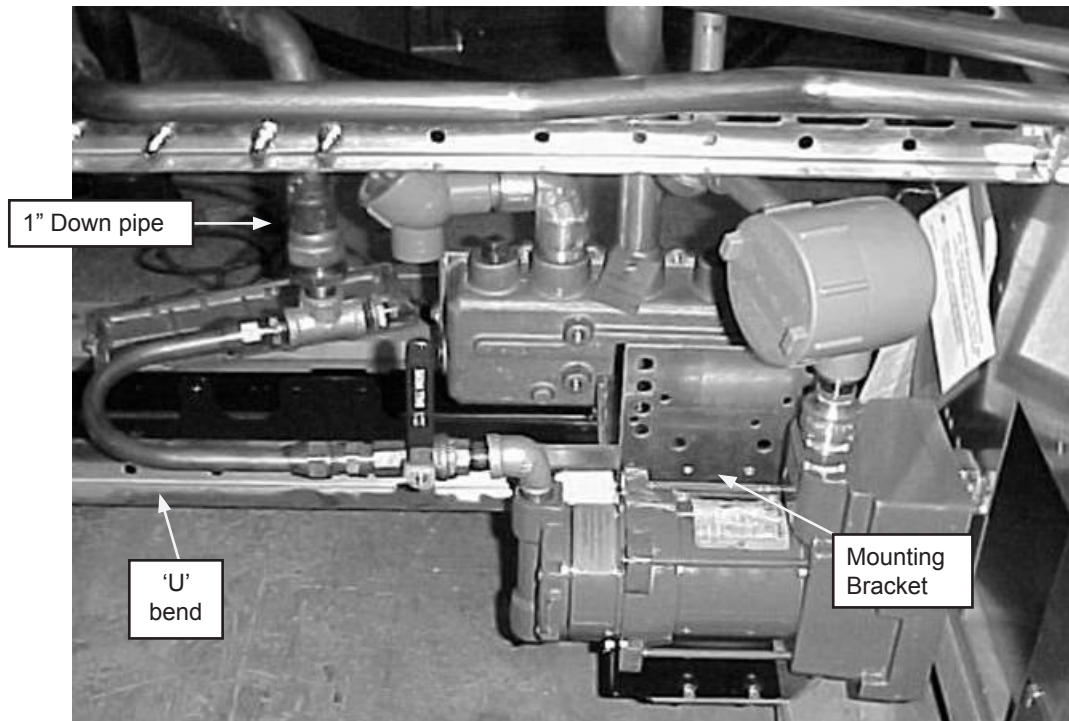


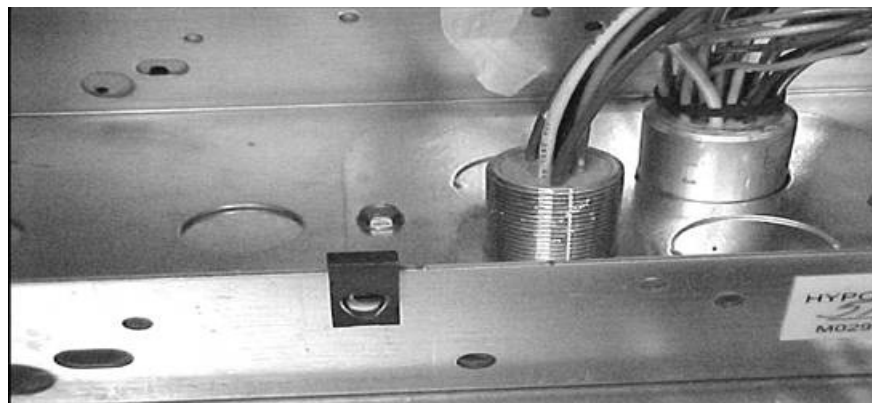
Photo J

- Get the vapor pump and install a 1/2” NPT street elbow fitting into the ‘IN’ port and a 5/8” flare x 1/2” NPT elbow in the ‘OUT’ port using tape, not pipe dope. Looking at the face of the pump, completely tighten both fittings so they are facing directly out from the front of the pump.
- Position the pump on top of the mounting bracket with the fittings facing in the direction shown in photo J. Slide the pump to allow for matching the location of holes in the pump and mounting bracket.
- Loosely secure the pump to the bracket using the four 1/4” bolts, nuts, flat and lock washers. (Final tightening is done after the electrical is completely installed.)
- Using tape, install a 1/2” close nipple into the street elbow. To this, install the 1/2” ball valve and one of the 5/8” flare x 1/2” NPT straight fittings. Final tighten such that the handle on the ball valve points upward when the valve is closed. □ Install and final tighten a 1” x 1/2” reducer bushing into the 1” vapor down pipe.
- To the 1/2” tee, install a 1/2” x 1/4” reducer bushing into one of the end ‘run’ openings, then install a 1/4” pipe plug into the bushing- final tighten. Install a 5/8” flare x 1/2” NPT straight fitting into the other end ‘run’ opening and tighten. Install a 1/2” close nipple into the branch opening.

- ❑ Install the above into the 1/2 “ reducer fitting on the vapor down pipe, final tightening so the flare fitting faces away from the VP1000 pump, see photo J.
- ❑ Final connection from the pump to the down pipe is done after the electrical piping has been completed.

## 9. INSTALLING THE SEALED NIPPLE ASSEMBLY: (See Photo G)

**NOTICE:** THE INTERFACE MODULE THAT IS SUPPLIED HAS A HARNESS ATTACHED AND A WIRING PLUG FOR THE AC CONNECTIONS. ALSO SUPPLIED IS THE SEALED NIPPLE ASSEMBLY (1316) THAT MUST BE USED BETWEEN THE ELECTRONICS COMPARTMENT AND THE DIVISION 1 AREA (THE SPACE BELOW AND OUTSIDE THE ELECTRONICS COMPARTMENT).



**Photo G**

- ❑ In the electronics compartment, locate the sealed nipple that contains the dispenser wiring. Notice that there are 2 or 3 blank knockouts next to the existing nipple. Diagonally, to the left and below the existing nipple, knock out one pre-punched filler piece. (Punch only the same one on each plate. Do not leave any empty holes).
- ❑ Remove the two hex head screws holding the knock out panel in place. The panel cannot be removed, but can be raised to allow access to the lower vapor barrier panel for removing the knockout in that piece and also allows access for securing the nuts of the sealed nipple assembly.
- ❑ Get the 1316 sealed nipple assembly and carefully remove the first nut and washer over the wires. Tighten the other nut down on the nipple as far as it will go leaving the washer on top of the nut.
- ❑ Run wires (from the short threaded end of sealed nipple) down from electronics cabinet through lower knockout only.
- ❑ Push the rubber washer down on the sealed nipple approximately 2”. Run wires (from the long threaded end of sealed nipple) and nipple up through the upper knockout plate. Install the washer and nut that was removed above and tighten the nipple securely to the plate.
- ❑ Reposition the upper knockout plate to its original location and secure with the previously removed screws. Check to be sure the rubber washer is seated on the lower panel.

- ❑ Do not use pipe dope or tape on the following fittings and be sure there is at least five full threads of engagement of the fittings in their respective couplings.
- ❑ To the bottom of the sealed nipple assembly installed above, install a 3/4" electrical coupling and then, a 3/4" x 1/2" reducing bushing into the coupling.
- ❑ Install one of the 1/2" x 7" electrical nipples to the reducing bushing above then the 1/2" coupling and then the other 1/2" x 7" electrical nipple.
- ❑ Get the 1/2" capped elbow and remove the cover. Thread the wires from above through one of the elbow hubs and completely tighten so that the open hub of the elbow faces the electrical wires on top of the motor.
- ❑ Get the 4" long conduit and install in the remaining opening in the capped elbow. (Do not pull wires at this time).
- ❑ Install 3/4" x 1/2" reducing bushings into each opening on the electrical junction box supplied.
- ❑ Install the J-box to the 4" nipple as shown in Photo J. This should position the cover opening to your left and the remaining opening on the J-box approximately over the electrical wires on the pump. The motor or bracket position may need to be adjusted to attain this alignment.
- ❑ At the VP1000, get and install the threaded half of the 1/2" electrical union over the wires coming from the motor. Do not use pipe dope on these fittings and be sure there is at least five full threads of engagement of the fittings in their respective couplings.
- ❑ Thread a 1/2" electrical close nipple into the remaining half of the electrical union and install into the remaining opening of the J-box.
- ❑ Carefully feed the motor wires into the split union pieces and into the "J" box until the two halves of the union can be slid together and secure.
- ❑ Completely tighten the hardware on both the pump and the bracket.
- ❑ Carefully feed the wires from the capped elbow into the J-box, pull wires loosely until the cover can be replaced on the capped elbow. Replace cover.
- ❑ In the "J" box, leave about 6" of wire on both the wires coming from the motor and from the sealed nipple, cut off excess wire and strip approximately 1/2" of insulation from all wires.
- ❑ Use wire nuts to join the wires, color for color, together. There may be some extra wires in some sealed nipples, cap these off and dress aside.
- ❑ Replace the cover on the junction box.
- ❑ Bend a broad 'U' into a piece of 5/8" copper tube and carefully fit between the flare fittings between the VP1000 and the vapor down-pipe. One of the 'legs' should be at least 6" long before cutting and installing the nuts and flaring the ends. This installation provides a flexible cushion in the tubing, see photos K & L below.
- ❑ Note: The discharge piping from the 5/8" flare elbow attached to the out port of the VP1000 is left up to the installer. There is extra 5/8 tubing, flare elbow and a bell reducer to help with the final installation.

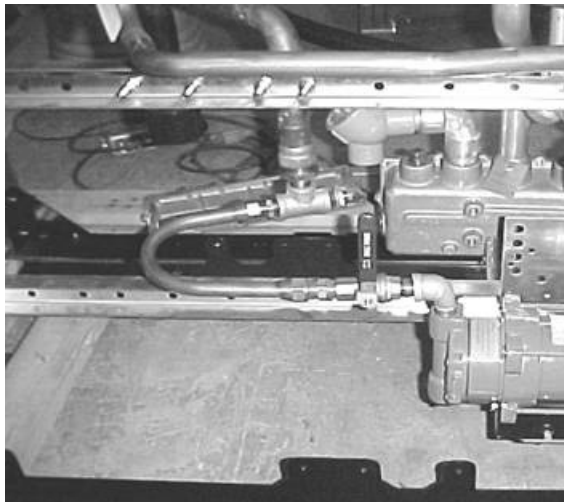


Photo K

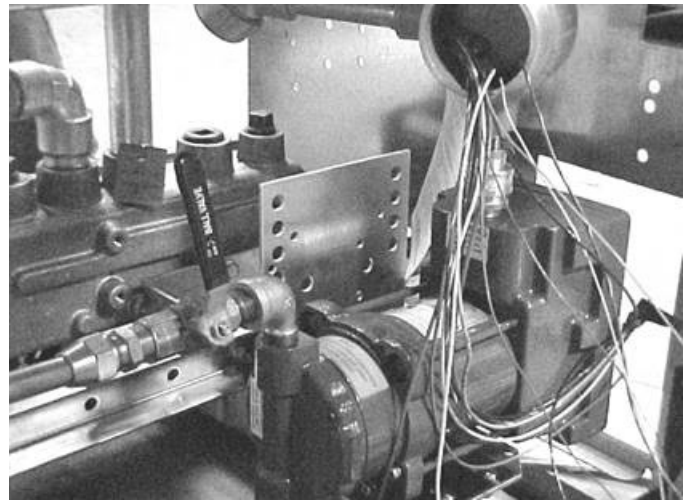


Photo L

## 10. WIRING INSIDE THE ELECTRONICS COMPARTMENT: (SEE PHOTOS H, M & N)

- ❑ Secure the prewired Interface Module to the inside, between the two cross rails in the electronics compartment using the 8-32 screw, nut and washer supplied, see photo H.
- ❑ The wiring kit contains one jumper assembly. To install the jumper assembly, connect the stripped wires, one to terminal 1 of the solenoid disconnect relay, see photo H, and the other to terminal 6 of the same terminal block.
- ❑ Identify the P1200 location on the valve converter board and remove the connector from the socket on the board. Insert this connector into the mating socket on the jumper assembly. Insert the matching plug on the cable into the J1200 location on the board, see photos M & N.

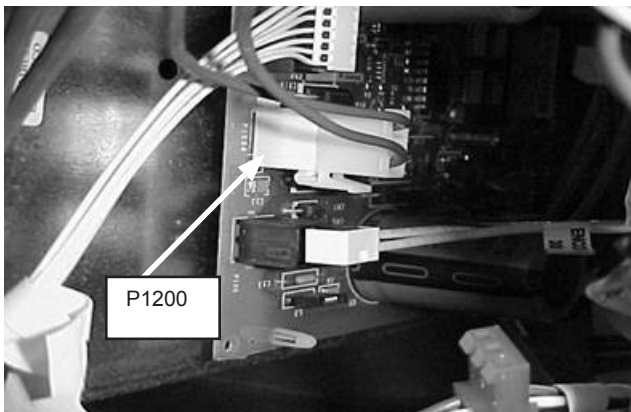


Photo M (300)

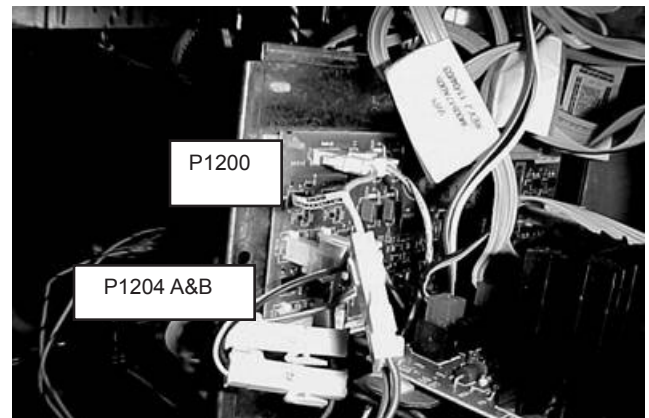
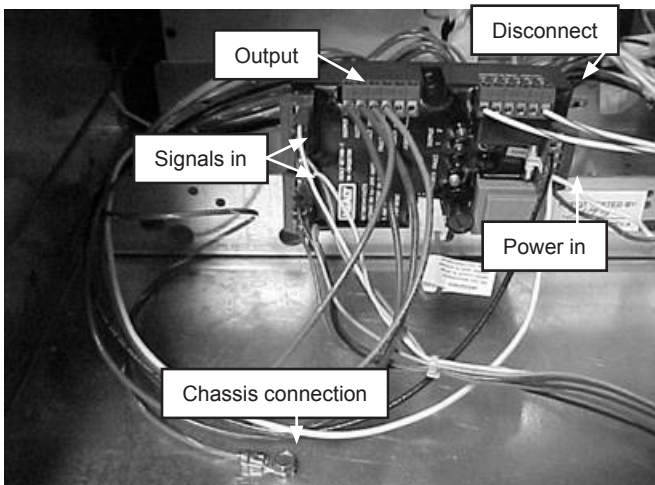


Photo N (500)

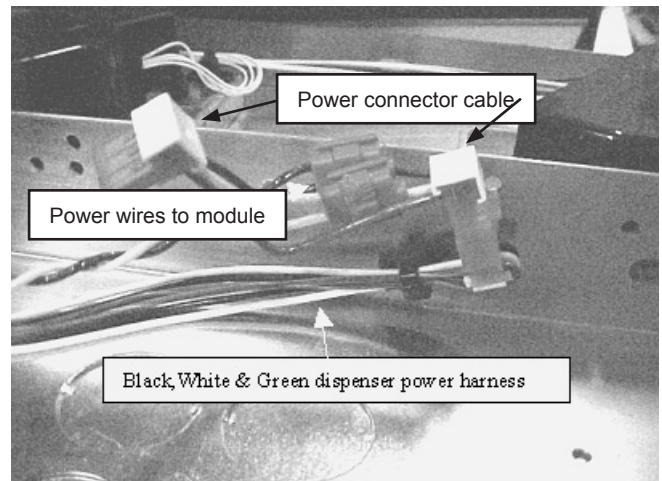
- ❑ **Using the cable harness attached to the module, identify and segregate the “A” side and “B” side connectors.** The valve board connections are arranged by product, so it is important to be sure the “A’s” and “B’s” are connected to the appropriate sockets on the board. Connect the ‘signal’ inputs A1, 2, 3 and B1, 2, 3 male/female connectors on the cable to the appropriate locations on the valve converter board. Be sure to keep the “A’s” and “B’s” together as there are “A’s” and “B’s” on both sides of the valve converter board. Note only connect the module to active gasoline products – **do not connect to diesel or other unused valve connection points.**



- The seven (7) wires from the sealed nipple assembly are connected as follows:
  - Red (either one) connected to 'OUTPUT 1' on output terminal board
  - Red (other one) connected to 'OUTPUT 2' on output terminal board
  - Purple connected to 'FAULT' on output terminal board
  - Orange connected to 'FAULT COMMON' on output terminal board
  - Green – connect the ring lug supplied and then attach to chassis, see photo O.
  - Black – connect to Motor terminal on power input terminal strip
  - White – connect to Neutral on input terminal strip
- The black wire on the power jumper is connected to 'Power In' and the white wire is connected to 'Neutral' on the input terminal strip. The orange connector on the other end of the black and white pair is connected to any available power plug on the dispenser harness. The dispenser power harness is composed of a black, white and green wires running together along the center rail and has orange, 3-pin connectors that will mate with the power wire from the MC100-1 module, see photo P.



**Photo O**



**Photo P**

## 11. CONNECTING HEALY SYSTEMS DISPENSING EQUIPMENT

- Completing the connection of Healy Systems dispensing equipment requires the installation of Healy Systems Phase II dispenser adaptors, hoses and nozzles (Hanging Hardware).
- If applicable, remove existing non-Healy hanging hardware (from the dispenser product outlet adaptor, to and including the nozzles).
  - Vapor ready dispensers may require a Healy Systems adaptor to make the hose threads compatible with other Healy Systems equipment. Install necessary adaptor following instructions packed with the adaptor. Various adaptors and pigtails are available, depending on how the dispenser is configured: M34 metric (Healy designation F3 or S3) or balance ready (Healy designation S4).
  - Healy Vapor Recovery Hoses are available in various lengths to satisfy local ordinances and still provide “far side” fueling capability. Install these following instructions contained on the shipping box.

- Breakaways are required: Install either Model 8701-VV breakaway or Model 807 swivel breakaway; install using the instructions supplied with the unit.
- The Healy Systems nozzle Model 900 (EVR) series is the only nozzle necessary to complete the upgrade. **Check to be sure the nozzle hook is mounted in the position shown for Healy nozzles in section 16.** Be sure to check for proper fit in the nozzle holster and that the nozzle can be locked in the off position. Also, be sure that when the nozzle is locked, that the dispenser cannot be activated from the locked position.

## 12. VP1000 THEORY OF OPERATION

The Healy Systems VP1000 is a self-contained rotary vane pump, designed for gasoline vapor recovery utilizing various parts of the Healy System Vapor Recovery product line. It is intended for use by either OEM dispenser/pump manufacturers or as an after market add-on to make existing equipment compatible with Healy System technology. In order to convert to 'others' equipment, an electronic interface is required to adapt the targeted pump/dispenser to the new vapor recovery equipment. The interface senses when authorization to dispense has been given and sends signals to the motor to operate at a low speed for one hose, or a higher speed for two hoses. It also functions to shut off the pump/dispenser if it senses that the vapor pump is not operating properly. The vacuum is regulated at a level sufficient to clear liquid gasoline from the vapor path in MPD applications. The Healy nozzle controls the actual amount of vapors withdrawn, itself, in response to the liquid gasoline flow rate.

### MOTOR SPECIFICATIONS

Horsepower	1/8
Voltage	120VAC

### INTERFACE SPECIFICATIONS

Input voltage	120 VAC
Relay current capacity	5A AC
Input signals	AC and DC voltages up to 130 VAC max
Motor Input signal	5 VDC @ 20 Hz 50% Duty Cycle

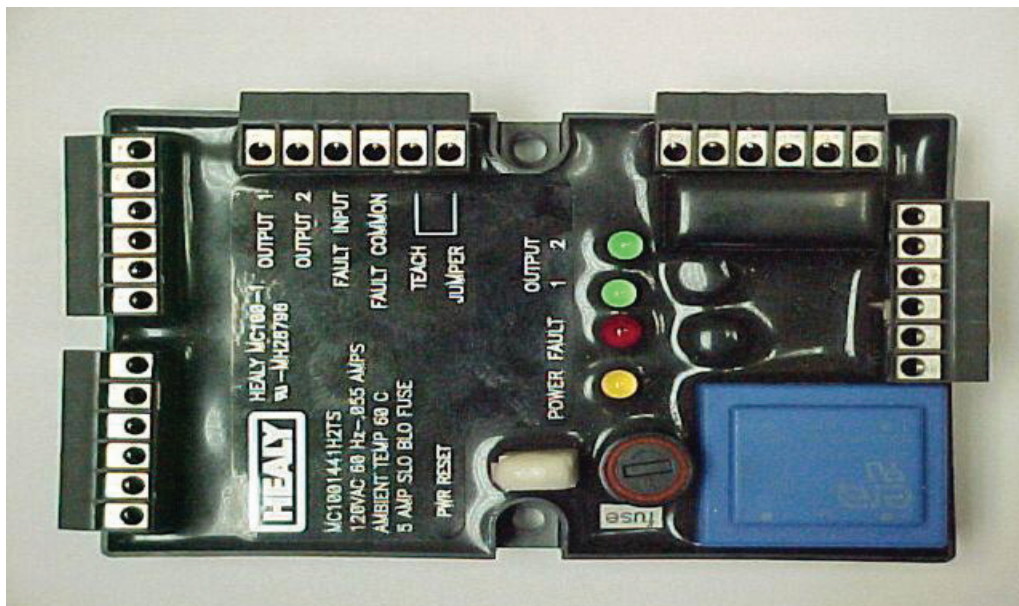
### 13. TESTING THE SYSTEM:

- Carefully review all work completed, being sure all mechanical joints are thoroughly tightened and electrical connections sealed.
- Open the product crash valves and restore power to the dispenser.
- With the power on, but no nozzles authorized, the VP1000 should not be running (unless the ambient temperature is below 40°F), but the power LED (yellow) should be energized on the interface module.
- Authorize one handle and the vacuum system should activate when the gasoline flow control valve is engaged. Repeat for all other nozzles, individually testing each nozzle on each side of dispenser. With each authorization, one of the green LED's on the interface module should illuminate and the VP1000 activate.
- Note: For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the same LED activates for all grades on the same side. If the other LED activates, wiring needs to be corrected.
- Authorize one nozzle, listen to the speed of the VP1000. With one nozzle activated, the speed will be slower than if a nozzle on each side is activated. Activate a nozzle on the other side of the dispenser and listen for the speed to change.
- To test the tightness of the vapor plumbing installed on the suction side of the system requires a 0-100" water column gauge. Connect the gauge into the 1/4" test port of the adaptor tee installed earlier in section 8 Photo J. Continue by following and completing the START-UP / NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM.

## 14. TROUBLESHOOTING THE VP1000:

- ❑ Use extreme care and caution when performing the tests listed below. If 120 VAC is accidentally applied to the fault or DC terminals, the module will be destroyed.
- ❑ With power applied to the dispenser, but no products authorized, there should be 120 VAC between neutral and 120 VAC on the module terminal strip.
- ❑ As above, with any product authorized, there should be single speed power applied to the VP1000. Verify this by checking for 2-3 VDC from OUTPUT 1 (RED WIRE) to FAULT COMMON (ORANGE WIRE), (or from OUTPUT 2 TO FAULT COMMON) also; one GREEN LED should be illuminated. With a second product authorized on the opposite side of the dispenser i.e. one product on each side, the motor should operate at higher speed and there should be 2-3 VDC on both output 1 and 2 (to fault common) and both GREEN LED's should be illuminated.
- ❑ With the pump running, a fault can be simulated by shorting, with a jumper wire, the "FAULT INPUT" (purple wire) to FAULT COMMON (orange). This should cause the motor to shut off, the solenoid valves to lose power and the dispenser to shut down. Also, as long as the short is maintained, the red LED will be illuminated. Removing the short will not automatically reset the module. To reset the module, remove the short, remove power to the dispenser for twenty seconds and restore power. The module should now be reset and the red led extinguished. This can also be accomplished by using the power reset (PWR RESET) on the module.
- ❑ If diagnosing a problem where the LED is already illuminated, a steady light indicates a low current condition, therefore expect a vane or rotor problem. If the LED is blinking, that indicates a high current condition and would expect to find a jammed rotor or vapor line flooded with product. See Start-up/ New Installation/ Warranty/ Annual Testing Form.
- ❑ The electronics of the motor will make three attempts to have a successful start of the motor. If it detects a problem, on the fourth unsuccessful start, it will short the fault line to signal minus (DC-) and shut down the electronics.

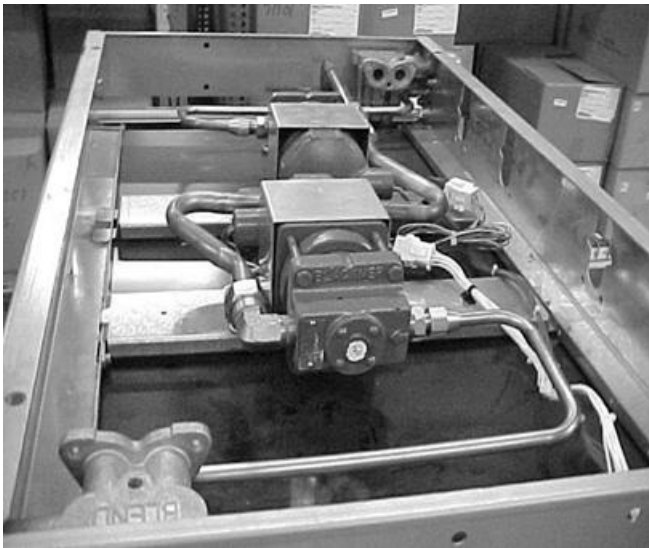
### MC100 Interface Module



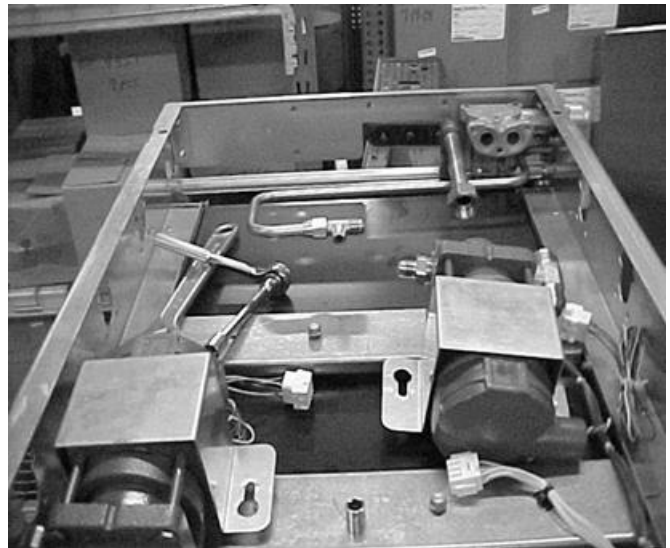
## 15. VAPORVAC™ REMOVAL:

Described below are the steps necessary to remove a VaporVac™ and re-plumb the vapor lines to install the Healy VP1000 series vapor assist recovery system.

- ❑ Removal of the VaporVac pumps requires the top cover of the dispenser be removed. From the top of the cover, remove the four corner bolts and lifting eyes if present, along with various washers. Remove the cover. Save hardware for reinstallation.
- ❑ With the top removed, notice the 'loose' cross rails that the top cover bolts were screwed in to – remove these rails and save for reinstallation after conversion.
- ❑ Be sure all electrical power to the dispenser has been disconnected and disconnect the electrical connections going to each pump.
- ❑ Loosen and disconnect all the vapor pipes from both VAC pumps. Do not remove the vapor pipes from the product outlets, see photos Q and R.
- ❑ From one of the pumps, remove the 3/4" NPT X 1" flare elbow fitting and save for use below. Remove the two brackets and motors.

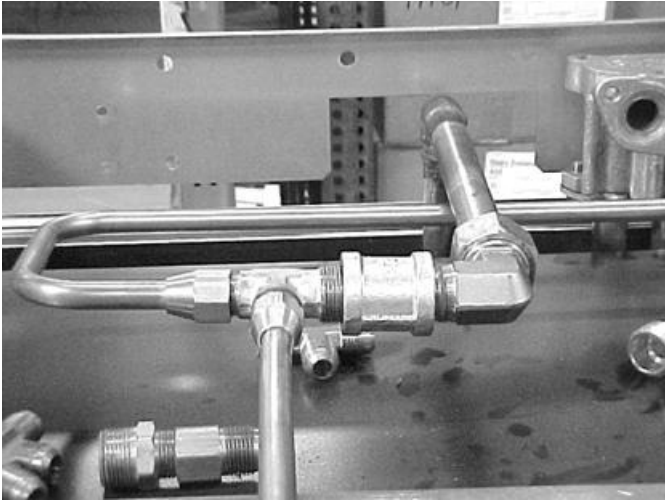


**Photo Q**

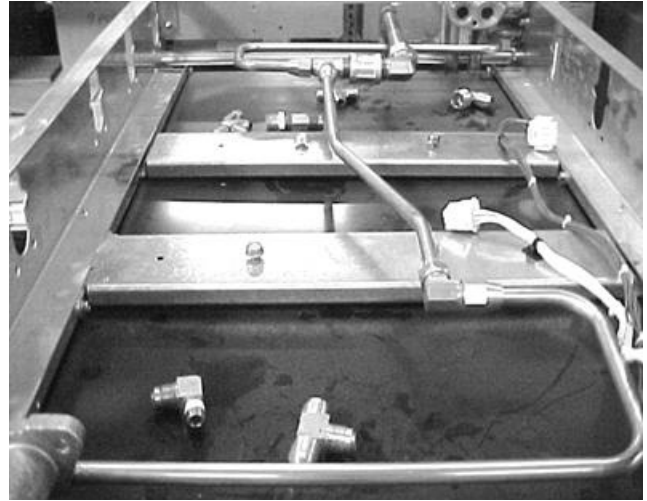


**Photo R**

- ❑ Into the 3/4" x 1" elbow that was removed above, attach the 3/4" x 1/2" bell reducer supplied in place of the 3/4" coupling shown in Photo S and then install the 1/2" NPT x 1/2" x 1/2" flare tee using tape. Tighten with the branch pointing opposite the flare connection, and then attach the flare fitting to the vapor down pipe fitting, see photo S.
- ❑ Connect the loose vapor tube fitting from the dispenser outlet to the run flare position on the tee. Cut and flare a piece of 1/2" copper tube suitable to connect the other vapor connection to the tee using the 1/2" x 1/2" flare elbow fitting supplied, see photo T.



**Photo S**



**Photo T**

- ❑ Electrical wiring and lower cabinet plumbing are the same for Balance or VaporVac™.
- ❑ Deprogram the VaporVac™ system using the “Electronically Disabling the VaporVac System” instruction sheet, enclosed in the Z083V VaporVac™ Kit.
- ❑ After testing, reinstall the cross rails, top cover and hardware removed earlier.

## Z083V VaporVac™ Kit

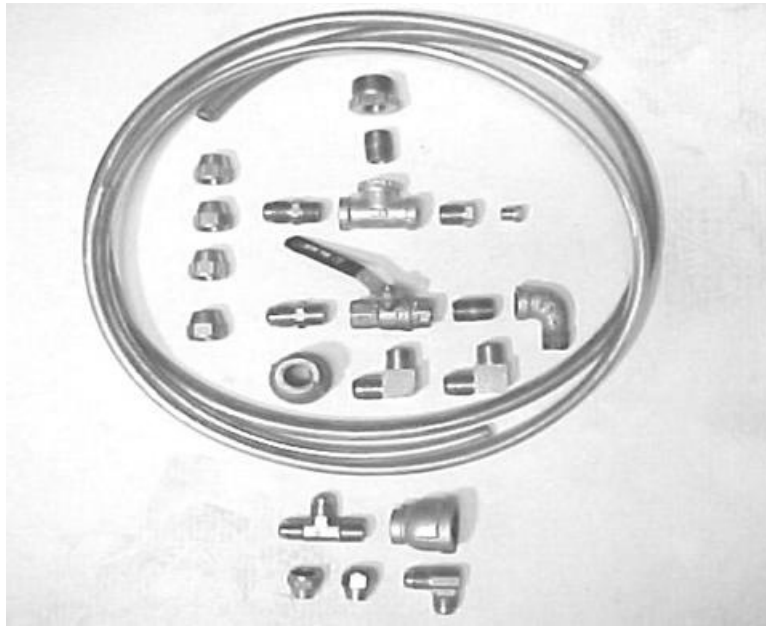


Photo U

### VAPOR KIT Z083V: for VaporVac™ Kit (See Photo U)

- 1 1/2" NPT X 5/8" flair straight fittings
- 3' 5/8" OD copper tube, type 'L'
- 1 1" x 1/2" reducing bushing
- 2 1/2" close nipple
- 1 1/2" x 1/2" x 1/2" tee
- 1 1/2" NPT x 1/4" reducing bushing
- 1 1/2" ball valve
- 1 1/4" pipe plug
- 4 5/8" flare nuts
- 1 1/2" street elbow
- 2 1/2" NPT x 5/8" flare elbow
- 1 1" x 1/2" bell reducer
- 1 1/2" flare x 1/2" flare x 1/2" NPT tee
- 1 3/4" x 1/2" bell reducer
- 1 1/2" x 1/2" flare elbow
- 2 1/2" flare nuts
- 2' 1/2" OD copper tube, type 'L'
- 1 "Electronically Disabling the VaporVac System" instruction sheet

## 16. GILBARCO ENCORE NOZZLE HOOK ADJUSTMENT

This document details how to adjust Gilbarco Encore dispensing unit nozzle hooks to accommodate various manufacturers' nozzles.

Required tools: drill, 7/32" or # 22 drill bit, 1/4" square-tip driver, 7 mm metric hex nut driver or socket, 3/8" nut driver or socket.

NOTE: AC or battery powered drills must not be used at the dispensing unit because of the danger of explosion or fire due to the presence of hazardous vapors.

### Step One: Preparation.

1. Notify site personnel of work to be performed.
2. Secure work area.
3. Isolate dispensing unit from point-of-sale or pump controller.
4. Close shear valves.
5. Remove nozzle(s) from nozzle boot(s) and place on ground.

### Step Two: Remove nozzle boot(s) from dispensing unit.

1. Loosen two nozzle boot mounting screws. (See figure 1) using 1/4" square tip driver. Note: Save nozzle boot mounting screws for use later.
2. Remove nozzle boot from door by pulling toward you.

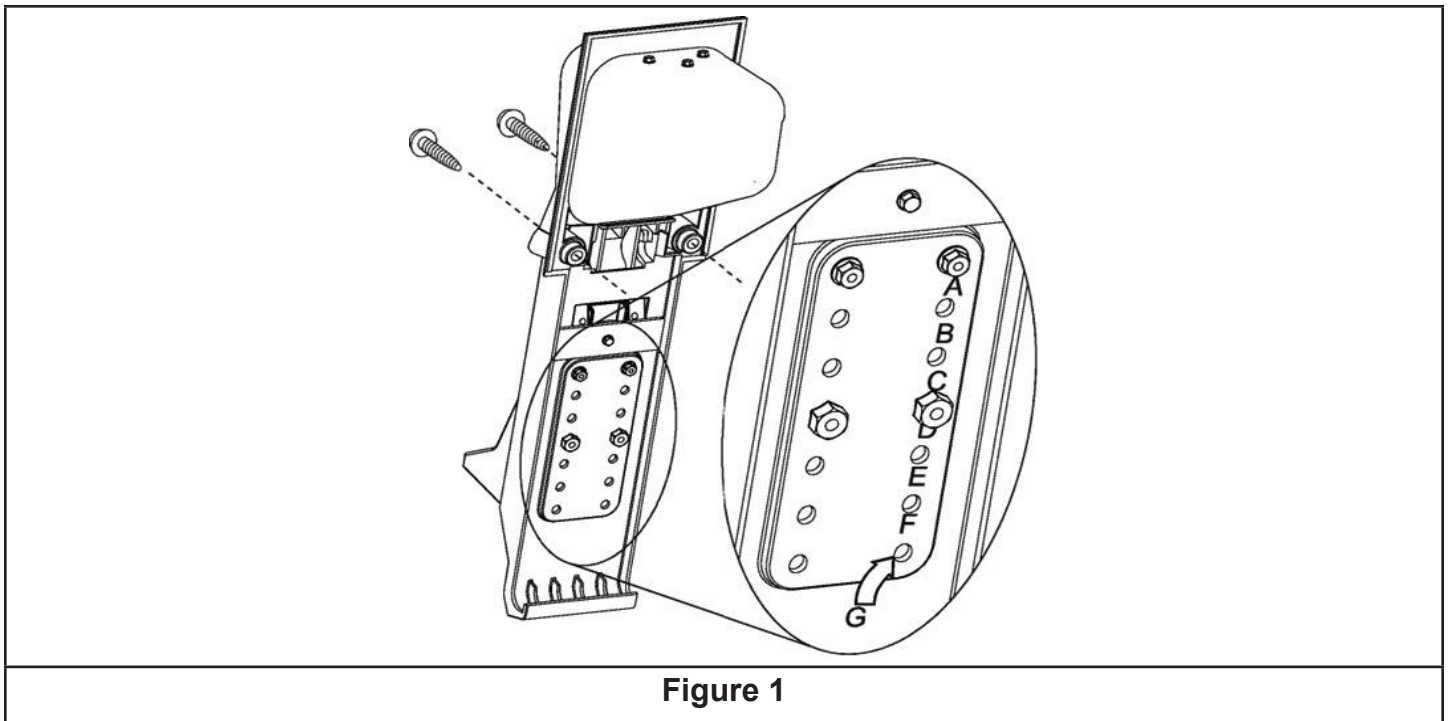


Figure 1

### Step Three: Remove nozzle hook from nozzle boot.

1. Place nozzle boot face down on work surface covered with soft cloth to protect nozzle boot face.
2. See figure 1 to identify existing nozzle hook retaining screw and nut locations. Identifying marks are located under right hand row of indented hole locations. Standard nozzle hook locations are A & D.



3. Use 7mm nut driver or socket to remove two upper hex head screws.
4. Use 3/8" nut driver or socket to remove two nuts from lower carriage bolts.
5. Remove nozzle hook and carriage bolts from nozzle boot. Save hex head screws, carriage bolts and nuts for use later.

**Step Four: Determine Nozzle Hook Position**

1. Determine new nozzle hook position using chart below as guide to select new hole positions. See Figure 1 to identify nozzle hook retaining screws and nuts locations. Identifying marks are located under right hand row of indented hole locations.

Nozzle Type	Upper Hex Head Screw Location	Lower Carriage Bolt & Nut Location
Standard Factory Location All Non-Vapor	A	D
VaporVac - OPW, Husky, Emco Wheaton	A	D
VaporVac - Catlow, Richards	B	E
Healy System	C	F
Balance - Husky Short	A	D
Balance - Husky Long, Emco Wheaton Long	E	Unmarked. Use nozzle hook carriage bolt holes as drill guide.
Balance - OPW Long	Bottom hole set ("G" on Figure 1)	Unmarked. Used nozzle hook carriage bolt holes as drill guide.

**Step Five: Drill New Holes.**

1. Use 7/32" or # 22 drill bit to drill new holes as needed.
2. When locations "E" or "G" are used by the upper hex head screws, the lower carriage bolt and nut hole set are unmarked. Temporarily mount the nozzle hook with the upper hex head screws in location "E" or "G" (as determined by chart) then use the nozzle hook carriage bolt holes as a drilling guide for the unmarked hole set.
3. Once holes are drilled, remove nozzle hook and clean up debris around hole set.

**Step Six: Assemble nozzle hook to nozzle boot.**

1. Reverse Step Three to assemble nozzle hook to nozzle boot.

**Step Seven: Test nozzle hook adjustment using new nozzle.**

1. Hold nozzle boot upright and insert nozzle over nozzle hook and into boot. Wiggle boot to verify the nozzle does not slip out of position.

**Step Eight: Install nozzle boot(s) onto dispensing unit.**


1. Reverse Step Two and install the adjusted nozzle boot onto the dispensing unit.

**Step Nine: Re-insert Nozzles into the boot.**

## 17. VP1000 VANE & ROTOR SERVICE & REPLACEMENT GUIDE

**Caution**  **Disconnect power before beginning service.**

1. The work area **must** be clean and have sufficient lighting.
2. Disconnect the vapor piping connected to the **IN** and **OUT** ports of the VP1000 cover assembly.
3. Remove the four Allen head screws and lock washers that secure the pump cover assembly to the pump housing and remove the cover carefully.

**Caution**  **Use a spill cloth when removing the cover, as there may be some gasoline inside the pump cavity.**

4. Carefully turn the rotor assembly by hand until the shaft key notch is at the 12 o'clock position. (See Figures)
5. Remove the rotor, vanes and shaft key from the pump housing.

**Note:** Place your hand or a container under the rotor while removing. Do not use any sharp objects that would scratch the surfaces of the pump cavity, pump shaft, rotor, or vanes.

6. Rotate the shaft by hand. If the shaft does not rotate freely, the entire vacuum pump needs replacement (p/n VP1000-5 or RVP1000-5).
7. If the rotor and vanes are cracked, chipped, excessively worn or excessively dirty, the rotor and vanes should be replaced because cleaning will not remedy these conditions (p/n VP1000VRC-G, VP1000VRC-P or VP1000VRC).
8. If there is no visible damage, use a lint-free cloth with isopropyl alcohol to clean the rotor and vanes.
9. Using a lint-free cloth with isopropyl alcohol, thoroughly clean: the inside of the pump ring and rear of the pump cavity, the rotor shaft, and the inside of the pump cover.
10. Reposition the shaft (if necessary) so that the shaft key notch is in the 12 o'clock position. Install the cleaned original or new shaft key onto the shaft.
11. Carefully install the cleaned original or new rotor onto the shaft followed by the cleaned original or new vanes into the rotor.

**Note:** The rotor assembly should slide on to the shaft easily, without excessive force. (Rotors and vanes are reversible)

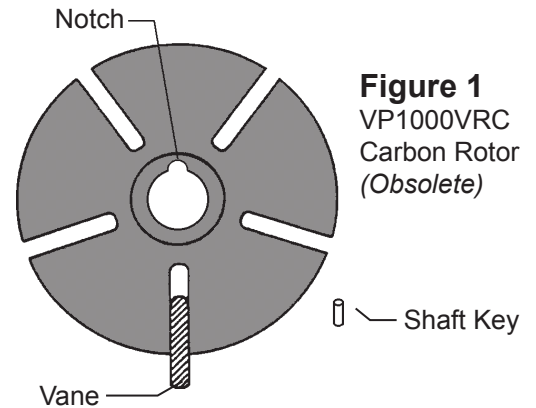
12. Lightly lubricate and install the new O-Ring for the pump housing.

**Note:** Do not allow any lubricant to get inside the pump housing.

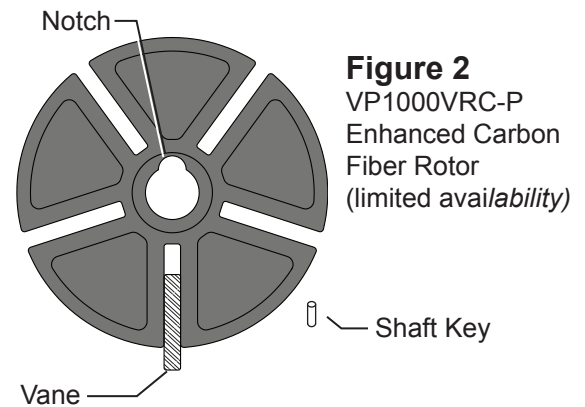
13. Install the pump cover using the four Allen head screws and lock washers removed in step 3 and cross tighten.

**Note:** Use caution when sliding the pump cover over the O-Ring seal to prevent cutting or tearing.

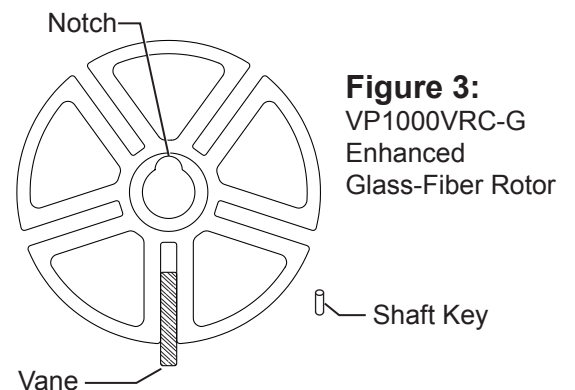
14. Re-connect the vapor piping to the **IN** and **OUT** ports of the pump cover assembly that was removed in Step 2.
15. Re-apply power. Test for normal operation. (See VP1000 Vacuum Performance Test Procedure)



**Figure 1**  
VP1000VRC  
Carbon Rotor  
(Obsolete)



**Figure 2**  
VP1000VRC-P  
Enhanced Carbon  
Fiber Rotor  
(limited availability)



**Figure 3:**  
VP1000VRC-G  
Enhanced  
Glass-Fiber Rotor

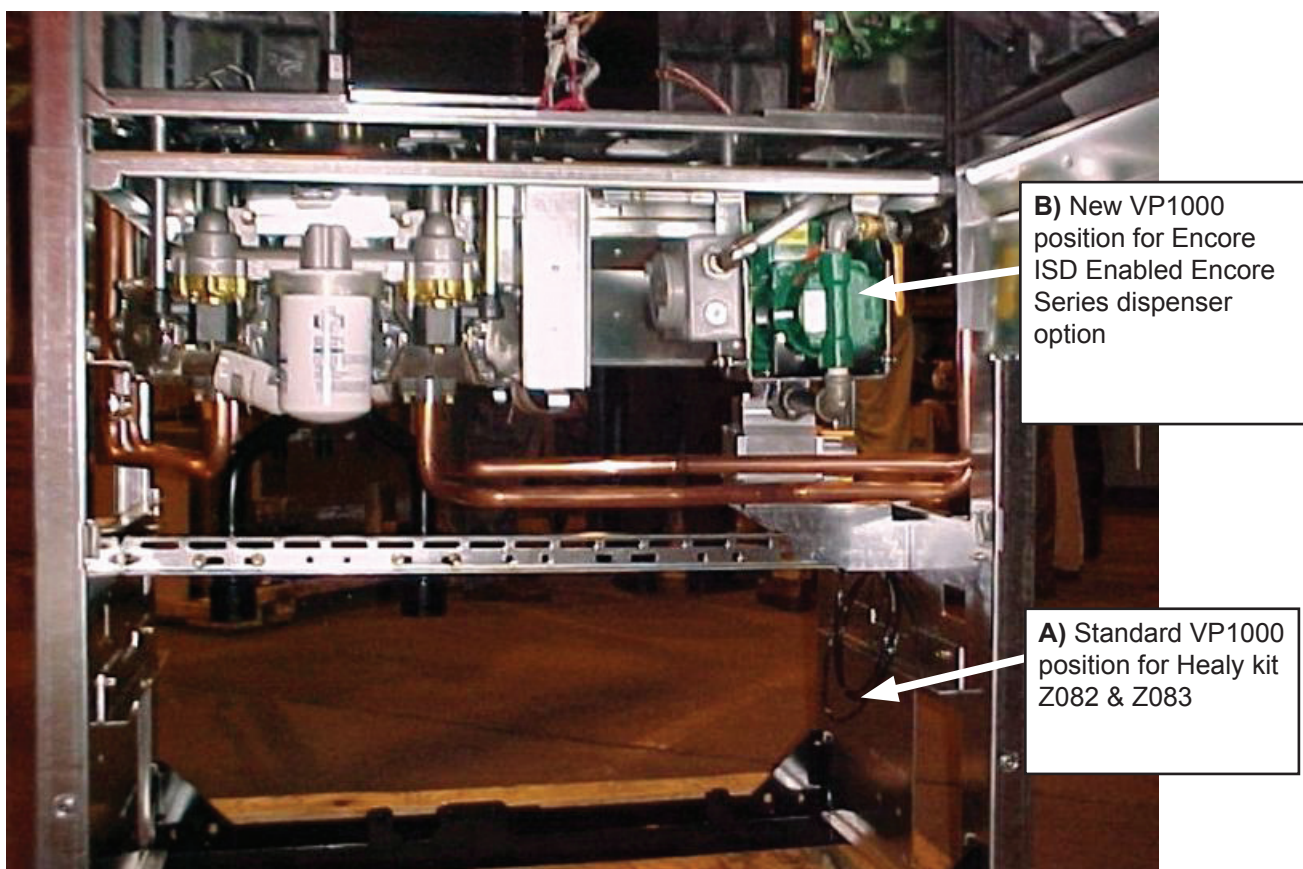
## 18. LOCATION CHANGE OF HEALY VP1000 ON ENCORE SERIES ISD ENABLED DISPENSERS

### 1. DESCRIPTION OF NEW VP1000 POSITION

To accommodate room for the ISD vapor flow meter and facilitate proper connection above a vapor line shear valve, the Healy VP1000 Vacuum Pump has been moved up approximately 20 inches in the hydraulics compartment from position A to position B as shown in Figure 1 below.

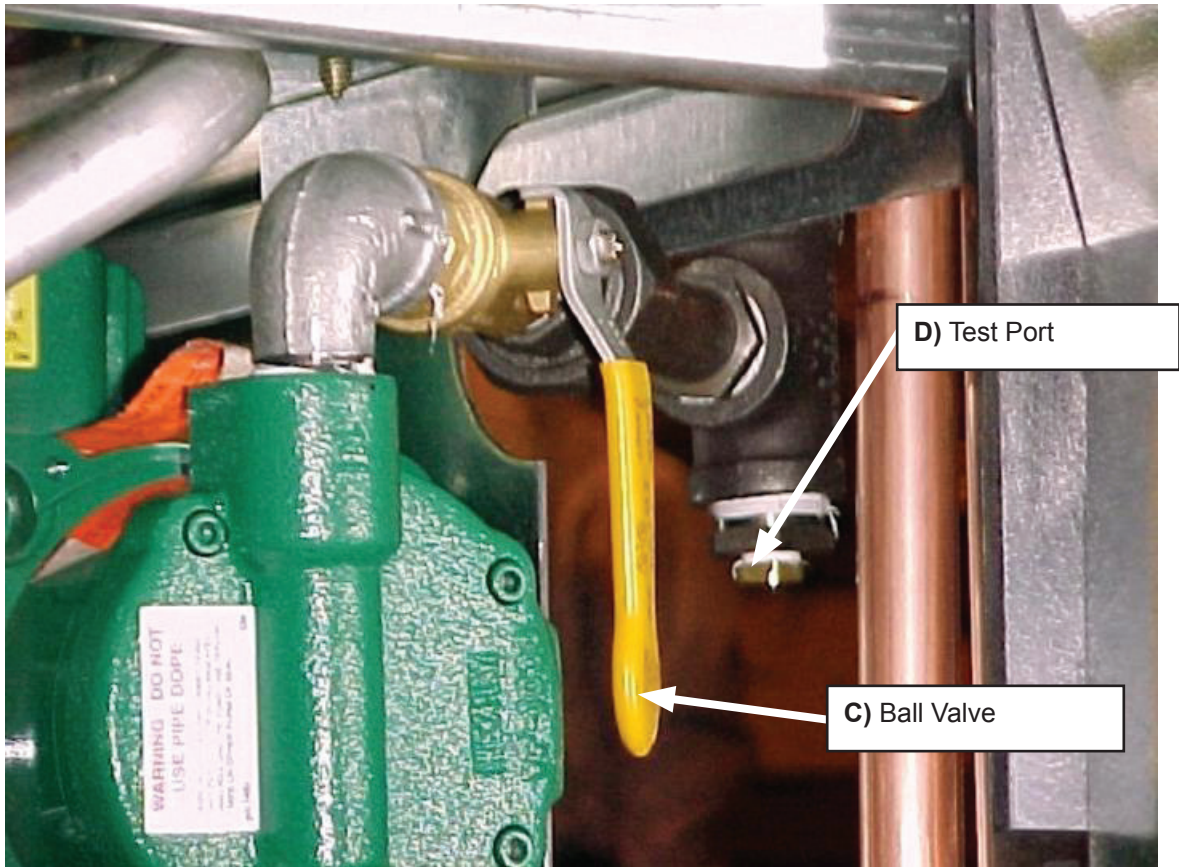
**Note:** Encore Series Dispensers may be field retrofit with the Healy VP1000 ISD Enabled by ordering Gilbarco Kit M07801S001 (contains all required parts and instructions).

**Figure 1**



The ball valve and test port required for Healy startup testing and troubleshooting have been moved to locations C and D as shown below in Figure 2.

**Figure 2**



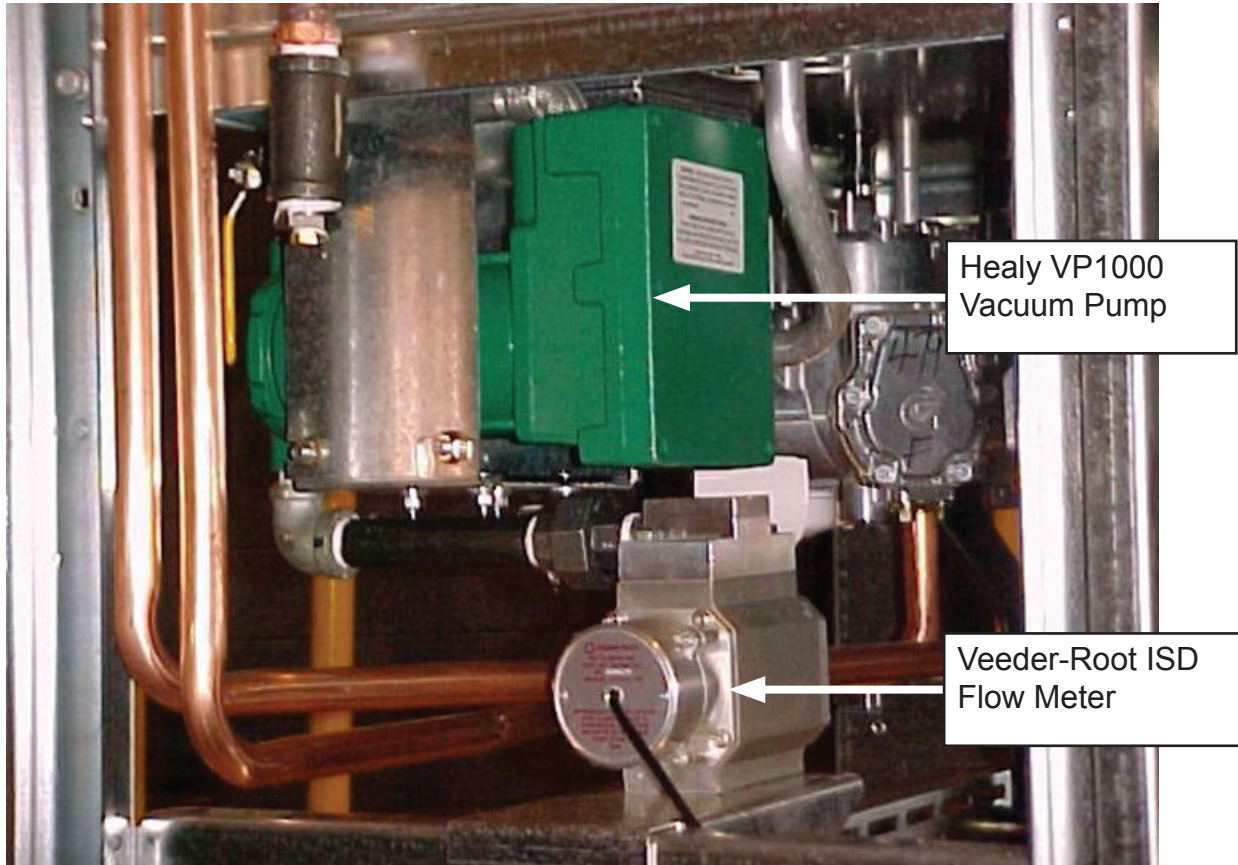
## 2. TESTING, TROUBLESHOOTING, SERVICING AND OTHER QUESTIONS

Please refer to Section 13 “TESTING THE SYSTEM” and the “START-UP / NEW INSTALLATION / WARRANTY / ANNUAL TESTING FORM” of the Encore series dispenser retrofit for Healy Systems manual for the detailed instructions on testing the VP1000 vacuum pump and dispenser piping. The manual also includes troubleshooting information in Section 14 if a problem is discovered during testing.

### 3. LOCATION OF VEEDER-ROOT ISD FLOW METER WITH RAISED VP1000

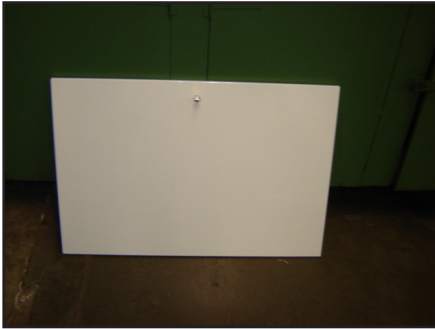
Figure 3 shows the location of the Veeder-Root ISD flow meter when used with the raised Healy VP1000 vacuum pump on a Gilbarco Encore series ISD enabled dispenser. Please refer to the ISD sections of the IOM for information on the proper installation, start-up and operation of the ISD flow meter.

**Figure 3**



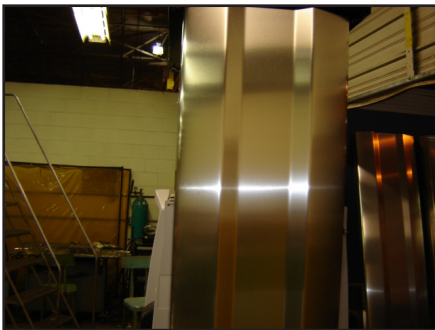
#### 4. HEALY / ISD FLOW METER INSTALLATION PROCESS STEPS FOR KIT M07801S001

- a. Power unit down
- b. Remove lower doors. See Picture 001.



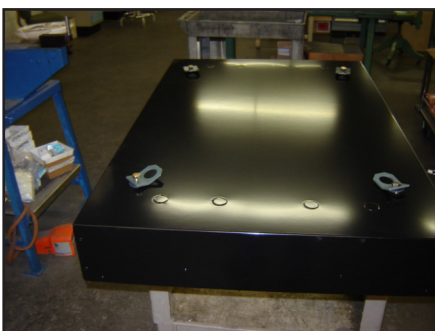
Picture 001

- c. Remove outer column sheathing from both sides of the unit by removing 4 screws holding sheathing to frame. See Picture 002.



Picture 002

- d. Remove upper housing top cover & lift brackets. See Picture 003.

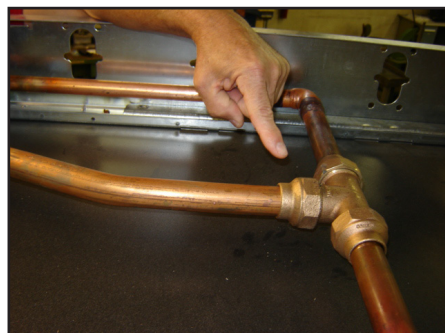


Picture 003

- e. Remove balanced vapor down spout tube by removing u-bolt from bottom of tube on the inlet support rail. Unscrew the nut from the T-fitting in the top of the upper housing. Rotate the T-fitting 180 degrees. See Pictures 004, 005 and 006.



Picture 004



Picture 005



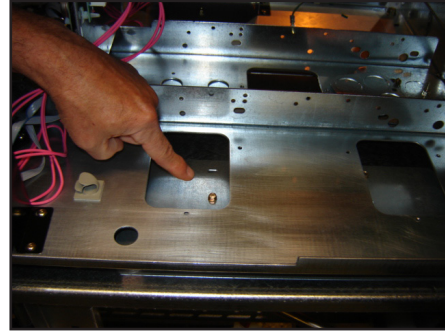
Picture 006

f. Install the new down spout tube to the opposite side of the unit from the previous tube. See Picture 007.



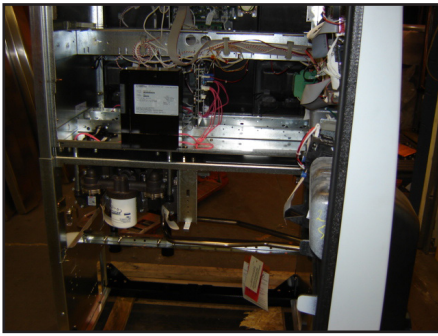
Picture 007

i. Remove the manifold blanking plate from the lower air gap plate by removing (2) screws. See Picture 011.



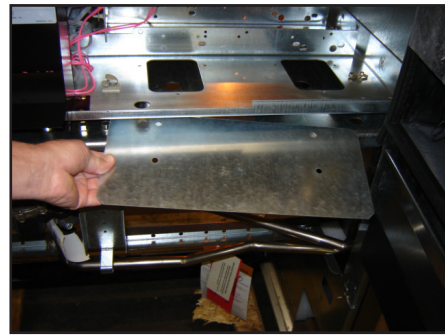
Picture 011

g. Open the Bezel door on "B" side of the unit. See Picture 008.



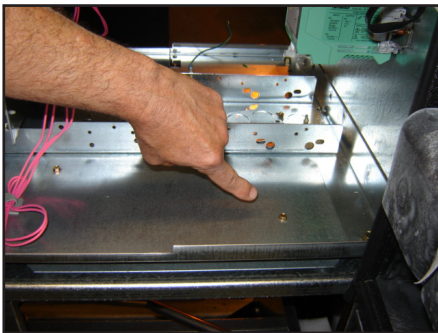
Picture 008

j. Place the Healy mounting plate in place on top of the lower air gap plate. See Picture 012.



Picture 012

h. Remove the manifold blanking plate from the bottom of the cd module by removing (2) screws. See Picture 009.



Picture 009

k. Pre-tap the (4) holes in the top of the Healy mounting brackets. Can use the 8 mm self tapping screws that are used to mount the Healy assy. to tap holes. See Picture 013.

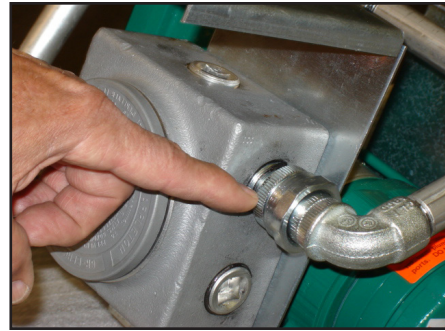


Picture 013

- l. Disconnect any cables coming thru the upper conduit plate located in the cd module the plate. Remove the upper & lower conduit plates by removing (2) screws from each plate. See Picture 014.



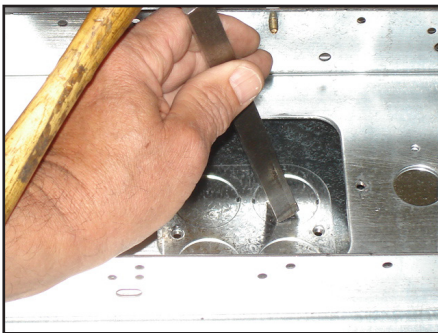
Picture 014



Picture 017

- o. Locate the Healy subassembly below the lower air gap plate and secure it to the plate with (4) screws. You will have to feed the wires from the conduit thru the openings of the lower air gap plate & cd module. See Pictures 018, 019, 020.

- m. Remove the correct knockout from both conduit mounting plates using a hammer & flat head punch. See Picture 17 for correct hole location to knock out.

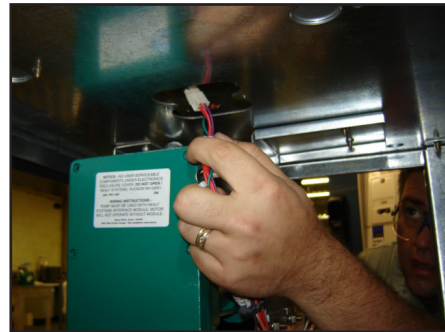


Picture 015

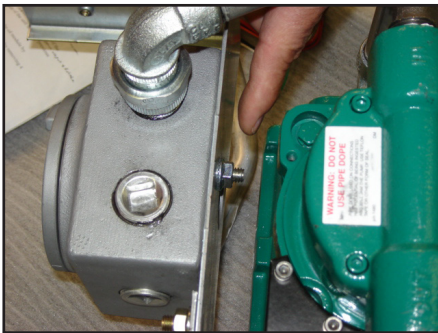


Picture 018

- n. Remove the Auxiliary junction box from the Healy subassembly by removing the nut from the stud on the back of the box. Unhook the conduit & union assembly from the box by loosening the large nut on the union. See Pictures 016, 017.



Picture 019



Picture 016



Picture 020

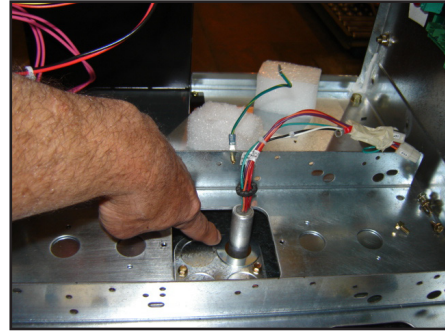


p. Connect the down spout tube to the Healy ball valve assy. by screwing the nut on the tube to the fitting on the ball valve and tightening. See Picture 021.



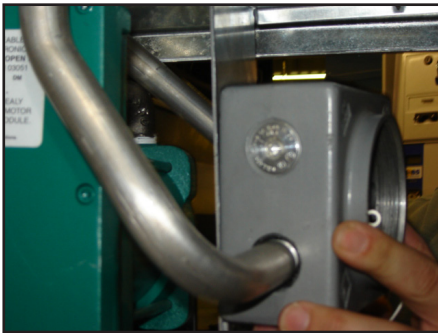
Picture 021

s. Install the conduit mounting plate to the lower air gap plate & install a conduit washer over the conduit coming thru the lower air gap plate from the Healy subassembly. Secure plate with 2 screws. See Picture 024.



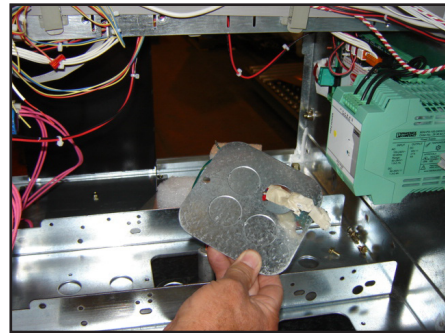
Picture 024

q. Reinstall the auxiliary junction box to the Healy sub assembly. Secure the box to the mounting bracket by installing a nut to the stud coming out of the back of the box. See Picture 022.



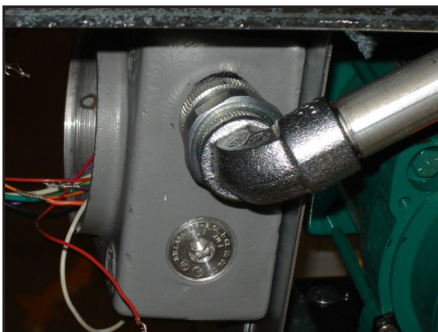
Picture 022

t. Reinstall the upper conduit knockout plate to the cd module using (2) screws. See Picture 025.



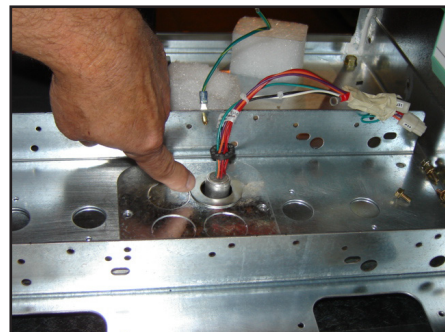
Picture 025

r. Feed the wires from the conduit & union assembly thru the opening in the box and reinstall the union to the box. See Picture 023.



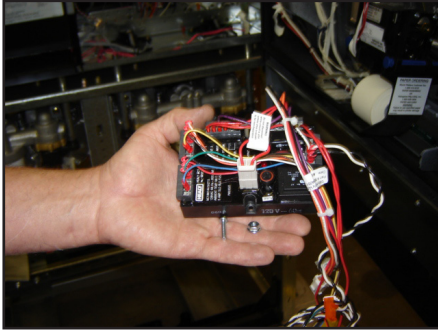
Picture 023

u. Install a washer over the conduit and reconnect any cables that you disconnected. See Picture 026.

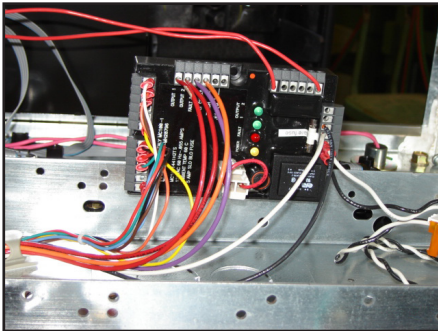


Picture 026

- v. Install a Healy electronic module to the channel in the cd module and secure with a nut and screw. See Pictures 027, 028.

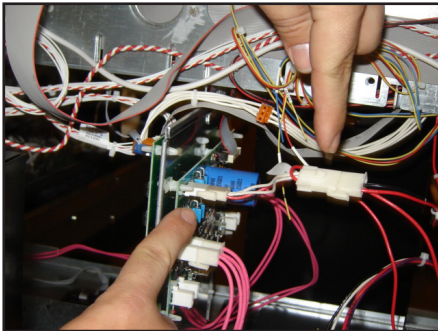


Picture 027

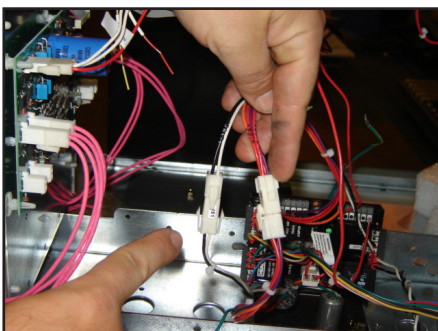


Picture 028

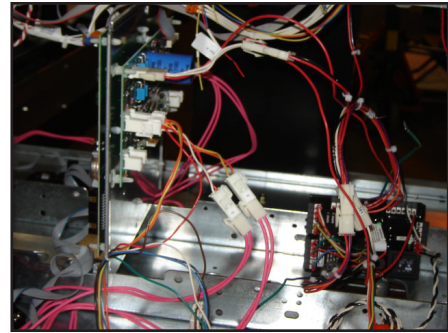
- w. Install cabling to base electronics. See supplied documentation & Pictures 029, 030, 031.



Picture 029



Picture 030



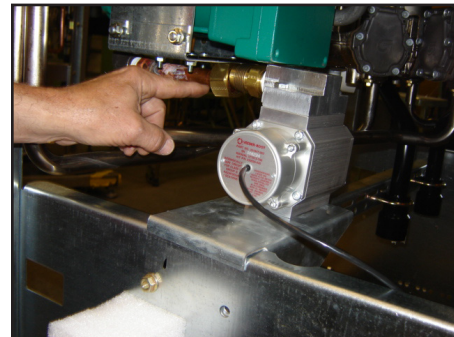
Picture 031

- x. Place the ISD/Flow meter assembly over the top inlet support and the lip of the side column of the lower frame assembly. Secure with (1) 8mm screw. See Picture 032.



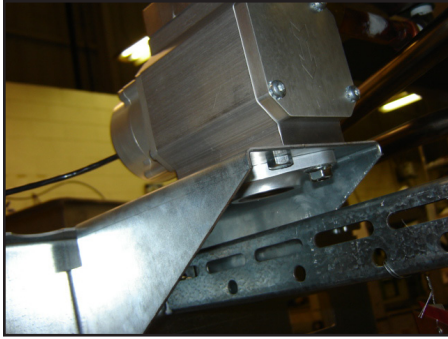
Picture 032

- y. Slide the assembly into place and connect the flare fitting to the tubing nut coming from the Healy pump assy. Tighten the nut. See Picture 033.



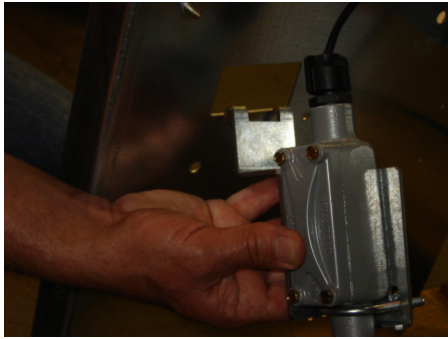
Picture 033

z. Connect the field connection piping to the bottom of the ISD assembly. See Picture 041 for adaptor to connect piping to.



Picture 034

aa. Install the ISD pulser junction box assembly to the frame & secure with one screw. See Pictures 035, 036.



Picture 035



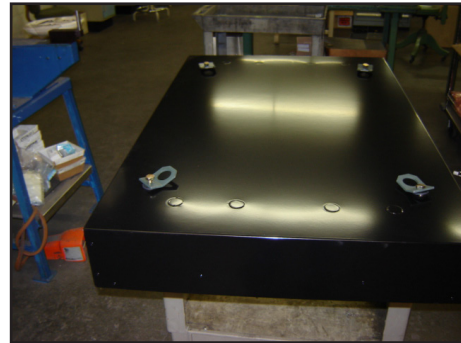
Picture 036

ab. Perform any required field wiring & run test if needed.

ac. Reinstall top cover & sheathing to unit. See Pictures 037, 038.

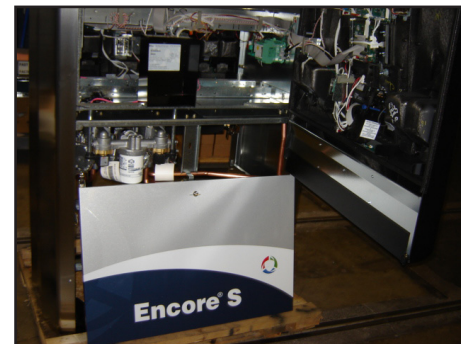


Picture 037



Picture 038

ad. Reinstall lower doors to unit & Close bezel door. See Picture 039.



Picture 039

START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations – complete SIDE A and sections 3, 4, 5 and 6 of SIDE B. Submit forms to Healy Systems.**
- **Warranty Service or Annual Testing – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on SIDE A and conduct the appropriate tests specified on SIDE B. Submit Forms to Healy Systems.**

SERVICE COMPANY NAME	TELEPHONE	
SERVICE TECHNICIAN	HEALY TECH CERT #	
STATION ADDRESS	CITY	STATE
DISPENSER MAKE	VACUUM PUMP SERIAL #	

**SIDE A**

DISPENSER EQUIPMENT CHECKLIST - Parts A-1 and A-2	YES	NO*
<b>A-1</b> Is all the installed dispenser hanging hardware listed in Exhibit 1 of Executive Order VR-201 or VR-202?	<input type="checkbox"/>	<input type="checkbox"/>
<b>A-2</b> Proper installation of the VP1000 requires the test port and ball valve on the inlet side of the vacuum pump. Are the test port and ball valve installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
<b>*If the answer to either A-1 or A-2 is NO, the Healy Warranty is Void.</b>		

**A-3**

- THE FOLLOWING TEST WILL PERFORM A POSITIVE PRESSURE LEAK CHECK OF THE VACUUM PUMP, DISPENSER VAPOR PIPING, HANGING HARDWARE AND ALL NOZZLES ON BOTH SIDES OF THE DISPENSER.
- THE VP1000 OUTLET IS NOT CONNECTED TO UNDERGROUND PIPING DURING THIS TEST.

**CAUTION: REGULATE GASEOUS NITROGEN TO 2.5 PSI (~70" WC) MAXIMUM BEFORE TESTING**

1. Install a 0-100 inch water column (" wc) mechanical gauge at the VP1000 test port.
2. Use the water column gage positive (high) pressure port.
3. Gaseous nitrogen gas can now be connected to the outlet (exhaust) port of the VP1000.
4. Test pressure **cannot** exceed 70" wc.
5. **Slowly** introduce the gaseous nitrogen to a pressure between 60 – 70" wc.
6. After reaching the pressure range, close the valve supplying the gaseous nitrogen.
7. Record the initial pressure reading on the gauge - observe and record the final pressure reading after 60 seconds.
8. Leaks must be repaired when the pressure falls more than 4" wc in 60 seconds.
9. Retest until all leaks have been repaired.
10. Record test results in Section A-4.

<b>A-4</b> <b>PRESSURE TEST</b> <b>2.5 PSI (~70"wc) Maximum</b>	<b>Initial Pressure test reading ("wc)</b>	<b>Pressure test reading after 60 seconds ("wc)</b>
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**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections **3, 4, 5** and **6** of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections **1** and **2** on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

<b>SIDE B</b>			
<i>Warranty Service</i> Complete Troubleshooting Sections <b>B-1 and B-2</b>		<i>Start-up/ New Installations/ Annual Testing</i> Complete Sections <b>B-3 through B-6</b>	
<b>B-1</b>	<p style="text-align: center;"><b>Control Module Fault Light</b> (Circle one)                      <b>Flashing (LED)</b>                      <b>Steady (LED)</b></p> <p>1. All fault conditions require removal and cleaning or replacement of the rotor and vanes located inside the vacuum pumps round front cover assembly. Use the <b>VP1000 ROTOR &amp; VANE SERVICE AND REPLACEMENT GUIDE</b> in the applicable dispenser retrofit manual of the ARB Approved Installation, Operation and Maintenance Manual for Executive Orders VR-201-O and VR-202-O.</p> <p>2. Clean all surfaces including vanes, rotor, rotor housing and cover assembly.</p> <p>3. Manually spin and inspect the motor shaft for bearing wear before re-installing the rotor kit.</p> <p>4. Replace motor when bearings or shaft are damaged or worn.</p> <p>5. Check O-ring seal before replacing rotor cover assembly.</p>		
<b>B-2</b>	<p>Re-Assemble / Reset Vacuum Pump and Module. (Power must be removed from both the vacuum pump and the <b>module for 20 seconds to reset the system</b>) using the power reset switch on the MC100 module.</p>		
<b>B-3</b>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Dispenser Vapor Line Integrity Test</p> <p>1. Install 0-100 inch water column (“ wc) vacuum mechanical gauge at the VP1000 test port.</p> <p>2. Authorize the dispenser for fueling. The VP1000 will begin to run.</p> <p>3. Close the ball valve at the pump inlet.</p> <p>4. Record the initial vacuum reading on the gauge – observe and record the final vacuum reading after 60 seconds.</p> <p>5. Open the ball valve at the pump inlet.</p> <p>6. Leaks must be repaired when the vacuum reading falls more than 4” wc in 60 seconds.</p> <p>7. Retest until all leaks have been repaired.</p> <p>8. Record data in Section B-4.</p> <p><b>Note: If the initial vacuum reading is less than 60” wc, it could indicate a problem with the VP1000. Remove the dispenser from service. Use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-4</b>	VACUUM TEST Using VP1000 as vacuum source	Initial Vacuum test reading (“ wc)	Vacuum test reading after 60 sec. (“ wc)
<b>B-5</b>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Dispenser Vacuum Test</p> <p>With one side of the dispenser authorized (VP1000 running) and the ball valve at the pump inlet open, dispense in handheld position a minimum of 0.5 gallons of fuel into a vehicle or test tank. Record the vacuum level while dispensing. Repeat test for the other side of the dispenser.</p> <p>1. Side “A” Dispensing Vacuum _____” wc</p> <p>2. Side “B” Dispensing Vacuum _____” wc</p> <p><b>Note: If the dispensing vacuum is less than 60” wc, remove the dispenser from service. See the troubleshooting section of the manual or contact FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-6</b>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Audible Increase Test</p> <p>Test the VP1000 Vacuum Pump for normal operation. Use the 6 step procedure titled, “Testing the VP1000 Vacuum Pump for normal operation using the following test procedure:” in Section 1.1 (Weekly Inspection and Testing) of the Healy Systems Scheduled Maintenance document in the ARB Approved Installation, Operation and Maintenance Manual for the Healy Phase II EVR System not Including ISD. This is to verify that the pump recognizes when both sides of the dispenser are activated for fueling.</p> <p>Does the VP1000 Vacuum Pump change speeds (audible increase) when both sides are activated for fueling?</p> <p style="text-align: center;">Yes    No</p> <p>If the answer is no, <b>use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
Repairs - Comments		To Obtain Returned Materials Authorization number (RMA#) Call 800-984-6266 Forms can be faxed to Franklin Fueling Systems Customer Service at 800-225-9787	

Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

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**GASBOY 9800 SERIES**  
**DISPENSER RETROFIT for HEALY SYSTEMS, INC.**  
**MODEL VP1000**  
**VAPOR RECOVERY ASSIST SYSTEM**  
**(KIT Z081)**

## **OUTLINE**

This Manual is to be used for new, replaced, retrofitted, or reconditioned dispensers/pumps.

- 1. Purpose**
  - 2. Safety**
  - 3. Models Covered**
  - 4. Parts Lists**
  - 5. Tools Required**
  - 6. Dispenser Access**
  - 7. Survey Scope of Work**
  - 8. Installing The Healy VP1000 System**
  - 9. Installing The Sealed Nipple Assembly**
  - 10. Connecting Vapor Lines**
  - 11. Wiring Inside The Electronics Compartment**
  - 12. Connecting Healy Systems Dispensing Equipment**
  - 13. VP1000 Theory Of Operation**
  - 14. Testing The System**
  - 15. Trouble Shooting The VP1000**
  - 16. VP1000 Vane & Rotor Service & Replacement Guide**
- Start-up/ New Installation/ Warranty/ Annual Testing Form**

## 1. PURPOSE:

This procedure describes the tools, methods and skill levels required to install a Healy Systems, Inc. Model VP1000 Vapor Recovery pump in non-vapor ready Gasboy™ model 9800 series gasoline dispensers. Only Healy trained and certified contractors will be able to perform these retrofits or warranty will be void. The installer shall be a skilled petroleum technician and thoroughly familiar with the requirements of State, Federal and local codes for installation and repair of gasoline dispensing equipment. Also, they shall be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation. NOTE: All electrical and hydraulic plumbing fittings referred to in these instructions must be UL “listed” or “recognized” for the purpose.

**Note:** Installations of vapor piping into the inlet side of the vacuum pump should be sloped such that the natural flow direction is toward the vacuum pump. However, it is permissible to have a piping slope tilted away from the vacuum pump provided that all other applicable tests (Dispenser integrity and V/L) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

**Note:** For installations with In-Station Diagnostics (ISD), the vapor flow meter shall be installed on the down stream side of the vacuum pump. Every effort shall be made to install the vapor flow meter so that vapor piping between the vacuum pump and the vapor flow meter is sloped such that the natural flow direction is toward the vapor flow meter. However, it is permissible to have the piping slope away from the vapor flow meter provided that all other applicable tests (Dispenser integrity, V/L and ISD Operability) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

## 2. SAFETY:

Before installing the equipment, read, understand and follow:

- The National Electrical Code (NFPA 70)
- The Automotive and Marine Service Code (NFPA 30A)
- Any national, state and local codes that may apply.

The failure to install the equipment in accordance with NFPA 30A and 70 may adversely affect the safe use and operation of the system.

Accurate, sound installations reduce service calls: Use experienced, licensed contractors that practice accurate, safe installation techniques. Careful installation provides a sound troubleshooting framework for field repairs and can eliminate potential problems.

1. Read all instructions before beginning.
2. Follow all safety precautions:
  - Barricade the area.
  - Do not allow vehicles or unauthorized people in the area.
  - Do not smoke or allow open flames in the area.
  - Do not use power tools in the work area.
  - Wear eye protection during installation.
3. Use circuit breakers for multiple disconnects to turn off power and prevent feedback from other dispensers.



### 3. MODELS COVERED:

Gasboy 98XXQX all suffix except I, S, 2, 3, 25, 35 & 9 gasoline dispensers. The addition of the Healy Systems VP1000 to the 98xx's will increase the current draw of the dispenser by 2 amps. Use the label supplied to note this change. This kit will retrofit a two hose unit: if single hose, a sealed cap is provided to close off one side.

NOTICE: BE SURE NOZZLE HOOK AND HOOD IS THE CORRECT ONE FOR A VAPOR RECOVERY NOZZLE AND HAS TO BE SPECIFICALLY ORDERED.

### 4. PARTS LISTS: (See Photo A)

- 1 VP1000 Vacuum Pump
- 1 1374A Wire Harness / MC100 Series Interface Module Assembly

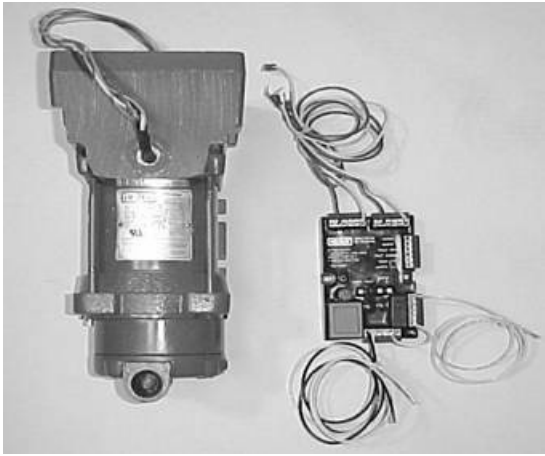


Photo A

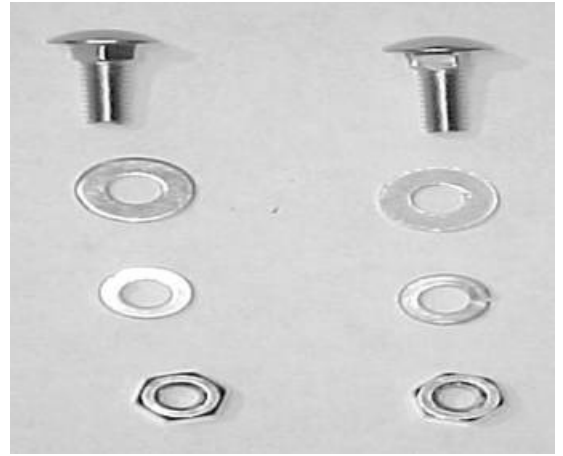


Photo B

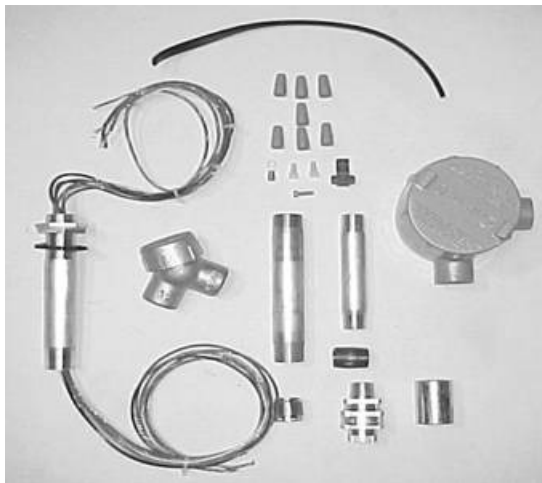


Photo C

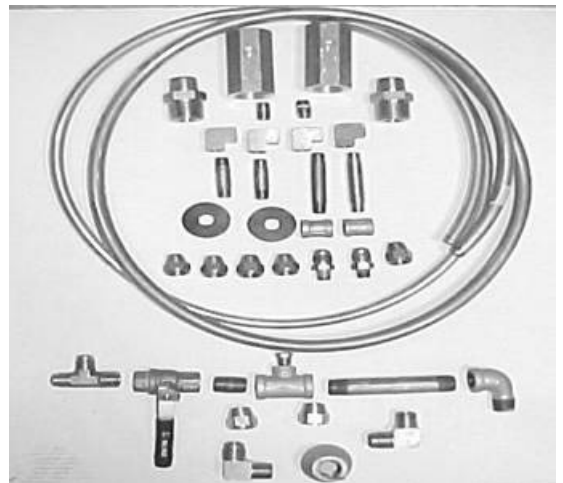


Photo D

#### HARDWARE KIT Z081H: (See Photo B)

- 2 1/4-20 bolts, washers, lock washers and nuts

#### ELECTRICAL KIT Z081E: (See Photo C)

- 1 Current change label (p/n 1405)
- 9 Wire nuts

- 1 8-32 x 5/8" machine screw
- 1 3/4" electrical coupling
- 1 #1316 potted conduit nipple
- 1 #8 Ring tong terminal
- 1 Notice label (p/n 1406)
- 1 UL Listed label (p/n 1410)
- 1 1/2" electrical capped elbow
- 1 3/4 " x 1/2 " electrical reducing bushing
- 1 1/2" electrical close nipple
- 1 1/2" electrical union
- 1 1/2" x 4-1/2" electrical nipple
- 1 3/4" x 6" electrical nipple
- 1' rubber channel grommet
- 1 Explosion proof junction box
- 1 Scotch-Loc connector (RED)

**VAPOR KIT Z081V: (See Photo D) – assumes 2 hose unit**

- |    |   |    |                               |
|----|---|----|-------------------------------|
| 2  | 1/4" NPT X 1/2" flare straight fittings     | 2  | 1/4" NPT couplings            |
| 4' | 1/2" OD copper tube, type 'L'               | 2  | 1/4" close nipple             |
| 2  | 1/4" x 2" nipple                            | 2  | 1/4" x 3" nipple              |
| 1  | 1/2" x 1/4" x 1/2" reducing tee             | 1  | 1/2" ball valve               |
| 1  | 1/4" pipe plug                              | 4  | 1/2" flare nuts               |
| 1  | 1/2" NPT x 1/2" x 1/2" flare tee            | 1  | 1/2" flare cap                |
| 1  | 1/2" street elbow galvanized                | 4  | 1/4" elbows                   |
| 1  | 1/2" x 5" galvanized nipple                 | 1  | 1/2" close nipple             |
| 2  | CX6-A Healy hose adaptor (splitter fitting) | 2  | 5/8" flare nuts               |
| 2  | 1" NPT x 3/4" NPT male/male adaptor         | 1  | 1" x 1/2" bell reducer        |
| 2  | Hole mask washers (self adhesive)           | 3' | 5/8" OD copper tube, type 'L' |
| 2  | 1/2" NPT x 5/8" flare elbow fittings        |    |                               |

**MATERIALS SUPPLIED BY INSTALLER:**

- Thread Sealing Compound – non-Setting, UL Classified for use on all tapered thread, non-electrical, plumbing fittings.
- Oil and gasoline compatible PTFE tape
- Non flammable drape (to cover mechanical parts while drilling holes)

## 5. TOOLS REQUIRED:

- ❑ 1/2" or 3/8" ratchet set w/ sockets 1/4" through 9/16" + 3" extension
- ❑ 9" lineman's pliers
- ❑ Assorted open end wrenches 1/4" through 3/4"
- ❑ Wire cutters/strippers 18 AWG and 26 AWG
- ❑ 1-1/8" Greenlee type sheet metal punch
- ❑ Mechanical hand drill (egg-beater type)
- ❑ Assorted drill bits 1/16" through 7/16"
- ❑ Assorted screwdrivers (flat blade-one must be 1/8" wide and Phillips)
- ❑ 1/2" copper tube bending tool
- ❑ 1/2" copper tube flaring tool
- ❑ 5/8" copper tube bending tool
- ❑ 5/8" copper tube flaring tool
- ❑ Copper tubing cutter
- ❑ Electrical multi-Oeter
- ❑ Small hand brush (1-1/2" thick, for clearing chips)
- ❑ 12" adjustable wrench
- ❑ 10" pipe wrench
- ❑ Tape measure
- ❑ Allen wrenches

## 6. DISPENSER ACCESS: (See Photo E)

- ❑ Secure Dispenser Access keys from Station Management.
- ❑ Lock-out and tag-out all electrical power to dispenser being modified.
- ❑ Remove both lower dress panels.
- ❑ Remove both upper bezels
- ❑ Remove the top sheet metal assembly.
- ❑ Remove the 4, 5/16 – 18 nuts and washers holding the top electrical chassis to the vapor barrier. Retain for reinstallation later in procedure.

## WARNING

This retrofit kit requires drilling in a Hazardous Location. Insure that all power to the dispenser has been turned off. Open all access doors for increased airflow. Use only sharp drill bits; dull bits may generate excessive heat. Use air powered drill at low RPM's. If an electric drill is used, a suitable UL Listed Gas Detector must be used to ensure the area is below 25% of the Lower Explosive Limit. Do not drill if gasoline odors are present.

If drilling in the electronics cabinet, carefully collect and remove all metal shavings that may be inside the cabinet. Failure to remove the shavings could result in an electrical shock hazard. Before drilling, check to ensure that no wires or fluid containing parts (i.e. product tubing) is located on the backside or near the chuck of the drill.

### 7. SURVEY – Scope of Work: *Perform this step before beginning steps 8 thru 12.*

Read and familiarize yourself with the theory of operations sheet and wiring instructions for the VP1000 Vapor Pump. The installation of the pump is on the sheet metal shelf under the meters on the side opposite the electrical 'J' box in the free space on the right hand side, see photos F & G. From this survey, you will have an indication of where the vapor plumbing fittings need to go and where the holes need to be drilled in the adjoining sheet metal to allow the vapor pipes from the pump to pass through the side skins to the hydraulics compartment. The Healy potted conduit nipple is installed under the upper electronics chassis in a 1 1/8" hole that needs to be drilled through the sheet metal panels. See Photo H and Section 9.

**CAUTION: ALL POWER TO DISPENSER UNDER MODIFICATION SHOULD BE COMPLETELY DISCONNECTED AND CAPPED OFF AT JUNCTION BOX TO AVOID UNINTENTIONAL FEEDBACK FROM OTHER DISPENSERS!!**

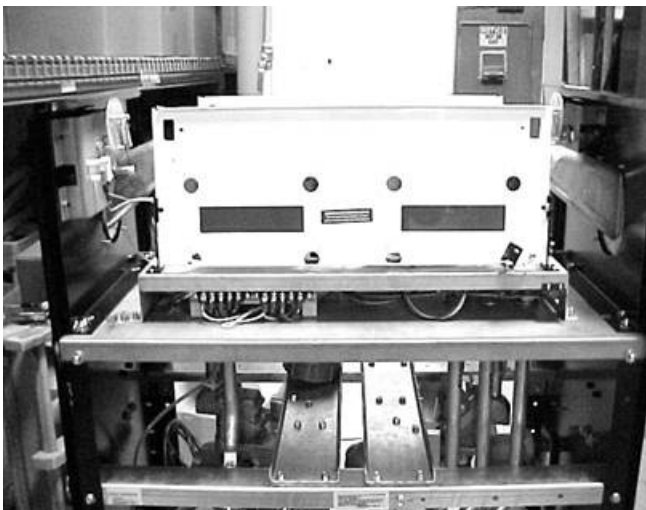


Photo E

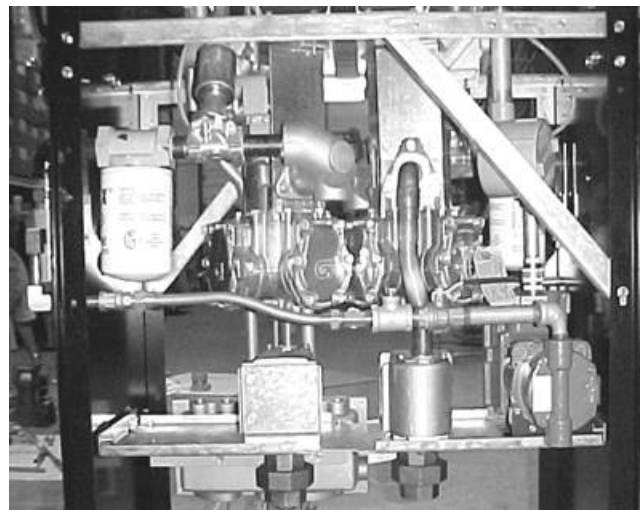
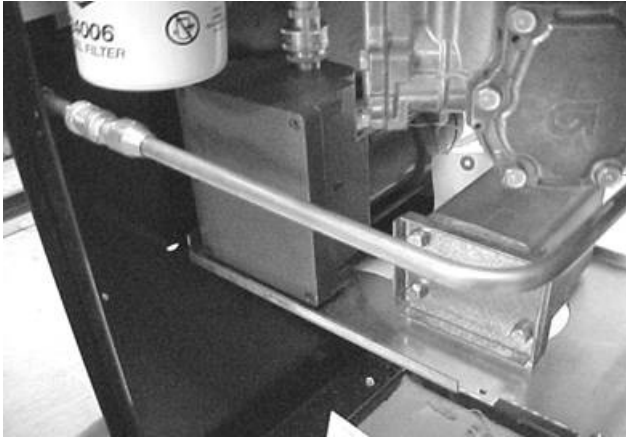
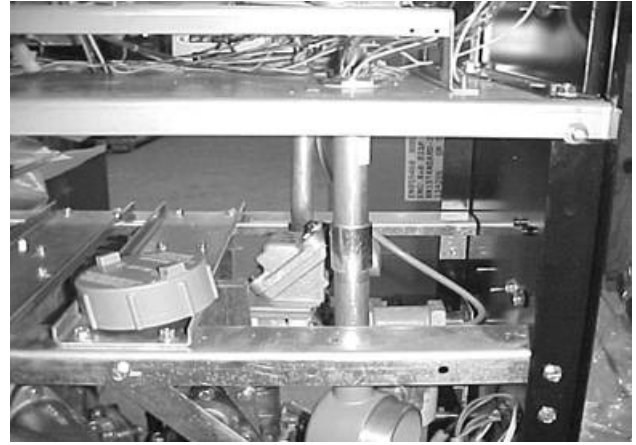


Photo F



**Photo G**



**Photo H**

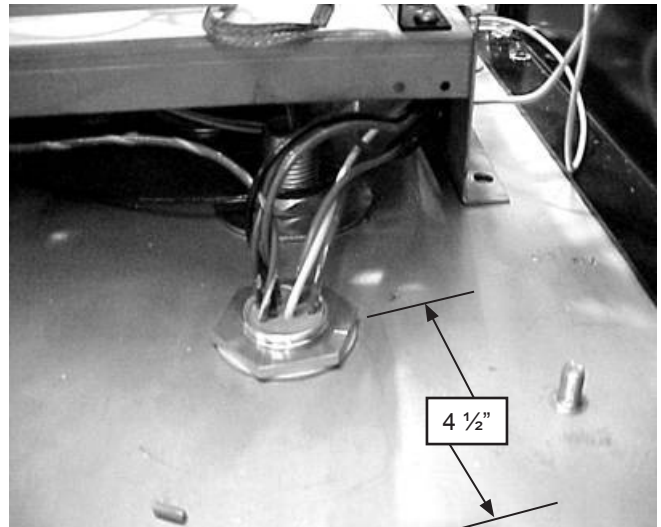
## **8. INSTALLING THE HEALY VP1000 SYSTEM:**

**NOTICE:** WHEN DRILLING HOLES, ASSURE THAT THERE ARE NO HAZARDOUS VAPORS PRESENT AND DO NOT ALLOW CHIPS TO FALL DOWN INTO THE HYDRAULICS AREA.

- ❑ In order to make the vapor connection from the CX6-A hose adaptor installed outside the cabinet to the VP1000 pump installed inside the cabinet, it is necessary to drill or punch a 7/8" hole see photo I. Measure 1-1/4" to the left of the right edge of the side panel, make a small line. Measure 20-5/8" up from the bottom edge of the side panel (NOT THE BASE OF THE DISPENSER), make a small line forming a cross and drill or punch the 7/8" hole. Repeat on other side if a dual hose unit.
- ❑ In order to make the electrical connections from the VP1000 pump which will be installed in the meter area to the upper electronics compartment where the interface module is mounted a 1-1/8" hole has to be made.
- ❑ Before beginning this step, place a nonflammable, flexible drape over the meter and encoder gears to prevent chips from the following drilling operation from falling into the gear mechanisms.
- ❑ Carefully lift the previously loosened electronics chassis from the mounting bolts and position toward the electrical 'J' box side of the cabinet about 5" from the edge of the shelf and set down.
- ❑ In line with the sealed nipple going to the meter encoder and 4-1/2" in from the edge of the chassis drill or punch a 1-1/8" hole to mount the 3/4" sealed nipple assembly, see photo J.



**Photo I**

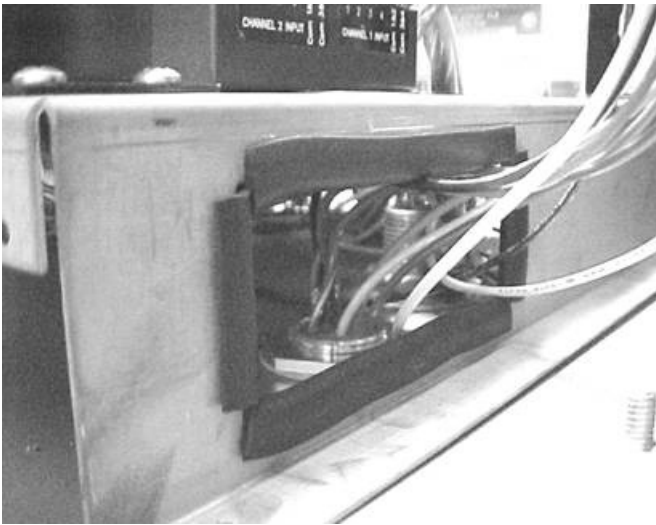


**Photo J**

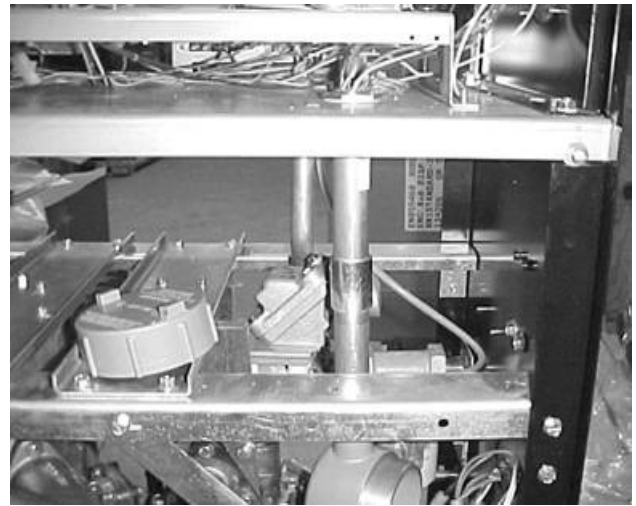
- Position the VP1000 pump on top of the sheet metal shelf on the right end, on the side opposite the main electrical 'J' box, see photo F & G.

## **9. INSTALLING THE SEALED NIPPLE ASSEMBLY:**

- Reposition the chassis to better expose the rectangular cutout in the side of the chassis. Surround this hole with rubber gasket material supplied, see photo K.
- Install the sealed nipple by carefully removing the first nut and washer, then slide the wires up, through the 1 1/8" hole and reinstall the washer and nut. Be sure at least one full thread is showing over the nut but not more than two threads and tighten the nuts securely, see photo J.
- Gather the upper wires and put through the grommeted opening in the chassis, from under the chassis and reposition the chassis on it's mounting studs. Check to be sure no wires are trapped under the edges of the chassis – do not re-install the mounting hardware at this time, see photo K.
- Below the top shelf, slide a 3/4" electrical coupling over the wires from the nipple, followed by the 3/4" x 6" electrical nipple. Secure these connections, see photo L.
- Remove the cover on the electrical junction box supplied and feed the nipple wires into the box until the box and nipple contact, then slowly rotate the box at least five turns before positioning the remaining conduit hub to the rear, towards the pump motor.



**Photo K**



**Photo L**

- ❑ Remove the cover from the capped elbow and install a 1/2" close nipple into one of the conduit hub openings. To this nipple, add a 1/2" x 3/4" electrical reducing bushing. Install this completed assembly into the open conduit hub on the junction box installed above, see photo M.
- ❑ Install the female half of the electrical union on to the 1/2" x 4-1/2" electrical nipple, then install the nipple into the open conduit hub on the capped elbow.
- ❑ Thread the motor wires through the male half of the electrical union and install the part into the motor, see photo O.
- ❑ Carefully thread the motor wires up through the 4-1/2" nipple, into the capped elbow. Pull the wires tightly as the two halves of the union are aligned and screw down the securing collar. Be sure no wires are pinched between the two halves of the union.
- ❑ Push the motor wires through the capped elbow into the junction box and replace the cover on the capped elbow.
- ❑ Leave about 6" of wire on each piece in each bundle of wires, then strip all wires 3/8" and join, color for color using wire nuts supplied. Replace the cover, see photo N.



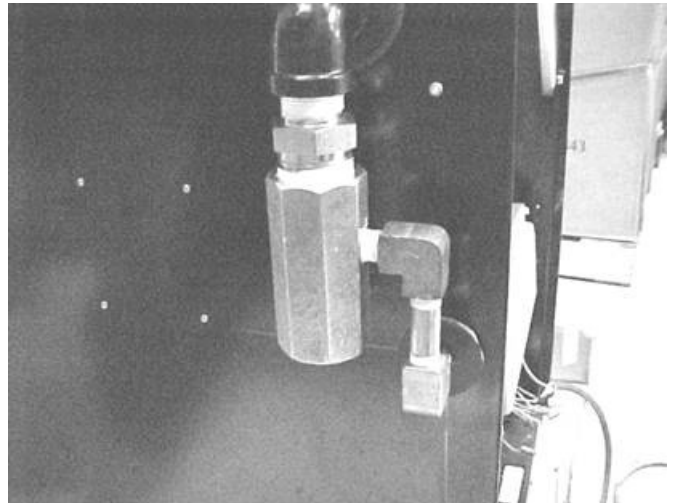
**Photo M**



**Photo N**



**Photo O**



**Photo P**

## 10. CONNECTING VAPOR LINES: (See Photos F, G, P, Q & R)

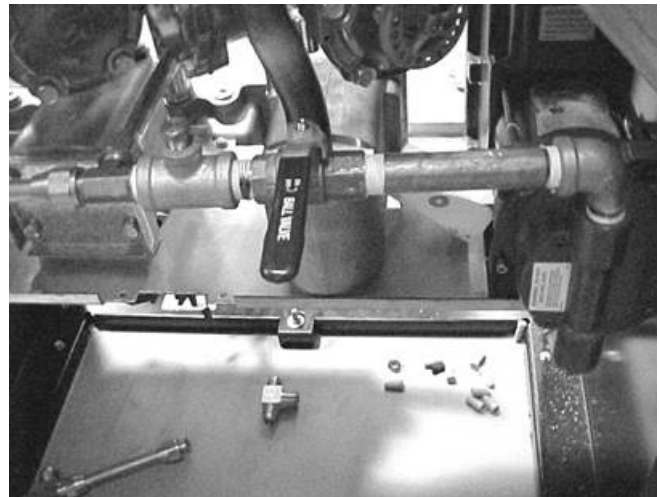
- ❑ Apply pipe sealant to the threads on the 1" x 3/4" male threaded nipple and install the 3/4" end into the product outlet on the dispenser. Note: Gasboy has an alternate 1" discharge fitting. If so equipped, installer will need to supply their own 1" x 2" nipple to install the Healy CX6-A splitter fitting. Do both sides if dual hose.
- ❑ Install the CX6-A splitter adaptor to the 1" threaded portion of the nipple and tighten both securely, with the final turn positioning the 1/4" vapor outlet of the CX6-A facing the closest edge of the cabinet. Do both sides if dual hose, see photo P.
- ❑ Note: Use Oil and gasoline compatible PTFE tape on the following steps.
- ❑ Assemble a 1/4" close nipple and elbow to the vapor hole in the CX6-A adaptor. Position the elbow to face downward. Do both sides if dual hose.
- ❑ Assemble the 1/4" x 2" nipple into elbow and then attach another elbow, positioned to face the cabinet wall when tightened. Do both sides if dual hose.
- ❑ Install the 1/4" x 3" nipple from inside the cabinet slide the nipple through the cabinet, toward the elbow but slide on the hole mask washer (white paper towards cabinet) between the outside of the cabinet and the elbow fitting. Do both sides if dual hose, see photos P & Q.
- ❑ Install the 1/4" coupling to the 1/4" x 3" nipple and then install a 1/4" NPT x 1/2" flare straight fitting in the coupling – tighten securely. Do both sides if dual hose, see photo Q.
- ❑ Remove the white protective tape from the hole mask washer installed above and press adhesive surface against cabinet. Do Both sides if dual hose.



Photo Q



Photo R



- ❑ Note: Use Oil and gasoline compatible PTFE tape on the following steps.
- ❑ Install the 1/2" street elbow to the inlet of the pump, tighten to face left, see photo R.
- ❑ Install the 1/2" NPT x 5" nipple to the elbow above. Install and tighten the 1/2" ball valve such that when the handle is closed, it points toward the outside of the cabinet.
- ❑ To the ball valve, install a 1/2" close nipple and the 1/2" x 1/4" x 1/2" reducing tee. Completely tighten with the 1/4" opening facing up.
- ❑ To the tee, install the 1/4" NPT plug and the 1/2" NPT x 1/2" x 1/2" flare tee. NOTE: If upgrade is being done on a single sided dispenser, install the 1/2" flare cap provided, onto the remaining tee opening.
- ❑ Make up a piece of 1/2" OD copper tube that will go from the flare tee on the ball valve to the straight flare fitting on the coupling leading to the CX6-A fitting outside the cabinet, see photo F.
- ❑ Refer to photo G for the next piece of 1/2" OD tube that is run from the CX6-X fitting on the other side of the dispenser. Carefully bend the piece to fit between the two meters and line up with the remaining port on the tee on the motor inlet plumbing.
- ❑ The vacuum pump is now well contained by both the electrical and vapor plumbing. If further fastening is required, drill two 5/16" holes up from below the center panel and through the mounting plate on the VP1000. Secure the pump with the nuts and bolts supplied.

## 11. WIRING THE ELECTRONICS

- ❑ Remove the screws from the two indicator/display panels and allow to lay flat.
- ❑ The interface module assembly will be mounted on top of the electronics chassis in the space at the right rear corner looking from the non 'J' box side of the dispenser. Before mounting, however, the red "DANGER" must be relocated about 5" to the left. Also, it is easier to make the wire connections with the module lifted up rather than secured to the chassis, see photo S.

- Loosely position the module on the electronic chassis, see photo S, dress the wires coming from the sealed nipple assembly over to the module leave at least six inches longer than necessary to reach the terminal boards on the module. Cut off excess and strip all wires 1/2".

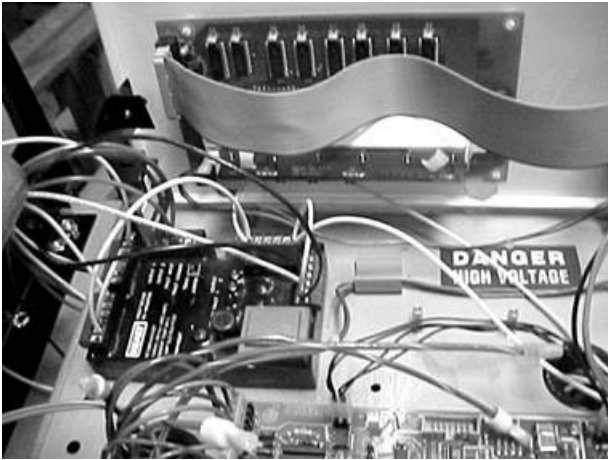


Photo S

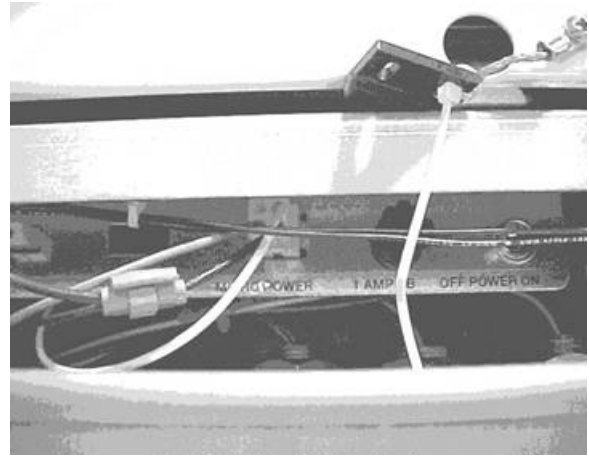
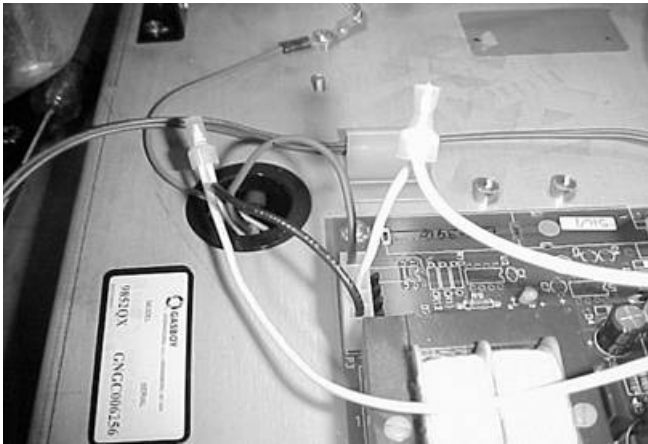


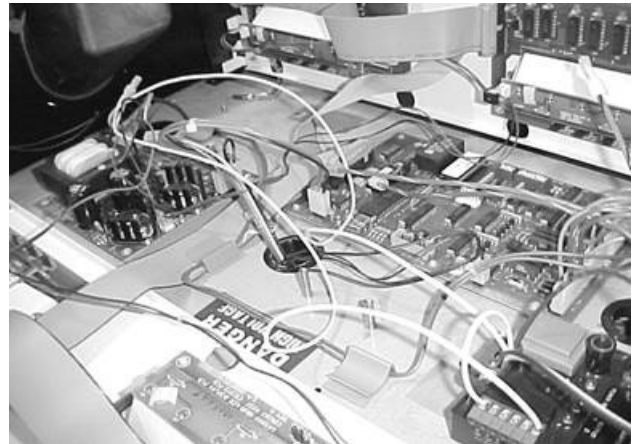
Photo T

- **Connect the wires from the sealed nipple to the interface module as follows: NOTE: Make sure the module screws contact the wire not the insulation.**
  - **Black wire to 'motor ' on module**
  - **White wire to 'neutral' on module**
  - **Red wire (either) to 'output 1' on module**
  - **Red wire (other) to 'output 2' on module**
  - **Orange wire to 'fault common' on module**
  - **Purple wire to 'fault input' on module**
  - **Green wire needs a #8 ring tong lug (provided) installed and connected to any chassis ground (frame)**
  - **Some sealed nipples may have extra wires, cap these and bundle them neatly out of the way.**
- The single black wire on the module is routed down through the center black grommet hole and to the far side of the upper deck. Locate the black/green/white wire set from the factory installed sealed nipple that go to the switch bracket assembly and are marked "MICRO POWER". Select the black wire in the connector and Scotch-loc™ the black wire from the module to the black wire in the connector, see photo T.
- The input signal wire connections are made to the valves terminal board under the electronics chassis. Route the yellow and red twisted pair (2 sets) of wires from the module through the rectangular hole containing the motor wires under the chassis to the valves terminal strip. Attach one set (yellow and red twisted pair) to one valve, and the other set to the other valve. The yellow and red wires supplied, with the terminals attached are screwed, one on each, on top of the existing yellow wires and red wires on each of the valve terminal boards. Be sure to keep the red and yellow pairs together on the same valve.

- ❑ To obtain the electrical neutral connection for the module and motor requires interrupting the white (neutral) wire going to the three wire (5-position) connector on the Micro board. The module is supplied prewired with two white wires, one going to neutral on the power input strip on the module and the other going to pin location 1 on the disconnect relay. There is also a small white jumper going from pin 6 of the disconnect relay to a neutral on the power input strip.
- ❑ Get the white wire going to the power input strip and strip 3/8" off the end. Locate the white wire going to the MICRO connector and cut the wire, leaving about 1-1/2" going to the MICRO connector and the wire going back through the hole under the chassis. From the wire going under the chassis, strip 3/8" and connect to the previously stripped white wire going to power neutral. Use a wire nut supplied to secure and insulate the connection.
- ❑ Get the white wire going to pin 1 on the disconnect relay and strip 3/8" off the end. At the MICRO board, strip 3/8" off the other white wire in the connector and join with the first white wire. Secure with a wire nut supplied.



**Photo U**



**Photo V**

- ❑ Mount the interface module as shown in photo S using the 8-32 x 5/8" screw, supplied in the electrical kit. There is an existing hole in the chassis that is the right size and in the right place for the thread cutting screw.
- ❑ Install the following labels supplied:
  - NOTICE label for current increase, install on the inside of the cabinet panel near the existing power consumption label, see photo W.
  - Large NOTICE label relating to the vapor recovery upgrade and how to reset the electronic module should be installed near the module, where it will be readily visible to a service technician on the inside of the cabinet near the nozzle spout housing, see photo X.
  - UL, retrofit kit identification number, install near the electronic module.



Photo W

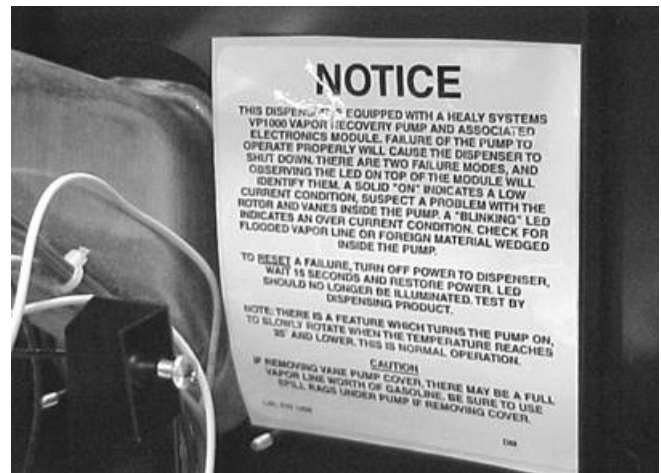


Photo X

- ❑ Replace the screws holding the indicator/display panel in place, the nuts and washers holding the electronics chassis to the vapor barrier and replace the top cover.
- ❑ Replace the two bezels and lower cabinet doors.

## 12. CONNECTING HEALY SYSTEMS DISPENSING EQUIPMENT

- ❑ Completing the connection of Healy Systems dispensing equipment requires the installation of Healy Systems Phase II dispenser adaptors, hoses and nozzles (Hanging Hardware).
- ❑ If applicable, remove existing non-Healy hanging hardware (from the dispenser product outlet adaptor to and including the nozzles).
- ❑ Healy Vapor Recovery Hoses are available in various lengths to satisfy local ordinances and still provide “far side” fueling capability. Install these following instructions contained on the shipping box.
- ❑ Breakaways are required: Install either Model 8701-VV breakaway or Model 807 swivel breakaway; install using the instructions supplied with the unit.
- ❑ The Healy Systems nozzle Model 900 (EVR) is the only nozzle necessary to complete the upgrade. Check to be sure the nozzle hanger is mounted in the highest position. Be sure to check for proper fit in the nozzle holster and that the nozzle can be locked in the off position. Also, be sure that when the nozzle is locked, that the dispenser cannot be activated from the locked position.

### 13. VP1000 THEORY OF OPERATION

The Healy Systems VP1000 is a self-contained rotary vane pump, designed for gasoline vapor recovery utilizing various parts of the Healy System Vapor Recovery product line. It is intended for use by either OEM dispenser/pump manufacturers or as an after market add-on to make existing equipment compatible with Healy System technology. In order to convert to 'others' equipment, an electronic interface is required to adapt the targeted pump/dispenser to the new vapor recovery equipment. The interface senses when authorization to dispense has been given and sends signals to the motor to operate at a low speed for one hose, or a higher speed for two hoses. It also functions to shut off the pump/dispenser if it senses that the vapor pump is not operating properly. The vacuum is regulated at a level sufficient to clear liquid gasoline from the vapor path in MPD applications. The actual amount of vapors withdrawn is controlled by the Healy nozzle, itself, in response to the liquid gasoline flow rate.

#### MOTOR SPECIFICATIONS

Horsepower	1/8
Voltage	120VAC

#### INTERFACE SPECIFICATIONS

Input voltage	120 VAC
Relay current capacity	5A AC
Input signals	AC and DC voltages up to 130 VAC max
Motor Input signal	5 VDC @ 20 Hz 50% Duty Cycle

#### 14. TESTING THE SYSTEM:

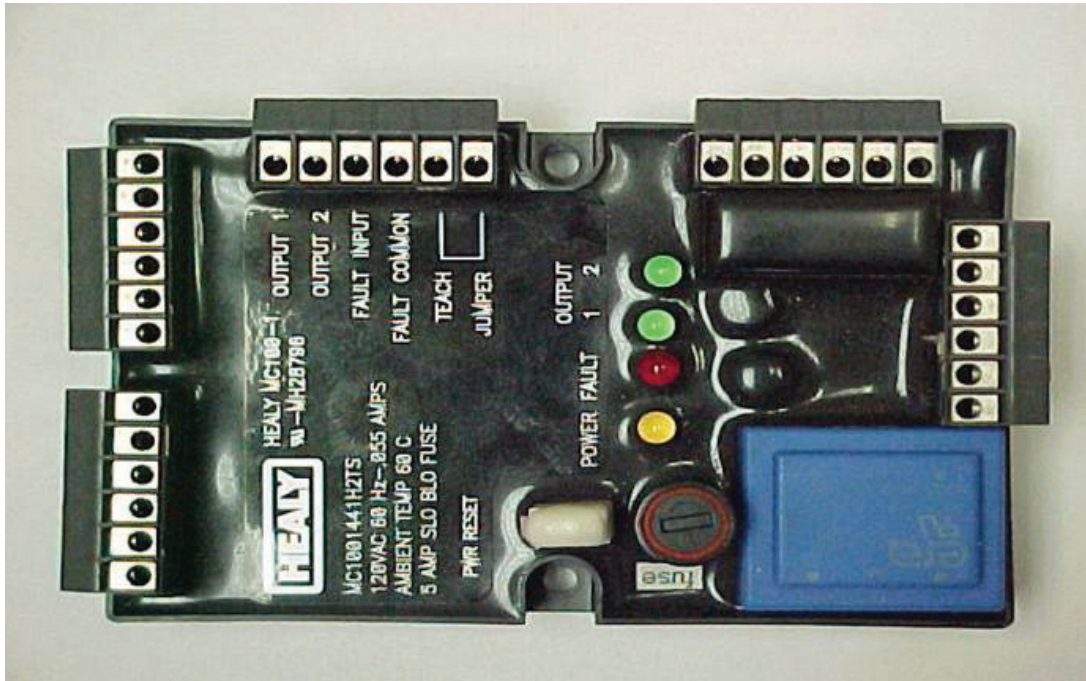
- Carefully review all work completed, being sure all mechanical joints are thoroughly tightened and electrical connections sealed.
- Open the product crash valves and restore power to the dispenser.
- With the power on, but no nozzles authorized, the VP1000 should not be running (unless the ambient temperature is below 40°F), but the power LED (yellow) should be energized on the interface module.
- Authorize one handle and the vacuum system should activate when the gasoline flow control valve is engaged. Repeat for all other nozzles, individually testing each nozzle on each side of dispenser. With each authorization, one of the green LED's on the interface module should illuminate and the VP1000 activate.
- **Note:** For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the same LED activates for all grades on the same side. If the other LED activates, wiring needs to be corrected.
- Authorize one nozzle and listen to the speed of the VP1000. With only one nozzle activated, the speed will be slower than if a nozzle on each side is activated. Activate a nozzle on the other side of the dispenser and listen for the speed to change.
- To test the tightness of the vapor plumbing installed on the suction side of the system requires a 0-100" water column gauge. Connect the gauge into the 1/4" test port of the reducing tee installed earlier in section 10 Photo R. Continue by following and completing the START-UP / NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM.

#### 15. TROUBLESHOOTING THE VP1000:

- Use extreme care and caution when performing the tests listed below. If 120 VAC is accidentally applied to the fault or DC terminals, the module will be destroyed.
- With power applied to the dispenser, but no products authorized, there should be 120 VAC between neutral and 120 VAC on the module terminal strip.
- As above, with any product authorized, there should be single speed power applied to the VP1000. Verify this by checking for 2-3 VDC from OUTPUT 1 (RED WIRE) to FAULT COMMON (ORANGE WIRE), (or from OUTPUT 2 TO FAULT COMMON) also; one GREEN LED should be illuminated. With a second product authorized on the opposite side of the dispenser i.e. one product on each side, the motor should operate at higher speed and there should be 2-3 VDC on both output 1 and 2 (to fault common) and both GREEN LED's should be illuminated.
- With the pump running, a fault can be simulated by shorting, with a jumper wire, the "FAULT INPUT" (purple wire) to FAULT COMMON (orange). This should cause the motor to shut off, the solenoid valves to lose power and the dispenser to shut down. Also, as long as the short is maintained, the red LED will be illuminated. Removing the short will not automatically reset the module. To reset the module, remove the short, remove power to the dispenser for twenty seconds and restore power. The module should now be reset and the red led extinguished. This can also be accomplished by using the power reset (PWR RESET) on the module.

- If diagnosing a problem where the LED is already illuminated, a steady light indicates a low current condition, therefore expect a vane or rotor problem. If the LED is blinking, that indicates a high current condition and would expect to find a jammed rotor or vapor line flooded with product. . See Start-up/ New Installation/ Warranty/ Annual Testing Form.
- The electronics of the motor will make three attempts to have a successful start of the motor. If it detects a problem, on the fourth unsuccessful start, it will short the fault line to signal minus (DC-) and shut down the electronics.

### MC100 Interface Module



## 17. VP1000 VANE & ROTOR SERVICE & REPLACEMENT GUIDE

**Caution**  **Disconnect power before beginning service.**

1. The work area **must** be clean and have sufficient lighting.
2. Disconnect the vapor piping connected to the **IN** and **OUT** ports of the VP1000 cover assembly.
3. Remove the four Allen head screws and lock washers that secure the pump cover assembly to the pump housing and remove the cover carefully.

**Caution**  **Use a spill cloth when removing the cover, as there may be some gasoline inside the pump cavity.**

4. Carefully turn the rotor assembly by hand until the shaft key notch is at the 12 o'clock position. (See Figures)
5. Remove the rotor, vanes and shaft key from the pump housing.

**Note:** Place your hand or a container under the rotor while removing. Do not use any sharp objects that would scratch the surfaces of the pump cavity, pump shaft, rotor, or vanes.

6. Rotate the shaft by hand. If the shaft does not rotate freely, the entire vacuum pump needs replacement (p/n VP1000-5 or RVP1000-5).
7. If the rotor and vanes are cracked, chipped, excessively worn or excessively dirty, the rotor and vanes should be replaced because cleaning will not remedy these conditions (p/n VP1000VRC-G, VP1000VRC-P or VP1000VRC).
8. If there is no visible damage, use a lint-free cloth with isopropyl alcohol to clean the rotor and vanes.
9. Using a lint-free cloth with isopropyl alcohol, thoroughly clean: the inside of the pump ring and rear of the pump cavity, the rotor shaft, and the inside of the pump cover.
10. Reposition the shaft (if necessary) so that the shaft key notch is in the 12 o'clock position. Install the cleaned original or new shaft key onto the shaft.
11. Carefully install the cleaned original or new rotor onto the shaft followed by the cleaned original or new vanes into the rotor.

**Note:** The rotor assembly should slide on to the shaft easily, without excessive force. (Rotors and vanes are reversible)

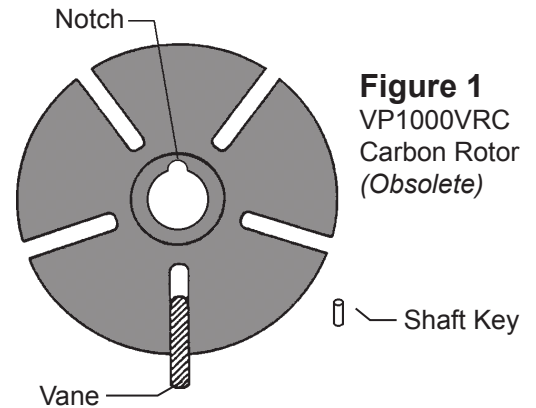
12. Lightly lubricate and install the new O-Ring for the pump housing.

**Note:** Do not allow any lubricant to get inside the pump housing.

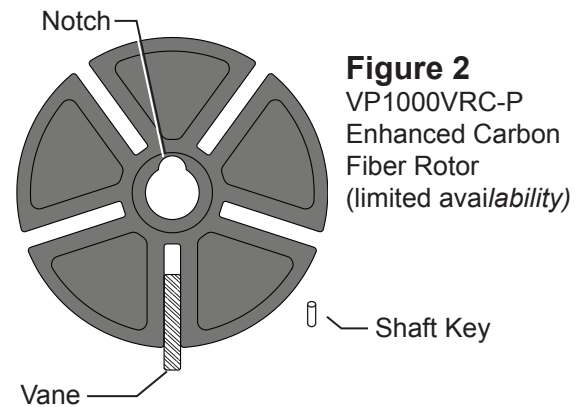
13. Install the pump cover using the four Allen head screws and lock washers removed in step 3 and cross tighten.

**Note:** Use caution when sliding the pump cover over the O-Ring seal to prevent cutting or tearing.

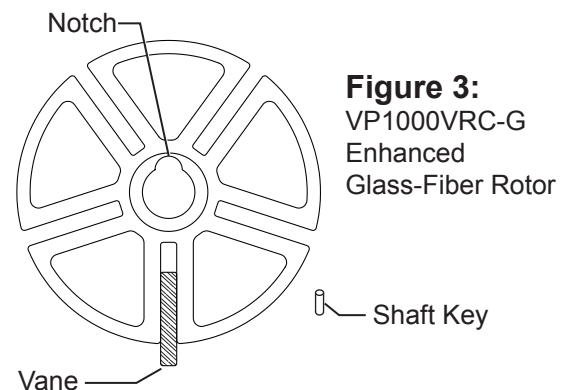
14. Re-connect the vapor piping to the **IN** and **OUT** ports of the pump cover assembly that was removed in Step 2.
15. Re-apply power. Test for normal operation. (See VP1000 Vacuum Performance Test Procedure)



**Figure 1**  
VP1000VRC  
Carbon Rotor  
(Obsolete)



**Figure 2**  
VP1000VRC-P  
Enhanced Carbon  
Fiber Rotor  
(limited availability)



**Figure 3:**  
VP1000VRC-G  
Enhanced  
Glass-Fiber Rotor



START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections 3, 4, 5 and 6 of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

SERVICE COMPANY NAME	TELEPHONE	
SERVICE TECHNICIAN	HEALY TECH CERT #	
STATION ADDRESS	CITY	STATE
DISPENSER MAKE	VACUUM PUMP SERIAL #	

## SIDE A

DISPENSER EQUIPMENT CHECKLIST - Parts A-1 and A-2	YES	NO*
<b>A-1</b> Is all the installed dispenser hanging hardware listed in Exhibit 1 of Executive Order VR-201 or VR-202?	<input type="checkbox"/>	<input type="checkbox"/>
<b>A-2</b> Proper installation of the VP1000 requires the test port and ball valve on the inlet side of the vacuum pump. Are the test port and ball valve installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
<b>*If the answer to either A-1 or A-2 is NO, the Healy Warranty is Void.</b>		

### A-3

- THE FOLLOWING TEST WILL PERFORM A POSITIVE PRESSURE LEAK CHECK OF THE VACUUM PUMP, DISPENSER VAPOR PIPING, HANGING HARDWARE AND ALL NOZZLES ON BOTH SIDES OF THE DISPENSER.
- THE VP1000 OUTLET IS NOT CONNECTED TO UNDERGROUND PIPING DURING THIS TEST.

**CAUTION: REGULATE GASEOUS NITROGEN TO 2.5 PSI (~70" WC) MAXIMUM BEFORE TESTING**

1. Install a 0-100 inch water column (" wc) mechanical gauge at the VP1000 test port.
2. Use the water column gage positive (high) pressure port.
3. Gaseous nitrogen gas can now be connected to the outlet (exhaust) port of the VP1000.
4. Test pressure **cannot** exceed 70" wc.
5. **Slowly** introduce the gaseous nitrogen to a pressure between 60 – 70" wc.
6. After reaching the pressure range, close the valve supplying the gaseous nitrogen.
7. Record the initial pressure reading on the gauge - observe and record the final pressure reading after 60 seconds.
8. Leaks must be repaired when the pressure falls more than 4" wc in 60 seconds.
9. Retest until all leaks have been repaired.
10. Record test results in Section A-4.

<p><b>A-4</b></p> <p style="text-align: center;"><b>PRESSURE TEST</b></p> <p style="text-align: center;"><b>2.5 PSI (~70"wc) Maximum</b></p>	<p><b>Initial Pressure test reading ("wc)</b></p>	<p><b>Pressure test reading after 60 seconds ("wc)</b></p>
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**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections 3, 4, 5 and 6 of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

<b>SIDE B</b>			
<i>Warranty Service</i> Complete Troubleshooting Sections <b>B-1 and B-2</b>		<i>Start-up/ New Installations/ Annual Testing</i> Complete Sections <b>B-3 through B-6</b>	
<b>B-1</b>	<b>Control Module Fault Light</b> <div style="display: flex; justify-content: space-around;"> <span><b>(Circle one)</b></span> <span><b>Flashing (LED)</b></span> <span><b>Steady (LED)</b></span> </div>	<ol style="list-style-type: none"> <li>All fault conditions require removal and cleaning or replacement of the rotor and vanes located inside the vacuum pumps round front cover assembly. Use the <b>VP1000 ROTOR &amp; VANE SERVICE AND REPLACEMENT GUIDE</b> in the applicable dispenser retrofit manual of the ARB Approved Installation, Operation and Maintenance Manual for Executive Orders VR-201-O and VR-202-O.</li> <li>Clean all surfaces including vanes, rotor, rotor housing and cover assembly.</li> <li>Manually spin and inspect the motor shaft for bearing wear before re-installing the rotor kit.</li> <li>Replace motor when bearings or shaft are damaged or worn.</li> <li>Check O-ring seal before replacing rotor cover assembly.</li> </ol>	
<b>B-2</b>	Re-Assemble / Reset Vacuum Pump and Module. (Power must be removed from both the vacuum pump and the <b>module for 20 seconds to reset the system</b> ) using the power reset switch on the MC100 module.		
<b>B-3</b>  Dispenser Vapor Line Integrity Test	<ol style="list-style-type: none"> <li>Install 0-100 inch water column (" wc) vacuum mechanical gauge at the VP1000 test port.</li> <li>Authorize the dispenser for fueling. The VP1000 will begin to run.</li> <li>Close the ball valve at the pump inlet.</li> <li>Record the initial vacuum reading on the gauge – observe and record the final vacuum reading after 60 seconds.</li> <li>Open the ball valve at the pump inlet.</li> <li>Leaks must be repaired when the vacuum reading falls more than 4" wc in 60 seconds.</li> <li>Retest until all leaks have been repaired.</li> <li>Record data in Section B-4.</li> </ol> <p><b>Note: If the initial vacuum reading is less than 60" wc, it could indicate a problem with the VP1000. Remove the dispenser from service. Use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-4</b>	VACUUM TEST Using VP1000 as vacuum source	Initial Vacuum test reading (" wc)	Vacuum test reading after 60 sec. (" wc)
<b>B-5</b>  Dispenser Vacuum Test	With one side of the dispenser authorized (VP1000 running) and the ball valve at the pump inlet open, dispense in handheld position a minimum of 0.5 gallons of fuel into a vehicle or test tank. Record the vacuum level while dispensing. Repeat test for the other side of the dispenser. <ol style="list-style-type: none"> <li>Side "A" Dispensing Vacuum _____" wc</li> <li>Side "B" Dispensing Vacuum _____" wc</li> </ol> <p><b>Note: If the dispensing vacuum is less than 60" wc, remove the dispenser from service. See the troubleshooting section of the manual or contact FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-6</b>  Audible Increase Test	Test the VP1000 Vacuum Pump for normal operation. Use the 6 step procedure titled, "Testing the VP1000 Vacuum Pump for normal operation using the following test procedure:" in Section 1.1 (Weekly Inspection and Testing) of the Healy Systems Scheduled Maintenance document in the ARB Approved Installation, Operation and Maintenance Manual for the Healy Phase II EVR System not Including ISD. This is to verify that the pump recognizes when both sides of the dispenser are activated for fueling. <p>Does the VP1000 Vacuum Pump change speeds (audible increase) when both sides are activated for fueling?</p> <p style="text-align: center;">Yes No</p> <p>If the answer is no, <b>use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		

Repairs - Comments	To Obtain Returned Materials Authorization number (RMA#) Call 800-984-6266 Forms can be faxed to Franklin Fueling Systems Customer Service at 800-225-9787
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Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



**WAYNE-DRESSER HARMONY™ SERIES DISPENSER RETROFIT for  
HEALY SYSTEMS, INC.  
MODEL VP1000  
VAPOR RECOVERY ASSIST SYSTEM  
(KIT Z078)**

**OUTLINE**

**Notice: USE THIS PROCEDURE IF CONVERTING A BALANCE VAPOR RECOVERY  
SYSTEM TO A HEALY VAPOR RECOVERY ASSIST SYSTEM**

This Manual is to be used for new, replaced, retrofitted, or reconditioned dispensers/pumps.

**See Healy Systems Kit Z080 For Dispensers With Wayne-Vac™ Systems**

- 1. Purpose**
  - 2. Safety**
  - 3. Models Covered**
  - 4. Parts Lists**
  - 5. Tools Required**
  - 6. Dispenser Access**
  - 7. Survey Scope of Work**
  - 8. Balance Removal**
  - 9. Installing The Healy VP1000 System**
  - 10. Connecting Vapor Lines**
  - 11. Installing The Sealed Nipple Assembly**
  - 12. Wiring Inside The Electronics Compartment**
  - 13. Connecting Healy Systems Dispensing Equipment**
  - 14. VP1000 Theory Of Operation**
  - 15. Testing The System**
  - 16. Trouble Shooting The VP1000**
  - 17. VP1000 Vane & Rotor Service & Replacement Guide**
- Start-up/ New Installation/ Warranty/ Annual Testing Form**

**1. PURPOSE:**

This procedure describes the tools, methods and skill levels required to install a Healy Systems, Inc. Model VP1000 Vapor Recovery pump in vapor ready Wayne Dresser Harmony™ series gasoline dispensers. Only Healy trained and certified contractors will be able to perform these retrofits or warranty will be void. The installer shall be a skilled petroleum technician and thoroughly familiar with the requirements of State, Federal and local codes for installation and repair of gasoline dispensing equipment. Also, they shall be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

**NOTE:** All electrical and hydraulic plumbing fittings referred to in these instructions must be UL “listed” or “recognized” for the purpose.

**Note:** Installations of vapor piping into the inlet side of the vacuum pump should be sloped such that the natural flow direction is toward the vacuum pump. However, it is permissible to have a piping slope tilted away from the vacuum pump provided that all other applicable tests (Dispenser integrity and V/L) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

**Note:** For installations with In-Station Diagnostics (ISD), the vapor flow meter shall be installed on the down stream side of the vacuum pump. Every effort shall be made to install the vapor flow meter so that vapor piping between the vacuum pump and the vapor flow meter is sloped such that the natural flow direction is toward the vapor flow meter. However, it is permissible to have the piping slope away from the vapor flow meter provided that all other applicable tests (Dispenser integrity, V/L and ISD Operability) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance**

## 2. SAFETY *Manual*.

Before installing the equipment, read, understand and follow:

- The National Electrical Code (NFPA 70)
- The Automotive and Marine Service Code (NFPA 30A)
- Any national, state and local codes that may apply.

The failure to install the equipment in accordance with NFPA 30A and 70 may adversely affect the safe use and operation of the system.

Accurate, sound installations reduce service calls: Use experienced, licensed contractors that practice accurate, safe installation techniques. Careful installation provides a sound troubleshooting framework for field repairs and can eliminate potential problems.

1. Read all instructions before beginning.
2. Follow all safety precautions:
  - Barricade the area.
  - Do not allow vehicles or unauthorized people in the area.
  - Do not smoke or allow open flames in the area.
  - Do not use power tools in the work area.
  - Wear eye protection during installation.
3. Use circuit breakers for multiple disconnects to turn off power and prevent feedback from other dispensers.

### 3. MODELS COVERED:

Wayne-Dresser Harmony series dispensers, all options except suffix "0", non vapor ready and WayneVAC™ systems. The addition of the Healy Systems VP1000 to the Harmony dispenser will increase the current draw of the dispenser by 2 amps. Use the label supplied to note this change.

### 4. PARTS LISTS: (See Photo A)

- 1 VP1000 Vacuum Pump
- 1 1365A Wire Harness / MC100 Series Interface Module Assembly

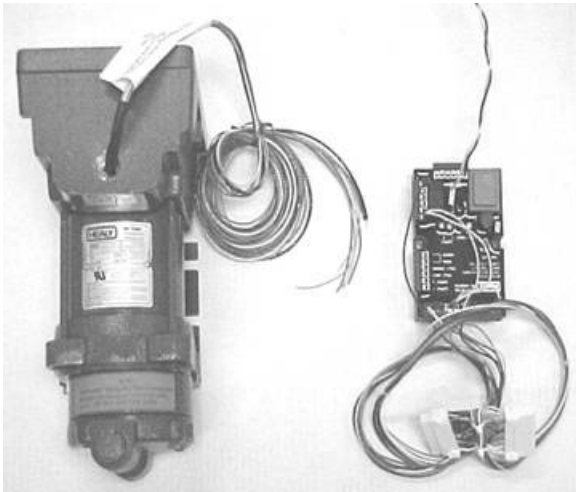


Photo A

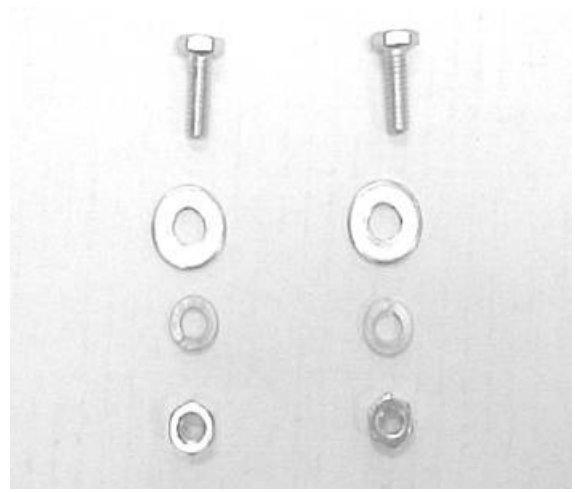


Photo B

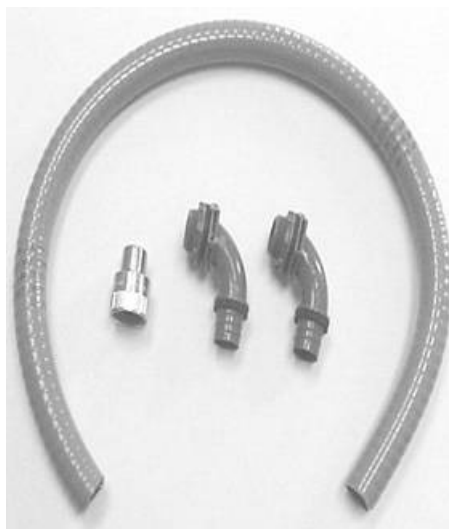


Photo C



Photo D

### HARDWARE KIT Z078H: (See Photo B)

- 2 1/4-20 bolts, washers, lock washers and nuts

### **ELECTRICAL KIT Z078E: (See Photo C)**

- 4 4" Tyraps
- 1 Current change label (p/n 1405)
- 7 Wire nuts
- 1 8-32 x 5/8" machine screw, washer and nut
- 1 1/2" male NPT x 3/4" female NPT electrical reducer fitting
- 1 #1346 potted conduit nipple
- 1 #8 Ring tong terminal
- 1 Notice label (p/n 1406)
- 1 UL Listed label (p/n 1410)
- 30" 3/4" (trade size) Non-Oetallic flexible, electrical conduit
- 2 3/4" Elbow connectors for above

### **VAPOR KIT Z078V: (See Photo D)**

- 3 1/2" NPT X 5/8" flair straight fittings
- 3 1/2" NPT X 5/8" flair elbow fittings
- 12' 5/8" OD copper tube, type 'L'
- 2 1" x 1/2 " reducing bushing
- 1 1/2" close nipple
- 1 1/2" x 1/4" x 1/2" reducing tee
- 1 1/2" ball valve
- 1 1/4" pipe plug
- 6 5/8" flare nuts

### **MATERIALS SUPPLIED BY INSTALLER:**

- Thread Sealing Compound – non-Setting, UL Classified for use on all tapered thread, Non-electrical, plumbing fittings.
- Oil and gasoline compatible PTFE tape

## 5. TOOLS REQUIRED:

- ❑ 1/2" or 3/8" ratchet set w/ sockets 1/4" through 9/16" + 3" extension
- ❑ 9" lineman's pliers
- ❑ Assorted open end wrenches 1/4" through 3/4"
- ❑ Wire cutters/strippers 18 AWG and 26 AWG
- ❑ 1-1/8" greenlee type sheet metal punch
- ❑ Mechanical hand drill (egg-beater type)
- ❑ Assorted drill bits 1/16" through 7/16"
- ❑ Assorted screwdrivers (flat blade-one must be 1/8" wide and Phillips)
- ❑ 5/8" copper tube bending tool
- ❑ 5/8" copper tube flaring tool
- ❑ Copper tubing cutter
- ❑ Electrical multi-Oeter
- ❑ Small hand brush (1-1/2" thick, for clearing chips)
- ❑ 12" adjustable wrench
- ❑ 10" pipe wrench
- ❑ Tape measure
- ❑ Allen wrenches
- ❑ #20 torx bit
- ❑ Whitney type hand sheet metal punch with 3/16" punch and die set

## 6. DISPENSER ACCESS:

- ❑ Secure Dispenser Access keys from Station Management.
- ❑ Lock-out and tag-out all electrical power to dispenser being modified.
- ❑ Remove both Upper Column Covers above the nozzle holsters.
- ❑ Remove the Lower Column Cover below the nozzle holster on the "A" side of the dispenser. This is the side that the 1" vapor tube runs vertical from the 1" tee connected to the upper vapor manifold to the elbow attached to the vapor tee mounted at the base of the dispenser see photo F.
- ❑ Remove the Upper Cladding covering the "J" Box see photo E.
- ❑ Remove the "J" Box cover.
- ❑ Remove the Door Cladding assembly and the Access Door assembly in order to expose the electronics compartment.



**7. SURVEY – Scope of Work: *Perform this step before beginning steps 8 thru 12.***

Read and familiarize yourself with the theory of operations sheet and wiring instructions for the VP1000 Vapor Pump. The installation of the pump is on the sheet metal shelf over the junction box, with the pump cover facing the “A” side of the dispenser, see photo E. This is the side that the 1” vapor tube runs vertical from the 1” elbow connected to the upper vapor manifold to the vapor tee mounted at the base of the dispenser, see photo F. From this survey, you will have an indication of where the vapor plumbing fittings need to go and where the holes need to be drilled in the adjoining sheet metal to allow the vapor pipes from the pump to pass through to the hydraulics compartment. Notice also in the electrical junction box, the plug washers on the left side of the box that you will remove to run the pump wires down to the Healy potted conduit nipple. The Healy potted conduit nipple is installed in another sealed opening in the bottom of the J-box. See Section 11.

**CAUTION: ALL POWER TO DISPENSER UNDER MODIFICATION SHOULD BE COMPLETELY DISCONNECTED AND CAPPED OFF AT JUNCTION BOX TO AVOID UNINTENTIONAL FEEDBACK FROM OTHER DISPENSERS!!**



**Photo E**



**Photo F**

## 8. BALANCE REMOVAL:

**NOTICE:** BEFORE REMOVING THE 1" VAPOR DOWN PIPE, BE SURE TO CLOSE THE IMPACT VALVES ON BOTH THE PRODUCT AND VAPOR RETURN LINE (IF CONNECTED). DISCONNECTING THE PRODUCT LINE IN FRONT OF THE VAPOR DOWN PIPE WILL EASE REMOVAL OF THE PIPE – BE SURE TO USE PETROLEUM 'DIAPERS' TO CATCH ANY FUEL THAT MAY BE SPILLED AS THE CONNECTIONS ARE BROKEN.

- ❑ Disconnect the two unions on the product pipe on both sides of the spin-on filter, see photo F. This will ease the removal of the vapor pipe.
- ❑ With the product filter removed, disconnect the vapor pipe from the 1" elbow that's attached to the vapor tee. Unbolt the tee from the bottom of the dispenser frame in order to remove the vapor pipe from the elbow.
- ❑ Swivel the pipe out from the cabinet far enough to allow turning it out of the tee at the top of the dispenser and discard the pipe.
- ❑ Bolt the tee back in the bottom frame and install a 1" x 1/2" NPT reducing bushing and a 1/2" NPT x 5/8" flare straight fitting.
- ❑ Reconnect the product plumbing.

## WARNING

**This retrofit kit requires drilling in a Hazardous Location. Insure that all power to the dispenser has been turned off. Open all access doors for increased airflow. Use only sharp drill bits; dull bits may generate excessive heat. Use air powered drill at low RPM's. If an electric drill is used, a suitable UL Listed Gas Detector must be used to ensure the area is below 25% of the Lower Explosive Limit. Do not drill if gasoline odors are present.**

**If drilling in the electronics cabinet, carefully collect and remove all metal shavings that may be inside the cabinet. Failure to remove the shavings could result in an electrical shock hazard. Before drilling, check to ensure that no wires or fluid containing parts (i.e. product tubing) is located on the backside or near the chuck of the drill.**

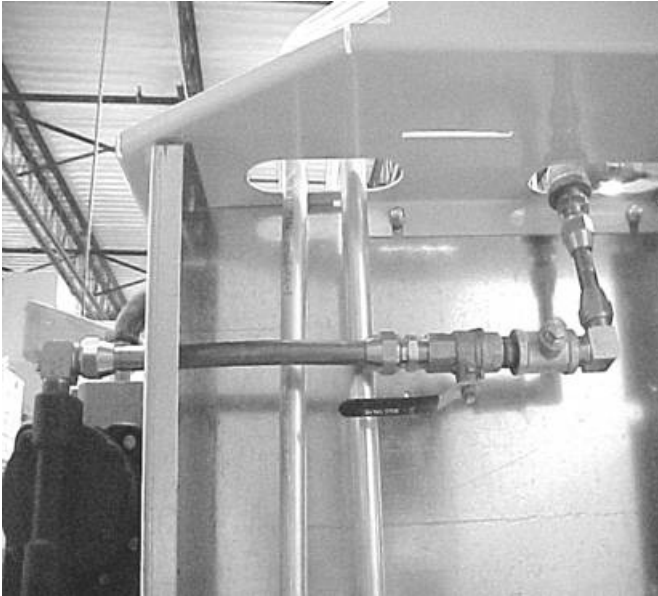
## 9. INSTALLING THE HEALY VP1000 SYSTEM:

**NOTICE:** WHEN DRILLING HOLES, ASSURE THAT THERE ARE NO HAZARDOUS VAPORS PRESENT AND DO NOT ALLOW CHIPS TO FALL DOWN INTO THE HYDRAULICS AREA.

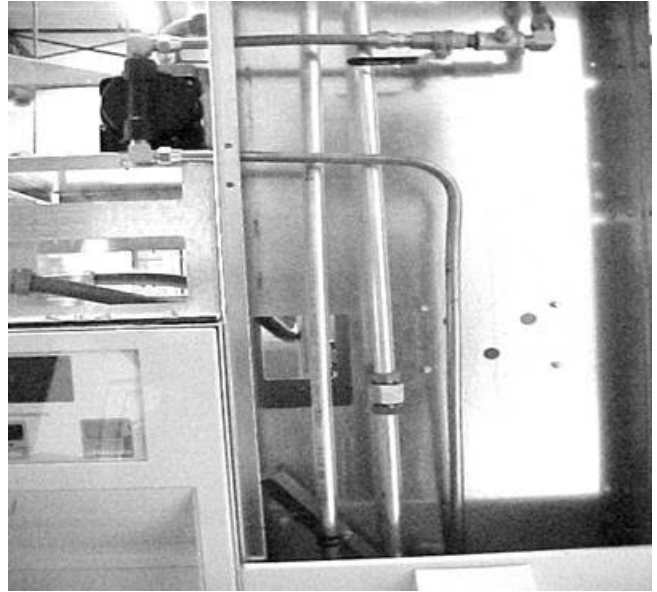
- ❑ In order to get the vapor tubing from the pump into the vapor plumbing area, it is necessary to drill or punch two 1-1/8" holes on the sheet metal column near the edge of the shelf, see photo E. Use a tape measure and mark the centerline of the holes to be 1-1/4" in from the front edge of the sheet metal column. Measure down from the top of the column 5-1/2" and mark on the 1-1/4" centerline, measure down an additional 6-3/4" and mark on the centerline. These marks are the centers of the holes for the vapor pipes going to the VP1000. DO NOT DRILL – verify positions in the next steps.
- ❑ Get the vapor pump and install a 1/2" NPT x 5/8" flare elbow fitting into the 'IN' and 'OUT' ports using tape, not pipe dope. Looking at the face of the pump, completely tighten both fittings so they are facing the right.
- ❑ Position the pump on top of the sheet metal shelf over the electrical junction box on top of the electronics cabinet, with the fittings pointing toward the hydraulics cabinet and overhanging the edge of the shelf about 1/4".
- ❑ Slide the pump to fit against the hydraulics cabinet and position so as to allow for matching the location of holes that need to be drilled through the sheet metal.
- ❑ Satisfied that the fittings and hole marks line up, remove the pump and drill the two, 1-1/8" holes, marked above.
- ❑ Position the pump assembly on top of the sheet metal shelf and slide over so that the ports are accessible from the hydraulics area.

## 10. CONNECTING VAPOR LINES: (See Photos F, G & H)

- ❑ Make connections below using pipe thread compound as required.
- ❑ Install a 1" x 1/2" NPT reducing bushing in the top vapor line manifold tee where the 1" down pipe was removed see photo G.
- ❑ Install a 1/2" NPT x 5/8" flair straight fitting into the above.



**Photo G**

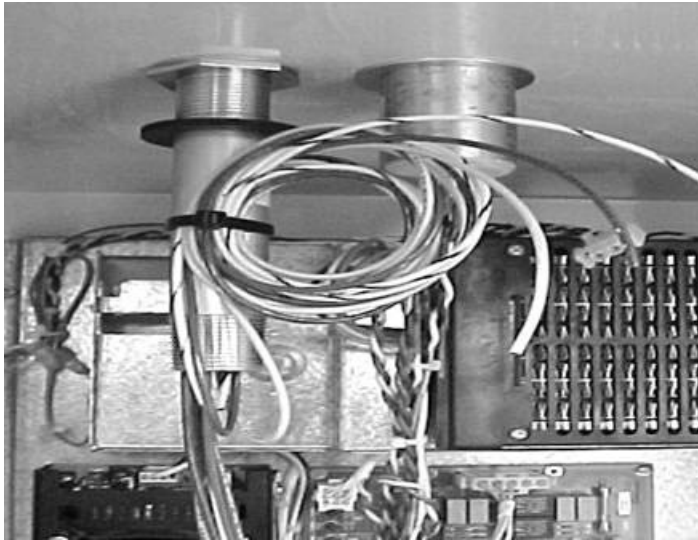


**Photo H**

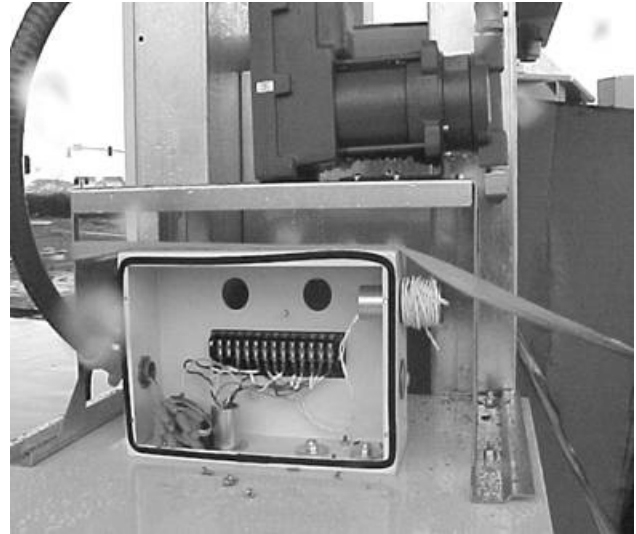
- ❑ Make up the following assembly, see photo G. Note: The ball valve handle closes toward you. Install a 1/2" NPT x 5/8" flare straight fitting to the left side of the ball valve, install the 1/2" close nipple to the right side then the 1/2" reducing tee and the 1/2" NPT x 5/8" flare elbow – completely tighten the tee with the 1/4" branch facing up and the elbow also facing up, install the 1/4" pipe plug into the branch.
- ❑ Make up a piece of 5/8" OD copper tube that will go from the flare elbow on the inlet of the VAC pump, through the upper 1-1/8" hole in the column to the straight flare fitting on the ball valve assembly so that when installed and secured, positions the flare elbow on the ball valve assembly in a straight line with the straight flare fitting that's attached to the 1" tee of the upper vapor manifold. Install and tighten with the ball valve assembly in position as shown in photo G.
- ❑ Make up a piece of 5/8" tube to connect the flare elbow on the ball valve assembly to the straight flare fitting that's attached to the 1" tee of the upper vapor manifold. This piece should be made so that when installed the ball valve assembly and tubing should be horizontal or slightly pitched toward the pump to avoid liquid traps. Install and tighten.
- ❑ Mark the location of the mounting bolt holes from the VAC pump base on the shelf, unscrew the flare nut on the inlet and move the VAC pump out of the way. Drill two 5/16" holes (one on each side of the bracket) required for mounting the pump.
- ❑ Reposition the VAC pump and reconnect the flare nut to the inlet port, then install the two 1/4-20 bolts, washers, lock washers and nuts to secure the pump.
- ❑ Measure and cut appropriate length of 5/8" tubing to reach from the 5/8" flare elbow on the outlet of the VAC pump, through the lower 1-1/8" hole in the column to the 5/8" flare straight fitting installed in the 1" elbow at the base of the dispenser, using a 90 degree bend, see photo H.
- ❑ Install and tighten making sure the horizontal portion of the tube attached to the outlet is either horizontal or slightly pitched downward away from the pump to avoid liquid traps.

## 11. INSTALLING THE SEALED NIPPLE ASSEMBLY: (See Photos I & J)

**NOTICE:** THE INTERFACE MODULE THAT IS SUPPLIED HAS A HARNESS ATTACHED AND A WIRING PLUG FOR THE AC CONNECTIONS. ALSO SUPPLIED IS THE SEALED NIPPLE ASSEMBLY (1346) THAT MUST BE USED BETWEEN THE DIVISION 1 AREA (THE ELECTRONICS COMPARTMENT) AND THE DIVISION 2 AREA (THE SPACE ABOVE AND OUTSIDE THE ELECTRONICS COMPARTMENT).



**Photo I**



**Photo J**

- ❑ Remove the bolts and washers that seal the access hole on the bottom left side of the “J” box.
- ❑ Get the 1346 sealed nipple assembly and carefully remove the first nut and washer over the wires. Thread these wires from inside the electronics compartment, up through the bottom hole uncovered above. Carefully replace the washer and nut over the wires and secure the unit into the box.
- ❑ At the VP1000, get and install the 1/2” male x 3/4” female adaptor over the wires coming from the motor. Do not use pipe dope on these fittings and be sure there is at least five full threads of engagement of the fittings in their respective couplings.
- ❑ Remove the nut from one of the 3/4” elbow connectors, thread the pump wires through the elbow and screw the threaded end with the “O” ring into the 1/2” male X 3/4” female adaptor.
- ❑ Thread the wires through the 30” piece of non-Oetallic electrical tubing and then twist the tubing onto the elbow on the motor until the rubber washer is compressed.
- ❑ Get the other elbow connector, remove only the nut (leave the o-ring in place) then thread the motor wires through the elbow and screw the fitting into the 3/4” tubing. Use care not to twist the wires.
- ❑ Thread the wires into the electrical junction box, pull up tightly and secure the fitting to the box using the nut removed above.
- ❑ In the “J” box, leave about 6” of wire on both the wires coming from the motor and from the sealed nipple, cut off excess wire and strip approximately 1/2” of insulation from all wires.

- ❑ Use wire nuts to join the wires, color for color, together. There may be some extra wires in some sealed nipples, cap these off and dress aside.
- ❑ Keep wires clear of pinch points and from interference, make sure no wires overhang the door openings.
- ❑ Replace the cover on the junction box.

**12. WIRING INSIDE THE ELECTRONICS COMPARTMENT: (SEE PHOTOS K, L, M & N)**

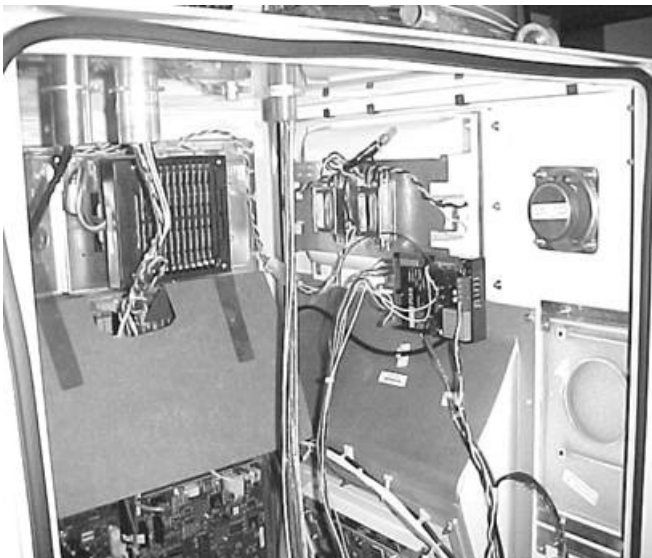


**Photo K**

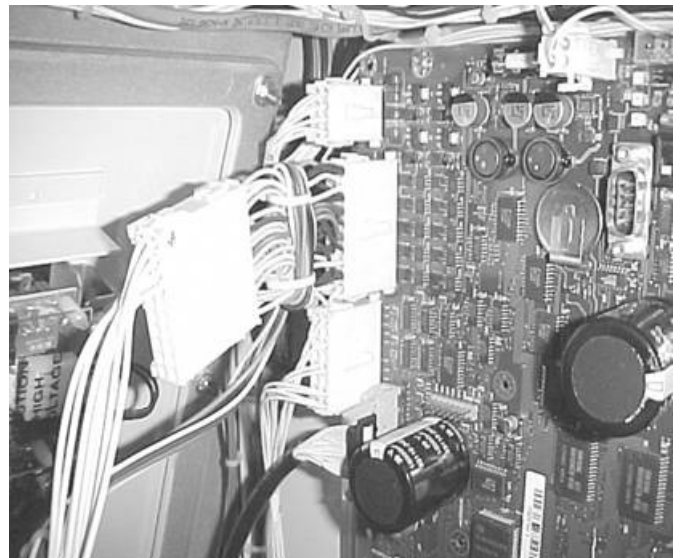


**Photo L**

- ❑ In the electronics bay, locate the light assembly on the upper right side of the cabinet, see photo K. In photo L, notice the 3/16" hole that must be made to accept the module mounting screw. Punch this hole approximately as shown. If drilling, be sure no hazardous vapors are present and use a coffee cup or other suitable container to prevent metal chips from falling inside the cabinet.



**Photo M**



**Photo N**

- ❑ Leave the wires coming from the sealed nipple assembly at least six inches longer than necessary to reach the bottom of the compartment. Cut off excess and strip all wires 1/2".
- ❑ Connect the wires from the sealed nipple to the interface module as follows:
  - Black wire to 'motor ' on module
  - White wire to 'neutral' on module
  - Red wire (either) to 'output 1' on module
  - Red wire (other) to 'output 2' on module
  - Orange wire to 'fault common' on module
  - Purple wire to 'fault input' on module
  - Green wire needs a #8 ring tong lug installed and connected to any chassis ground (frame)
  - Some sealed nipples may have some extra wires, cap these and bundle them neatly out of the way.
- ❑ The black and white twisted pair of wires with a connector should be connected to an available AC outlet on the dispenser Relay Board #887225.
- ❑ The male/female multiconductor cable that is wired to the interface module is routed up to the computer board # 173976 (See Photo N). Disconnect the valves cable that's in the J3 connector and install in the female side of the double connector on the harness. The entire assembly is then installed back into J3 on the Computer board. WIRING IS COMPLETE.
- ❑ Mount the interface module as shown in Photo M using the 8-32 x 5/8" screw, washer and nut supplied in the electrical kit.
- ❑ Install the following labels supplied:
  - NOTICE label for current increase (1405), install on the frame rail near the existing power consumption label.
  - Large NOTICE label (1406) relating to the vapor recovery upgrade and how to reset the electronic module should be installed near the module, where it will be readily visible to a service technician on the junction box cover.
  - UL, retrofit kit identification number (1410), install on the electronic module.

### **13. CONNECTING HEALY SYSTEMS DISPENSING EQUIPMENT**

- ❑ Completing the connection of Healy Systems dispensing equipment requires the installation of Healy Systems Phase II dispenser adaptors, hoses and nozzles (Hanging Hardware).
- ❑ If applicable, remove existing non-Healy hanging hardware (from the dispenser product outlet adaptor to and including the nozzles).
- ❑ Vapor ready dispensers will require a Healy Systems adaptor to make the hose threads compatible with other Healy Systems equipment. Install following instructions packed with the adaptor. Various adaptors and pigtails are available, depending on how the dispenser is configured: M34 metric (Healy designation F3 or S3) or balance ready (Healy designation S4).

- ❑ Healy Vapor Recovery Hoses are available in various lengths to satisfy local ordinances and still provide “far side” fueling capability. Install these following instructions contained on the shipping box.
- ❑ Breakaways are required: Install either Model 8701-VV breakaway or Model 807 swivel breakaway; install using the instructions supplied with the unit.
- ❑ The Healy Systems nozzle Model 900 (EVR) is the only nozzle necessary to complete the upgrade. Check to be sure the nozzle hanger is mounted in the highest position. Be sure to check for proper fit in the nozzle holster and that the nozzle can be locked in the off position. Also, be sure that when the nozzle is locked, that the dispenser can not be activated from the locked position.

#### 14. VP1000 THEORY OF OPERATION

The Healy Systems VP1000 is a self-contained rotary vane pump, designed for gasoline vapor recovery utilizing various parts of the Healy System Vapor Recovery product line. It is intended for use by either OEM dispenser/pump manufacturers or as an after market add-on to make existing equipment compatible with Healy System technology. In order to convert to ‘others’ equipment, an electronic interface is required to adapt the targeted pump/dispenser to the new vapor recovery equipment. The interface senses when authorization to dispense has been given and sends signals to the motor to operate at a low speed for one hose, or a higher speed for two hoses. It also functions to shut off the pump/dispenser if it senses that the vapor pump is not operating properly. The vacuum is regulated at a level sufficient to clear liquid gasoline from the vapor path in MPD applications. The actual amount of vapors withdrawn is controlled by the Healy nozzle, itself, in response to the liquid gasoline flow rate.

#### MOTOR SPECIFICATIONS

Horsepower	1/8
Voltage	120VAC

#### INTERFACE SPECIFICATIONS

Input voltage	120 VAC
Relay current capacity	5AAC
Input signals	AC and DC voltages up to 130 VAC max
Motor Input signal	5 VDC @ 20 Hz 50% Duty Cycle



## 15. TESTING THE SYSTEM:

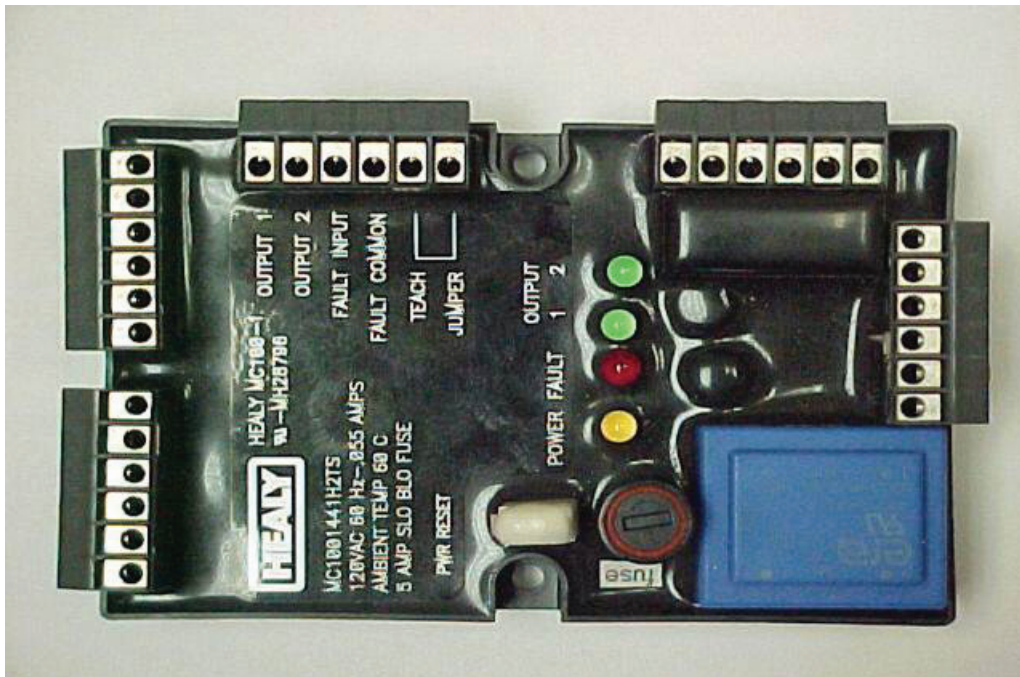
- Carefully review all work completed, being sure all mechanical joints are thoroughly tightened and electrical connections sealed.
- Open the product crash valves and restore power to the dispenser.
- With the power on, but no nozzles authorized, the VP1000 should not be running (unless the ambient temperature is below 40°F), but the power LED (yellow) should be energized on the interface module.
- Authorize one handle and the vacuum system should activate when the gasoline flow control valve is engaged. Repeat for all other nozzles, individually testing each nozzle on each side of dispenser. With each authorization, one of the green LED's on the interface module should illuminate and the VP1000 activate.
- Note: For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the same LED activates for all grades on the same side. If the other LED activates, wiring needs to be corrected.
- Authorize one nozzle and listen to the speed of the VP1000. With only one nozzle activated, the speed will be slower than if a nozzle on each side is activated. Activate a nozzle on the other side of the dispenser and listen for the speed to change.
- To test the tightness of the vapor plumbing installed on the suction side of the system requires a 0-100" water column gauge. Connect the gauge into the 1/4" test port of the reducing tee installed earlier in section 10 Photo G. Continue by following and completing the START-UP / NEW INSTALLATION / WARRANTY / ANNUAL TESTING FORM.

## 16. TROUBLESHOOTING THE VP1000:

- Use extreme care and caution when performing the tests listed below. If 120 VAC is accidentally applied to the fault or DC terminals, the module will be destroyed.
- With power applied to the dispenser, but no products authorized, there should be 120 VAC between neutral and 120 VAC on the module terminal strip.
- As above, with any product authorized, there should be single speed power applied to the VP1000. Verify this by checking for 2-3 VDC from OUTPUT 1 (RED WIRE) to FAULT COMMON (ORANGE WIRE), (or from OUTPUT 2 TO FAULT COMMON) also; one GREEN LED should be illuminated. With a second product authorized on the opposite side of the dispenser i.e. one product on each side, the motor should operate at higher speed and there should be 2-3 VDC on both output 1 and 2 (to fault common) and both GREEN LED's should be illuminated.
- With the pump running, a fault can be simulated by shorting, with a jumper wire, the "FAULT INPUT" (purple wire) to FAULT COMMON (orange). This should cause the motor to shut off, the solenoid valves to lose power and the dispenser to shut down. Also, as long as the short is maintained, the red LED will be illuminated. Removing the short will not automatically reset the module. To reset the module, remove the short, remove power to the dispenser for twenty seconds and restore power. The module should now be reset and the red led extinguished. This can also be accomplished by using the power reset (PWR RESET) on the module.

- If diagnosing a problem where the LED is already illuminated, a steady light indicates a low current condition, therefore expect a vane or rotor problem. If the LED is blinking, that indicates a high current condition and would expect to find a jammed rotor or vapor line flooded with product. See Start-up / New Installation / Warranty / Annual Testing Form.
- The electronics of the motor will make three attempts to have a successful start of the motor. If it detects a problem, on the fourth unsuccessful start, it will short the fault line to signal minus (DC-) and shut down the electronics.

### MC 100 Interface Module



## 17. VP1000 VANE & ROTOR SERVICE & REPLACEMENT GUIDE

**Caution**  **Disconnect power before beginning service.**

1. The work area **must** be clean and have sufficient lighting.
2. Disconnect the vapor piping connected to the **IN** and **OUT** ports of the VP1000 cover assembly.
3. Remove the four Allen head screws and lock washers that secure the pump cover assembly to the pump housing and remove the cover carefully.

**Caution**  **Use a spill cloth when removing the cover, as there may be some gasoline inside the pump cavity.**

4. Carefully turn the rotor assembly by hand until the shaft key notch is at the 12 o'clock position. (See Figures)
5. Remove the rotor, vanes and shaft key from the pump housing.

**Note:** Place your hand or a container under the rotor while removing. Do not use any sharp objects that would scratch the surfaces of the pump cavity, pump shaft, rotor, or vanes.

6. Rotate the shaft by hand. If the shaft does not rotate freely, the entire vacuum pump needs replacement (p/n VP1000-5 or RVP1000-5).
7. If the rotor and vanes are cracked, chipped, excessively worn or excessively dirty, the rotor and vanes should be replaced because cleaning will not remedy these conditions (p/n VP1000VRC-G, VP1000VRC-P or VP1000VRC).
8. If there is no visible damage, use a lint-free cloth with isopropyl alcohol to clean the rotor and vanes.
9. Using a lint-free cloth with isopropyl alcohol, thoroughly clean: the inside of the pump ring and rear of the pump cavity, the rotor shaft, and the inside of the pump cover.
10. Reposition the shaft (if necessary) so that the shaft key notch is in the 12 o'clock position. Install the cleaned original or new shaft key onto the shaft.
11. Carefully install the cleaned original or new rotor onto the shaft followed by the cleaned original or new vanes into the rotor.

**Note:** The rotor assembly should slide on to the shaft easily, without excessive force. (Rotors and vanes are reversible)

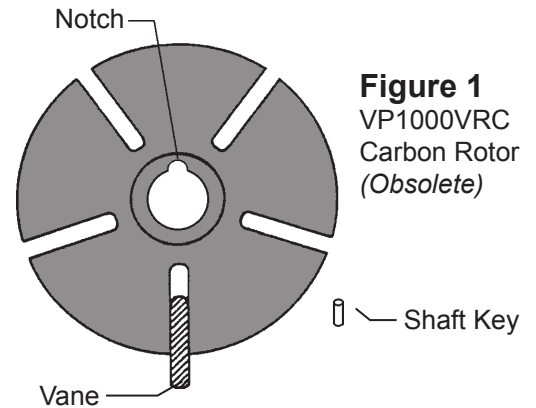
12. Lightly lubricate and install the new O-Ring for the pump housing.

**Note:** Do not allow any lubricant to get inside the pump housing.

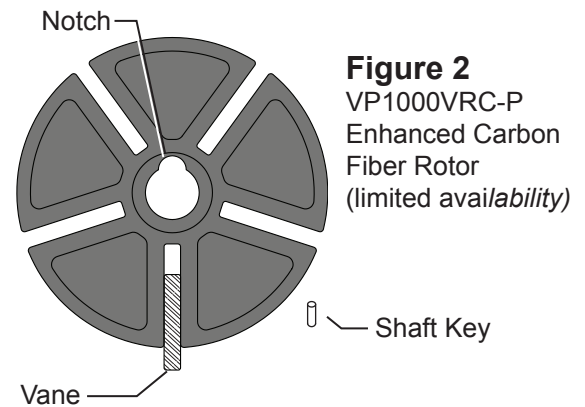
13. Install the pump cover using the four Allen head screws and lock washers removed in step 3 and cross tighten.

**Note:** Use caution when sliding the pump cover over the O-Ring seal to prevent cutting or tearing.

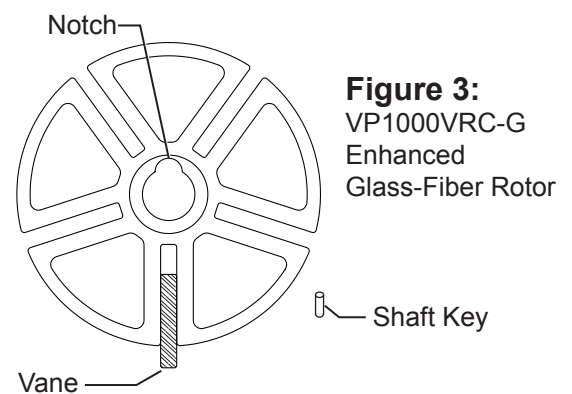
14. Re-connect the vapor piping to the **IN** and **OUT** ports of the pump cover assembly that was removed in Step 2.
15. Re-apply power. Test for normal operation. (See VP1000 Vacuum Performance Test Procedure)



**Figure 1**  
VP1000VRC  
Carbon Rotor  
(Obsolete)



**Figure 2**  
VP1000VRC-P  
Enhanced Carbon  
Fiber Rotor  
(limited availability)



**Figure 3:**  
VP1000VRC-G  
Enhanced  
Glass-Fiber Rotor

START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections 3, 4, 5 and 6 of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

SERVICE COMPANY NAME	TELEPHONE	
SERVICE TECHNICIAN	HEALY TECH CERT #	
STATION ADDRESS	CITY	STATE
DISPENSER MAKE	VACUUM PUMP SERIAL #	

## SIDE A

DISPENSER EQUIPMENT CHECKLIST - Parts A-1 and A-2	YES	NO*
<b>A-1</b> Is all the installed dispenser hanging hardware listed in Exhibit 1 of Executive Order VR-201 or VR-202?	<input type="checkbox"/>	<input type="checkbox"/>
<b>A-2</b> Proper installation of the VP1000 requires the test port and ball valve on the inlet side of the vacuum pump. Are the test port and ball valve installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
<b>*If the answer to either A-1 or A-2 is NO, the Healy Warranty is Void.</b>		

### A-3

- THE FOLLOWING TEST WILL PERFORM A POSITIVE PRESSURE LEAK CHECK OF THE VACUUM PUMP, DISPENSER VAPOR PIPING, HANGING HARDWARE AND ALL NOZZLES ON BOTH SIDES OF THE DISPENSER.
- THE VP1000 OUTLET IS NOT CONNECTED TO UNDERGROUND PIPING DURING THIS TEST.

**CAUTION: REGULATE GASEOUS NITROGEN TO 2.5 PSI (~70" WC) MAXIMUM BEFORE TESTING**

1. Install a 0-100 inch water column (" wc) mechanical gauge at the VP1000 test port.
2. Use the water column gage positive (high) pressure port.
3. Gaseous nitrogen gas can now be connected to the outlet (exhaust) port of the VP1000.
4. Test pressure **cannot** exceed 70" wc.
5. **Slowly** introduce the gaseous nitrogen to a pressure between 60 – 70" wc.
6. After reaching the pressure range, close the valve supplying the gaseous nitrogen.
7. Record the initial pressure reading on the gauge - observe and record the final pressure reading after 60 seconds.
8. Leaks must be repaired when the pressure falls more than 4" wc in 60 seconds.
9. Retest until all leaks have been repaired.
10. Record test results in Section A-4.

<p><b>A-4</b></p> <p style="text-align: center;"><b>PRESSURE TEST</b></p> <p style="text-align: center;"><b>2.5 PSI (~70"wc) Maximum</b></p>	<p><b>Initial Pressure test reading ("wc)</b></p>	<p><b>Pressure test reading after 60 seconds ("wc)</b></p>
--	---	--

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations – complete SIDE A and sections 3, 4, 5 and 6 of SIDE B. Submit forms to Healy Systems.**
- **Warranty Service or Annual Testing – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on SIDE A and conduct the appropriate tests specified on SIDE B. Submit Forms to Healy Systems.**

<b>SIDE B</b>			
<i>Warranty Service</i> Complete Troubleshooting Sections <b>B-1 and B-2</b>		<i>Start-up/ New Installations/ Annual Testing</i> Complete Sections <b>B-3 through B-6</b>	
<b>B-1</b>	<p><b>Control Module Fault Light</b> (Circle one)                      <b>Flashing (LED)</b>                      <b>Steady (LED)</b></p> <p>1. All fault conditions require removal and cleaning or replacement of the rotor and vanes located inside the vacuum pumps round front cover assembly. Use the <b>VP1000 ROTOR &amp; VANE SERVICE AND REPLACEMENT GUIDE</b> in the applicable dispenser retrofit manual of the ARB Approved Installation, Operation and Maintenance Manual for Executive Orders VR-201-O and VR-202-O.</p> <p>2. Clean all surfaces including vanes, rotor, rotor housing and cover assembly.</p> <p>3. Manually spin and inspect the motor shaft for bearing wear before re-installing the rotor kit.</p> <p>4. Replace motor when bearings or shaft are damaged or worn.</p> <p>5. Check O-ring seal before replacing rotor cover assembly.</p>		
<b>B-2</b>	<p>Re-Assemble / Reset Vacuum Pump and Module. (Power must be removed from both the vacuum pump and the <b>module for 20 seconds to reset the system</b>) using the power reset switch on the MC100 module.</p>		
Dispenser Vapor Line Integrity Test	<p><b>B-3</b></p> <p>1. Install 0-100 inch water column (“ wc) vacuum mechanical gauge at the VP1000 test port.</p> <p>2. Authorize the dispenser for fueling. The VP1000 will begin to run.</p> <p>3. Close the ball valve at the pump inlet.</p> <p>4. Record the initial vacuum reading on the gauge – observe and record the final vacuum reading after 60 seconds.</p> <p>5. Open the ball valve at the pump inlet.</p> <p>6. Leaks must be repaired when the vacuum reading falls more than 4” wc in 60 seconds.</p> <p>7. Retest until all leaks have been repaired.</p> <p>8. Record data in Section B-4.</p> <p><b>Note: If the initial vacuum reading is less than 60” wc, it could indicate a problem with the VP1000. Remove the dispenser from service. Use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-4</b>	VACUUM TEST Using VP1000 as vacuum source	Initial Vacuum test reading (“ wc)	Vacuum test reading after 60 sec. (“ wc)
Dispenser Vacuum Test	<p><b>B-5</b></p> <p>With one side of the dispenser authorized (VP1000 running) and the ball valve at the pump inlet open, dispense in handheld position a minimum of 0.5 gallons of fuel into a vehicle or test tank. Record the vacuum level while dispensing. Repeat test for the other side of the dispenser.</p> <p>1. Side “A” Dispensing Vacuum _____” wc</p> <p>2. Side “B” Dispensing Vacuum _____” wc</p> <p><b>Note: If the dispensing vacuum is less than 60” wc, remove the dispenser from service. See the troubleshooting section of the manual or contact FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
Audible Increase Test	<p><b>B-6</b></p> <p>Test the VP1000 Vacuum Pump for normal operation. Use the 6 step procedure titled, “Testing the VP1000 Vacuum Pump for normal operation using the following test procedure:” in Section 1.1 (Weekly Inspection and Testing) of the Healy Systems Scheduled Maintenance document in the ARB Approved Installation, Operation and Maintenance Manual for the Healy Phase II EVR System not Including ISD. This is to verify that the pump recognizes when both sides of the dispenser are activated for fueling.</p> <p>Does the VP1000 Vacuum Pump change speeds (audible increase) when both sides are activated for fueling?</p> <p style="text-align: center;">Yes No</p> <p>If the answer is no, <b>use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
Repairs - Comments	<p>To Obtain Returned Materials Authorization number (RMA#) Call 800-984-6266 Forms can be faxed to Franklin Fueling Systems Customer Service at 800-225-9787</p>		

Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



**WAYNE-DRESSER HARMONY™ SERIES DISPENSER RETROFIT for  
HEALY SYSTEMS, INC.  
MODEL VP1000  
VAPOR RECOVERY ASSIST SYSTEM  
(KIT Z080)**

**OUTLINE**

**NOTICE: USE THIS PROCEDURE IF CONVERTING A WAYNE-VAC™ VAPOR RECOVERY ASSIST SYSTEM TO A HEALY VAPOR RECOVERY ASSIST SYSTEM**

This Manual is to be used for new, replaced, retrofitted, or reconditioned dispensers/pumps.

**See Healy Systems Kit Z078 For Dispensers With Balance Systems**

- 1. Purpose**
  - 2. Safety**
  - 3. Models Covered**
  - 4. Parts Lists**
  - 5. Tools Required**
  - 6. Dispenser Access**
  - 7. Survey Scope Of Work**
  - 8. Wayne-VAC Removal**
  - 9. Installing The Healy VP1000 System**
  - 10. Connecting Vapor Lines**
  - 11. Installing The Sealed Nipple Assembly**
  - 12. Wiring Inside The Electronics Compartment**
  - 13. Connecting Healy Systems Dispensing Equipment**
  - 14. VP1000 Theory Of Operation**
  - 15. Testing The System**
  - 16. Trouble Shooting The VP1000**
  - 17. VP1000 Vane & Rotor Service & Replacement Guide**
- Start-up / New Installation / Warranty / Annual Testing Form**

## 1. PURPOSE:

This procedure describes the tools, methods and skill levels required to install a Healy Systems, Inc. Model VP1000 Vapor Recovery pump in vapor ready Wayne Dresser Harmony™ series gasoline dispensers. Only Healy trained and certified contractors will be able to perform these retrofits or warranty will be void. The installer shall be a skilled petroleum technician and thoroughly familiar with the requirements of State, Federal and local codes for installation and repair of gasoline dispensing equipment. Also, they shall be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation. NOTE: All electrical and hydraulic plumbing fittings referred to in these instructions must be UL “listed” or “recognized” for the purpose.

**Note:** Installations of vapor piping into the inlet side of the vacuum pump should be sloped such that the natural flow direction is toward the vacuum pump. However, it is permissible to have a piping slope tilted away from the vacuum pump provided that all other applicable tests (Dispenser integrity and V/L) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

**Note:** For installations with In-Station Diagnostics (ISD), the vapor flow meter shall be installed on the down stream side of the vacuum pump. Every effort shall be made to install the vapor flow meter so that vapor piping between the vacuum pump and the vapor flow meter is sloped such that the natural flow direction is toward the vapor flow meter. However, it is permissible to have the piping slope away from the vapor flow meter provided that all other applicable tests (Dispenser integrity, V/L and ISD Operability) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

## 2. SAFETY:

Before installing the equipment, read, understand and follow:

- The National Electrical Code (NFPA 70)
- The Automotive and Marine Service Code (NFPA 30A)
- Any national, state and local codes that may apply.

The failure to install the equipment in accordance with NFPA 30A and 70 may adversely affect the safe use and operation of the system.

Accurate, sound installations reduce service calls: Use experienced, licensed contractors that practice accurate, safe installation techniques. Careful installation provides a sound troubleshooting framework for field repairs and can eliminate potential problems.

1. Read all instructions before beginning.
2. Follow all safety precautions:
  - ❑ Barricade the area.
  - ❑ Do not allow vehicles or unauthorized people in the area.
  - ❑ Do not smoke or allow open flames in the area.
  - ❑ Do not use power tools in the work area.
  - ❑ Wear eye protection during installation.



3. Use circuit breakers for multiple disconnects to turn off power and prevent feedback from other dispensers.

### 3. MODELS COVERED:

Wayne-Dresser Harmony™ series dispensers, all options except suffix “O”, non vapor ready and Balance systems. The addition of the Healy Systems VP1000 to the Harmony dispenser will increase the current draw of the dispenser by 2 amps. Use the label supplied to note this change.

### 4. PARTS LISTS: (See Photo A)

- 1 VP1000 Vacuum Pump
- 1 1365A Wire Harness / MC100 Series Interface Module Assembly

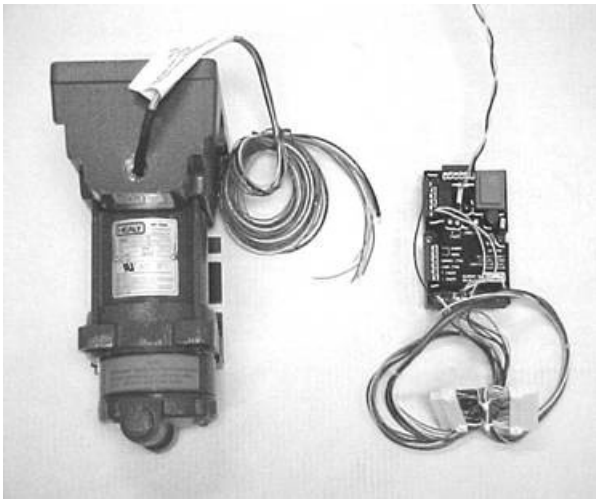


Photo A

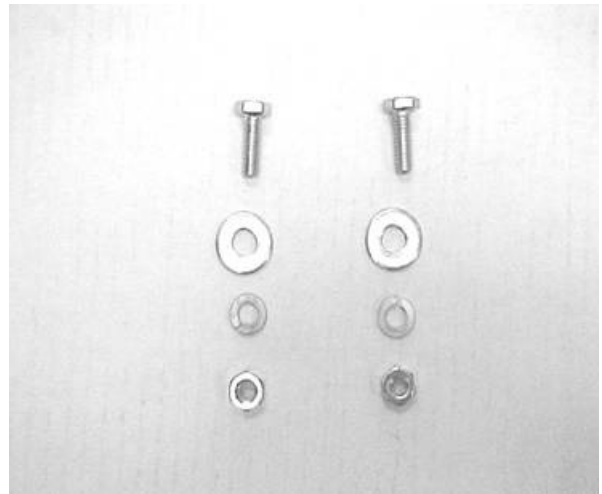


Photo B



Photo C



Photo D

### HARDWARE KIT Z080H: (See Photo B)

- 2 1/4-20 bolts, washers, lock washers and nuts

### **ELECTRICAL KIT Z080E: (See Photo C)**

- 4 4" Tyraps
- 1 Current change label (p/n 1405)
- 7 Wire nuts
- 1 8-32 x 3/4" machine screw, washer & nut
- 1 1/2" male NPT x 3/4" female NPT electrical reducer fitting
- 1 #1346 potted conduit nipple
- 1 #8 Ring tong terminal
- 1 Notice label (p/n 1406)
- 1 UL Listed label (p/n 1410)

### **VAPOR KIT Z080V: (See Photo D)**

- 2 3/8" NPT x 5/8" flare straight fittings
- 3 1/2" NPT x 5/8" flare elbow fittings
- 1 1/2" NPT x 5/8" flare straight fitting
- 3 3/4" NPT x 5/8" flare straight fittings
- 1 5/8" x 5/8" x 5/8" flare tee
- 12' 5/8" OD copper tube, type 'L'
- 1 1/4" pipe plug
- 1 3/8" pipe plug
- 1 1/2" close nipple
- 1 1/2" x 1/4" x 1/2" reducing tee
- 1 1/2" ball valve
- 1 3/4" elbow
- 12 5/8" flare nuts

### **MATERIALS SUPPLIED BY INSTALLER:**

- Thread Sealing Compound – non-Setting, UL Classified for use on all tapered thread, Non-electrical, plumbing fittings.
- Oil and gasoline compatible PTFE tape

## 5. TOOLS REQUIRED:

- ❑ 1/2" or 3/8" ratchet set w/ sockets 1/4" through 9/16" + 3" extension
- ❑ 9" lineman's pliers
- ❑ Assorted open end wrenches 1/4" through 3/4"
- ❑ Wire cutters/strippers 18 AWG and 26 AWG
- ❑ 1-1/8" greenlee type sheet metal punch
- ❑ Mechanical hand drill (egg-beater type)
- ❑ Assorted drill bits 1/16" through 7/16"
- ❑ Assorted screwdrivers (flat blade-one must be 1/8" wide and Phillips)
- ❑ 5/8" copper tube bending tool
- ❑ 5/8" copper tube flaring tool
- ❑ Copper tubing cutter
- ❑ Electrical multi-Oeter
- ❑ Small hand brush (1-1/2" thick, for clearing chips)
- ❑ 12" adjustable wrench
- ❑ 10" pipe wrench
- ❑ Tape measure
- ❑ Allen wrenches
- ❑ #20 torx bit
- ❑ Whitney type hand sheet metal punch with 3/16" punch and die set

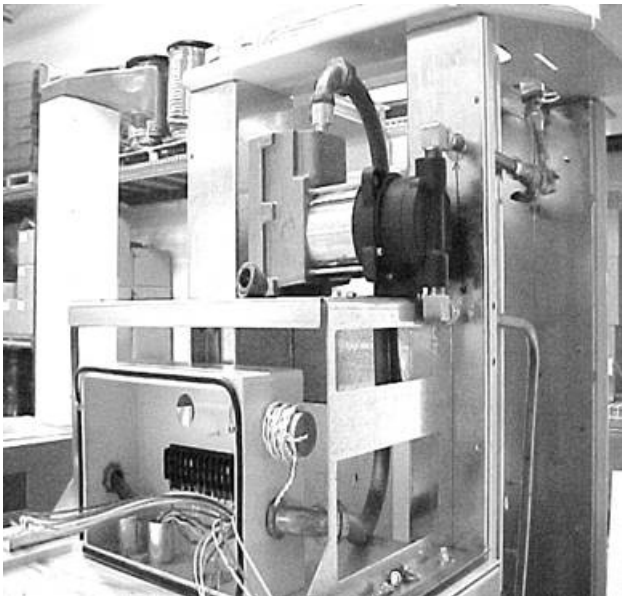
## 6. DISPENSER ACCESS:

- ❑ Secure Dispenser Access keys from Station Management.
- ❑ Lock-out and tag-out all electrical power to dispenser being modified.
- ❑ Remove the Top Cladding and Upper Shield in order to expose upper vapor tubing attached to the outlet castings.
- ❑ Remove both Upper Column Covers above nozzle holsters in order to expose Wayne-VAC™ vacuum pumps.
- ❑ Remove the Lower Column Cover below the nozzle holster on the "A" side of the dispenser. This is the side that the vapor tubes from the out port of the Wayne-VAC™ vacuum pumps are connected to a vapor tee mounted at the base of the dispenser, see photo F.
- ❑ Remove the Upper Cladding covering the "J" Box, see photo E.
- ❑ Remove the "J" Box cover.
- ❑ Remove the Door Cladding assembly and the Access Door assembly in order to expose the electronics compartment.

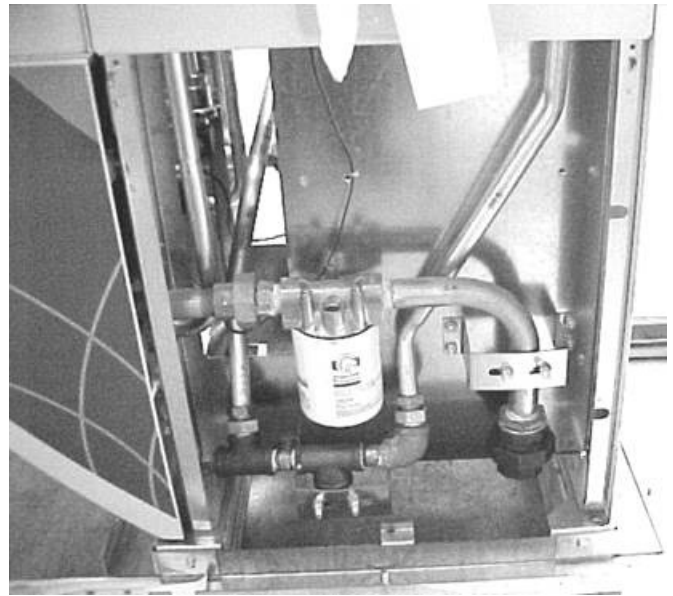
## 7. SURVEY– Scope of Work: *Perform this step before beginning steps 8 thru 12.*

Read and familiarize yourself with the theory of operations sheet and wiring instructions for the VP1000 Vapor Pump. The installation of the pump is on the sheet metal shelf over the junction box, with the pump cover facing the “A” side of the dispenser, see photo E. This is the side that the vapor tubes from the out port of the Wayne-VAC™ vacuum pumps are connected to a vapor tee mounted at the base of the dispenser, see photo F. From this survey, you will have an indication of where the vapor plumbing fittings need to go and where the holes need to be drilled in the adjoining sheet metal to allow the vapor pipes from the pump to pass through to the hydraulics compartment. Notice also in the electrical junction box, on the bottom right side, there is a potted conduit nipple which contains the Wayne-VAC™ wiring harness (for pump on “A” side) that you will remove to install the Healy potted conduit nipple, See Section 11.

**CAUTION: ALL POWER TO DISPENSER UNDER MODIFICATION SHOULD BE COMPLETELY DISCONNECTED AND CAPPED OFF AT JUNCTION BOX TO AVOID UNINTENTIONAL FEEDBACK FROM OTHER DISPENSERS!!**



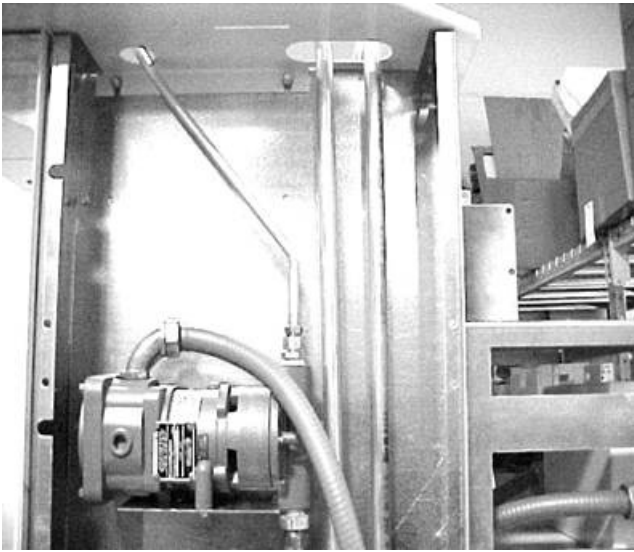
**Photo E**



**Photo F**

## 8. WAYNE-VAC™ REMOVAL:

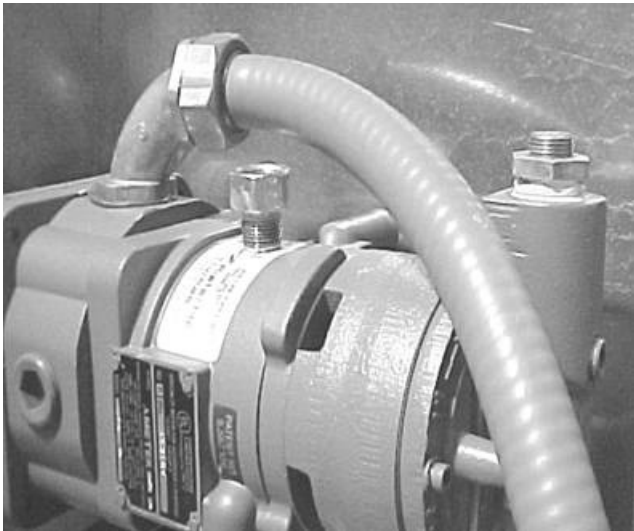
- ❑ Disconnect and lockout the power to the dispenser.
- ❑ Open the dispenser cabinet doors as specified in section 6 above.
- ❑ Close the vapor recovery (Stage II Vapor return line) impact valve. If there is no impact valve, be sure to have proper plugs or caps available to plug the Stage II line before disconnecting the Wayne-VAC™ equipment.
- ❑ Unscrew the flare nuts holding the vapor tube into the inlet of both VAC pumps, see photo G.
- ❑ Unscrew the flare nuts from the vapor port of both outlet castings and remove the vapor tubes, see photo H.
- ❑ Remove the 3/8” NPT x 3/8” flare elbow fittings from both outlet castings, see photo H.



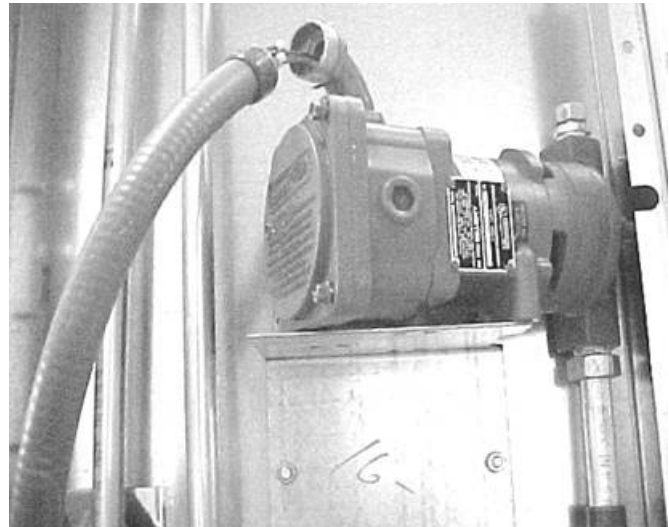
**Photo G**



**Photo H**



**Photo I**



**Photo J**

- ❑ Remove the 3/8" NPT x 3/8" flare straight fitting from the inlet of the VAC pump on the "B" side and install the 3/8" pipe plug supplied in the Healy Vapor Kit, tighten securely, see photo I.
- ❑ On the "A" side VAC pump, back off the electrical nut from the elbow attached to the pump and the flare nut holding the vapor tube in the out port of the pump, see photo J.
- ❑ Remove the (3) sheet metal screws that hold the pump to the bracket.
- ❑ Remove the electronics cover, secured with (4) bolts, from the pump.
- ❑ Disconnect harness wires from the pump wires and pull through the elbow. Let the electrical tube hang for future use. Remove the elbow and set aside for future use.
- ❑ Lift the VAC pump off the outlet vapor tube and set aside.
- ❑ Remove the VAC pump mounting bracket.
- ❑ Unscrew the flare nut holding the outlet vapor tube in the bottom of the dispenser and remove the vapor tubing, see photo F, right side when facing the dispenser.

- Remove the 3/4” NPT flare fitting from the 3/4” elbow and install a 3/4” NPT x 5/8” flare straight fitting supplied in the Healy Vapor Kit, tighten securely.
- In the “J” box, bottom right, you will see the potted nipple containing the wire harness that was previously disconnected from the Wayne-VAC™ pump. Follow this harness from the bottom of the potted nipple (under the “J” box) to the Wayne-VAC™ electronics control board #887227; remove the (2) connectors from the board and also the green ground wire attached to the chassis.
- Remove the coupling (under the “J” box) from the potted nipple and wire harness that was just disconnected from the Wayne-VAC™ electronics control board #887227.
- Remove the potted nipple from the “J” box and pull the wire harness out of the flexible, non-Oetallic electrical tubing and elbow, set aside.
- **IMPORTANT:** In the “J” box, bottom left, you will see the potted nipple containing the wire harness that controls the Wayne-VAC™ pump on the “B” side of the dispenser. Follow this harness from the bottom of the potted nipple (under the “J” box) to the Wayne-VAC electronics control board #887227, remove the (2) connectors from the board and neatly bundle up out of the way.

## **WARNING**

**This retrofit kit requires drilling in a Hazardous Location. Insure that all power to the dispenser has been turned off. Open all access doors for increased airflow. Use only sharp drill bits; dull bits may generate excessive heat. Use air powered drill at low RPM’s. If an electric drill is used, a suitable UL Listed Gas Detector must be used to ensure the area is below 25% of the Lower Explosive Limit. Do not drill if gasoline odors are present.**

**If drilling in the electronics cabinet, carefully collect and remove all metal shavings that may be inside the cabinet. Failure to remove the shavings could result in an electrical shock hazard. Before drilling, check to ensure that no wires or fluid containing parts (i.e. product tubing) is located on the backside or near the chuck of the drill.**

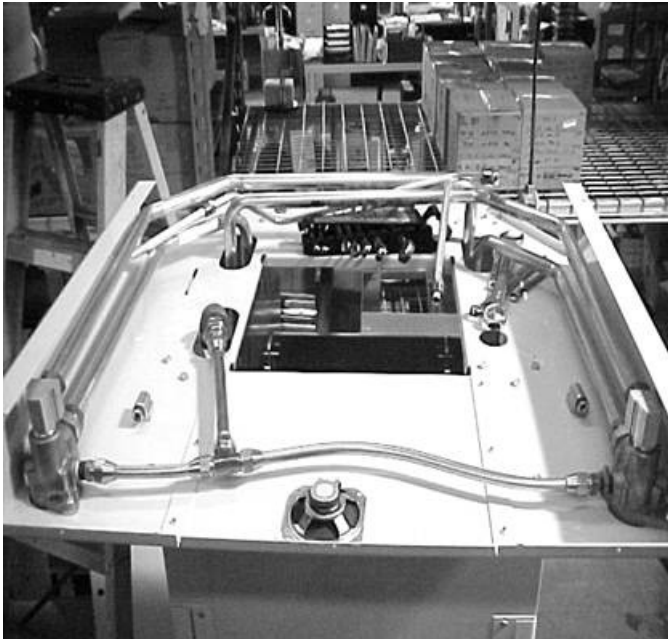
## **9. INSTALLING THE HEALY VP1000 SYSTEM**

**NOTICE:** WHEN DRILLING HOLES, ASSURE THAT THERE ARE NO HAZARDOUS VAPORS PRESENT AND DO NOT ALLOW CHIPS TO FALL DOWN INTO THE HYDRAULICS AREA.

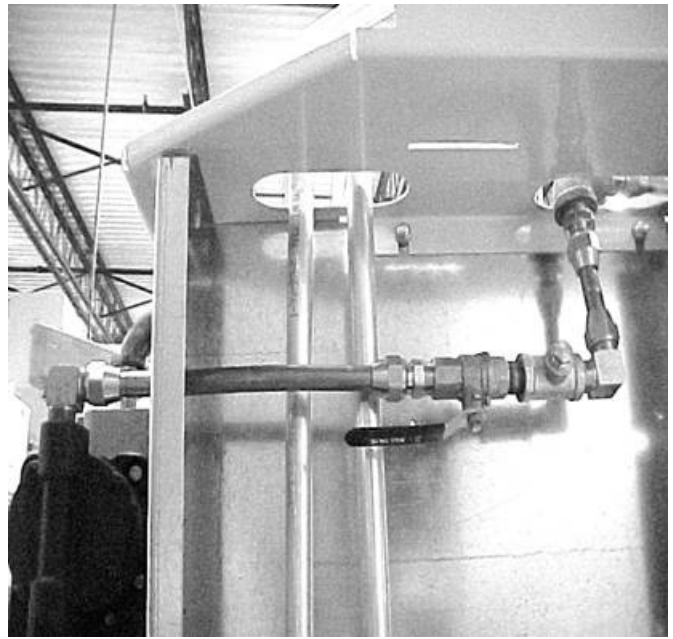
- In order to get the vapor tubing from the pump into the vapor plumbing area, it is necessary to drill or punch two 1-1/8” holes on the sheet metal column near the edge of the shelf, see photo E. Use a tape measure and mark the centerline of the holes to be 1-1/4” in from the front edge of the sheet metal column. Measure down from the top of the column 5-1/2” and mark on the 1-1/4” centerline, measure down an additional 6-3/4” and mark on the centerline. These marks are the centers of the holes for the vapor pipes going to the VP1000. DO NOT DRILL – verify positions in the next steps.

- ❑ Get the vapor pump and install a 1/2" NPT x 5/8" flare elbow fitting into the 'IN' and 'OUT' ports using tape, not pipe dope. Looking at the face of the pump, completely tighten both fittings so they are facing the right.
- ❑ Position the pump on top of the sheet metal shelf over the electrical junction box on top of the electronics cabinet, with the fittings pointing toward the hydraulics cabinet and overhanging the edge of the shelf about 1/4".
- ❑ Slide the pump to fit against the hydraulics cabinet and position so as to allow for matching the location of holes that need to be drilled through the sheet metal.
- ❑ Satisfied that the fittings and hole marks line up, remove the pump and drill the two, 1-1/8" holes, marked above.
- ❑ Position the pump assembly on top of the sheet metal shelf and slide over so that the ports are accessible from the hydraulics area.

## 10. CONNECTING VAPOR LINES: (See Photos K, L, M & N)



**Photo K**



**Photo L**

- ❑ Install a 3/8" NPT x 5/8" flare straight fitting into the vapor port of both outlet castings, see photo K.
- ❑ Install a 3/4" NPT x 5/8" flare straight fitting into each end of the 3/4" elbow supplied in the Healy vapor kit.
- ❑ Make up (3) pieces of 5/8" OD tube and attach as shown in photo K. The lengths are approximately as follows: 15-1/2" from the right outlet casting, 4-1/2" from the left outlet casting and 10" from the 3/4" elbow to the tee. Do not block column area.

- ❑ Make up the following assembly, see photo L. Note: The ball valve handle closes toward you. Install a 1/2" NPT x 5/8" flare straight fitting to the left side of the ball valve, install the 1/2" close nipple to the right side then the 1/2" reducing tee and the 1/2" NPT x 5/8" flare elbow – completely tighten the tee with the 1/4" branch facing up and the elbow also facing up, install the 1/4" pipe plug into the branch.
- ❑ Make up a piece of 5/8" OD copper tube that will go from the flare elbow on the inlet of the VAC pump, through the upper 1-1/8" hole in the column to the straight flare fitting on the ball valve assembly so that when installed and secured, positions the flare elbow on the ball valve assembly in a straight line with the straight flare fitting that's attached to the 3/4" elbow of the upper vapor manifold. Install and tighten with the ball valve assembly in position as shown in photo L.
- ❑ Make up a piece of 5/8" tube to connect the flare elbow on the ball valve assembly to the straight flare fitting that's attached to the 3/4" elbow of the upper vapor manifold. This piece should be made so that when installed the ball valve assembly and tubing should be horizontal or slightly pitched toward the pump to avoid liquid traps. Install and tighten.
- ❑ Mark the location of the mounting bolt holes from the VAC pump base on the shelf, unscrew the flare nut on the inlet and move the VAC pump out of the way. Drill two 5/16" holes (one on each side of the bracket) required for mounting the pump.
- ❑ Reposition the VAC pump and reconnect the flare nut to the inlet port, then install the two 1/4-20 bolts, washers, lock washers and nuts to secure the pump.



**Photo M**



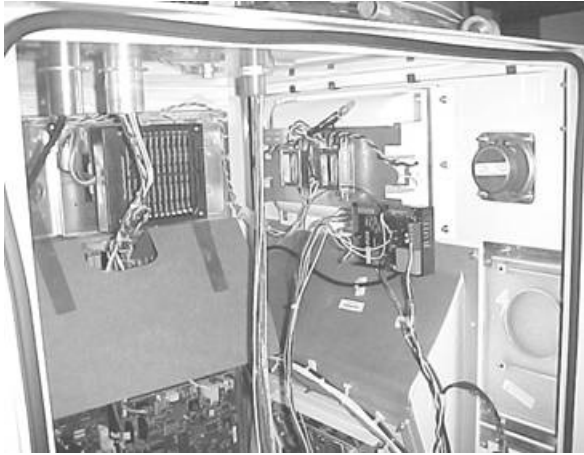
**Photo N**

- ❑ Measure and cut appropriate length of 5/8" tubing to reach from the 5/8" flare elbow on the outlet of the VAC pump, through the lower 1-1/8" hole in the column to the 5/8" flare straight fitting installed in the 3/4" elbow at the base of the dispenser, using a 90 degree bend, see photos M & N.
- ❑ Install and tighten making sure the horizontal portion of the tube attached to the outlet is either horizontal or slightly pitched downward away from the pump to avoid liquid traps.



## 11. INSTALLING THE SEALED NIPPLE ASSEMBLY: (See Photos O & P)

**NOTICE:** THE INTERFACE MODULE THAT IS SUPPLIED HAS A HARNESS ATTACHED AND A WIRING PLUG FOR THE AC CONNECTIONS. ALSO SUPPLIED IS THE SEALED NIPPLE ASSEMBLY (1346) THAT MUST BE USED BETWEEN THE DIVISION 1 AREA (THE ELECTRONICS COMPARTMENT) AND THE DIVISION 2 AREA (THE SPACE ABOVE AND OUTSIDE THE ELECTRONICS COMPARTMENT).



**Photo I**

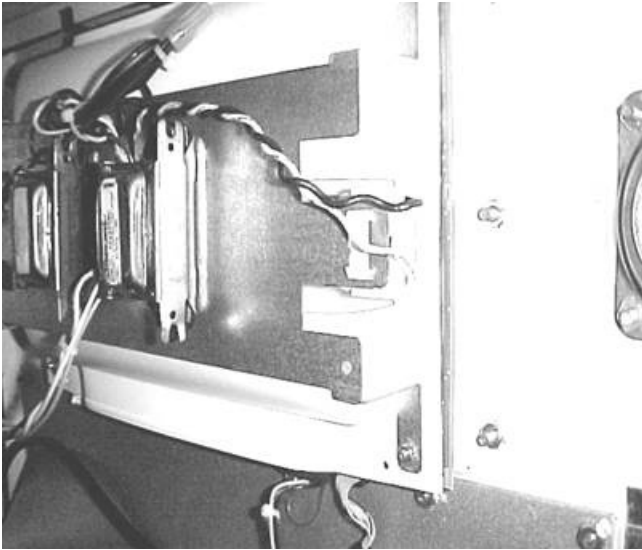


**Photo P**

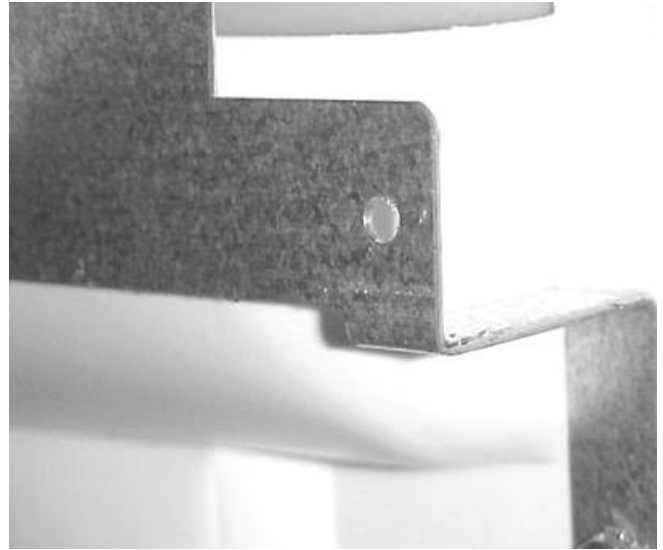
- ❑ Get the 1346 sealed nipple assembly and carefully remove the first nut and washer over the wires. Thread these wires from inside the electronics compartment, up through the hole inside the "J" box, (bottom right) where the Wayne VAC™ potted nipple was removed. Carefully replace the washer and nut over the wires and secure the unit into the box.
- ❑ At the VP1000, get and install the 1/2" male x 3/4" female adaptor over the wires coming from the motor. Do not use pipe dope on these fittings and be sure there is at least five full threads of engagement of the fittings in their respective couplings.
- ❑ Thread the pump wires through the elbow that was removed from the Wayne VAC™ motor electronics housing and screw the threaded end with the "O" ring into the 1/2" male x 3/4" female adaptor installed in the above step. Tighten so that the elbow faces away from the "J" box, see photo P.
- ❑ Get the electrical tube that was left hanging during the Wayne VAC™ removal, and route up to the VP1000 VAC pump as shown in photo P.
- ❑ Run the electronic wires from the VP1000 through the electrical tube and into the "J" box as shown. Reconnect the electrical tube to the elbow on the VAC pump.
- ❑ In the "J" box, leave about 6" of wire on both the wires coming from the motor and from the sealed nipple, cut off excess wire and strip approximately 1/2" of insulation from all wires.

- ❑ Use wire nuts to join the wires, color for color, together. There may be some extra wires in some sealed nipples, cap these off and dress aside.
- ❑ Keep wires clear of pinch points and from interference, make sure no wires overhang the door openings.
- ❑ Replace the cover on the junction box.

## 12. WIRING INSIDE THE ELECTRONICS COMPARTMENT: (See Photos Q, R, S, & T)

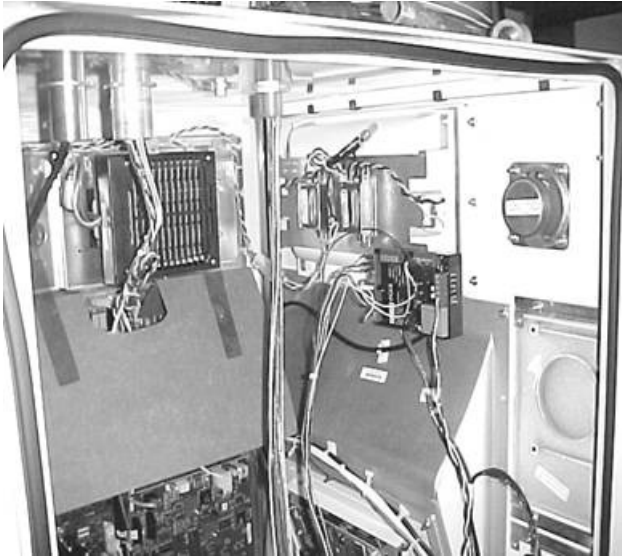


**Photo Q**

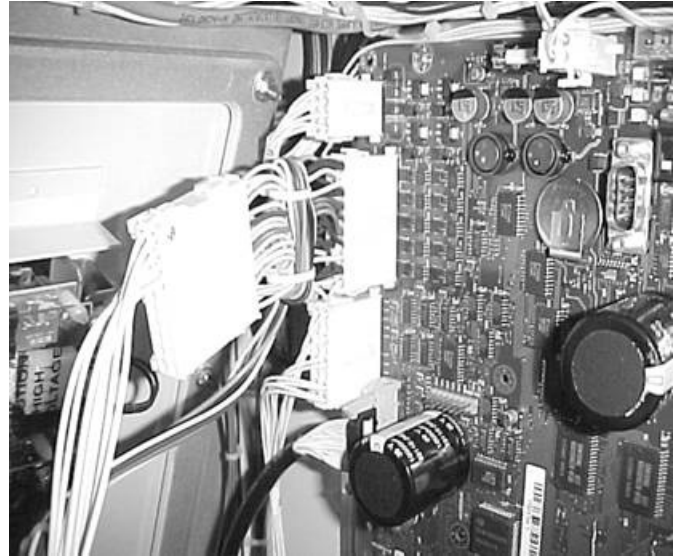


**Photo R**

- ❑ In the electronics bay, locate the light assembly on the upper right side of the cabinet, see photo Q. In photo R, notice the 3/16" hole that must be made to accept the module mounting screw. Punch this hole approximately as shown. If drilling, be sure no hazardous vapors are present and use a coffee cup or other suitable container to prevent metal chips from falling inside the cabinet.



**Photo S**



**Photo T**

- Leave the wires coming from the sealed nipple assembly at least six inches longer than necessary to reach the bottom of the compartment. Cut off excess and strip all wires 1/2".
- Connect the wires from the sealed nipple to the interface module as follows:
  - Black wire to 'motor ' on module
  - White wire to 'neutral' on module
  - Red wire (either) to 'output 1' on module
  - Red wire (other) to 'output 2' on module
  - Orange wire to 'fault common' on module
  - Purple wire to 'fault input' on module
  - Green wire needs a #8 ring tong lug installed and connected to any chassis ground (frame)
  - Some sealed nipples may have some extra wires, cap these and bundle them neatly out of the way.
- The black and white twisted pair of wires with a connector should be connected to an available AC outlet on the dispenser Relay Board #887225.
- The male/female multiconductor cable that is wired to the interface module is routed up to the computer board # 173976, see photo T. Disconnect the valves cable that's in the J3 connector and install in the female side of the double connector on the harness. The entire assembly is then installed back into J3 on the Computer board. WIRING IS COMPLETE.
- Mount the interface module as shown in Photo S using the 8-32 x 5/8" screw, washer and nut supplied in the electrical kit.

- Install the following labels supplied:
  - NOTICE label for current increase (1405), install on the frame rail near the existing power consumption label.
  - Large NOTICE label (1406) relating to the vapor recovery upgrade and how to reset the electronic module should be installed near the module, where it will be readily visible to a service technician on the junction box cover.
  - UL, retrofit kit identification number (1410), install on the electronic module.

### **13. CONNECTING HEALY SYSTEMS DISPENSING EQUIPMENT**

- Completing the connection of Healy Systems dispensing equipment requires the installation of Healy Systems Phase II dispenser adaptors, hoses and nozzles (Hanging Hardware).
- If applicable, remove existing non-Healy hanging hardware (from the dispenser product outlet adaptor to and including the nozzles).
- Vapor ready dispensers will require a Healy Systems adaptor to make the hose threads compatible with other Healy Systems equipment. Install following instructions packed with the adaptor. Various adaptors and pigtails are available, depending on how the dispenser is configured: M34 metric (Healy designation F3 or S3) or balance ready (Healy designation S4).
- Healy Vapor Recovery Hoses are available in various lengths to satisfy local ordinances and still provide “far side” fueling capability. Install these following instructions contained on the shipping box.
- Breakaways are required: Install either Model 8701-VV breakaway or Model 807 swivel breakaway; install using the instructions supplied with the unit.
- The Healy Systems nozzle Model 900 (EVR) is the only nozzle necessary to complete the upgrade. Check to be sure the nozzle hanger is mounted in the highest position. Be sure to check for proper fit in the nozzle holster and that the nozzle can be locked in the off position. Also, be sure that when the nozzle is locked, that the dispenser can not be activated from the locked position.

### **14. VP1000 THEORY OF OPERATION**

The Healy Systems VP1000 is a self-contained rotary vane pump, designed for gasoline vapor recovery utilizing various parts of the Healy System Vapor Recovery product line. It is intended for use by either OEM dispenser/pump manufacturers or as an after market add-on to make existing equipment compatible with Healy System technology. In order to convert to ‘others’ equipment, an electronic interface is required to adapt the targeted pump/dispenser to the new vapor recovery equipment. The interface senses when authorization to dispense has been given and sends signals to the motor to operate at a low speed for one hose, or a higher speed for two hoses. It also functions to shut off the pump/dispenser if it senses that the vapor pump is not operating properly. The vacuum is regulated at a level sufficient to clear liquid gasoline from the vapor path in MPD applications. The actual amount of vapors withdrawn is controlled by the Healy nozzle, itself, in response to the liquid gasoline flow rate.

## MOTOR SPECIFICATIONS

Horsepower	1/8 HP
Voltage	120 VAC

## INTERFACE SPECIFICATIONS

Input voltage	120 VAC
Relay current capacity	5A AC
Input signals	AC and DC voltages up to 130 VAC max
Motor Input signal	5 VDC @ 20 Hz 50% Duty Cycle

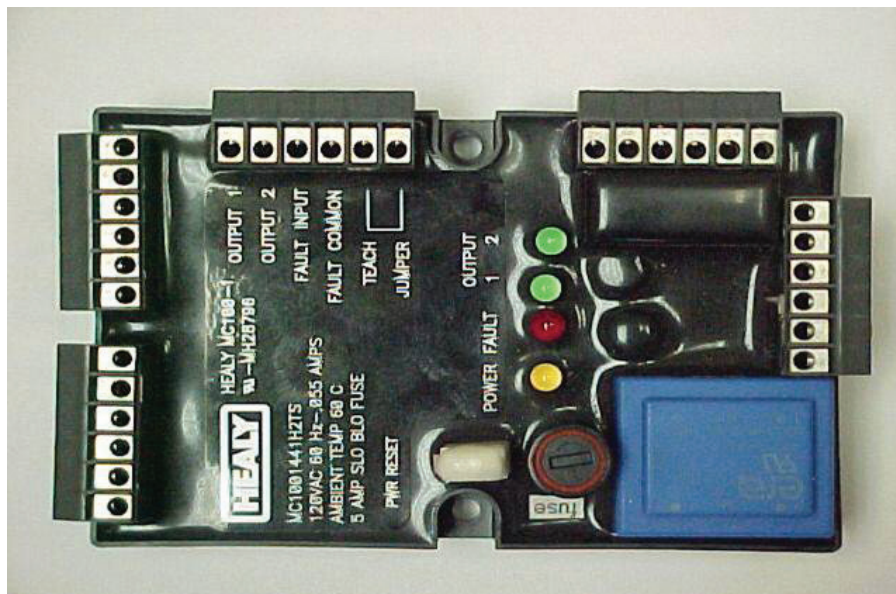
### 15. TESTING THE SYSTEM:

- Carefully review all work completed, being sure all mechanical joints are thoroughly tightened and electrical connections sealed.
- Open the product crash valves and restore power to the dispenser.
- With the power on, but no nozzles authorized, the VP1000 should not be running (unless the ambient temperature is below 40°F), but the power LED (yellow) should be energized on the interface module.
- Authorize one handle and the vacuum system should activate when the gasoline flow control valve is engaged. Repeat for all other nozzles, individually testing each nozzle on each side of dispenser. With each authorization, one of the green LED's on the interface module should illuminate and the VP1000 activate.
- Note: For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the same LED activates for all grades on the same side. If the other LED activates, wiring needs to be corrected.
- Authorize one nozzle and listen to the speed of the VP1000. With only one nozzle activated, the speed will be slower than if a nozzle on each side is activated. Activate a nozzle on the other side of the dispenser and listen for the speed to change.
- To test the tightness of the vapor plumbing installed on the suction side of the system requires a 0-100" water column gauge. Connect the gauge into the 1/4" test port of the reducing tee installed earlier in section 10 Photo L. Continue by following and completing the START-UP / NEW INSTALLATION / WARRANTY / ANNUAL TESTING FORM.

## 16. TROUBLESHOOTING THE VP1000:

- ❑ Use extreme care and caution when performing the tests listed below. If 120 VAC is accidentally applied to the fault or DC terminals, the module will be destroyed.
- ❑ With power applied to the dispenser, but no products authorized, there should be 120 VAC between neutral and 120 VAC on the module terminal strip.
- ❑ As above, with any product authorized, there should be single speed power applied to the VP1000. Verify this by checking for 2-3 VDC from OUTPUT 1 (RED WIRE) to FAULT COMMON (ORANGE WIRE), (or from OUTPUT 2 TO FAULT COMMON) also; one GREEN LED should be illuminated. With a second product authorized on the opposite side of the dispenser i.e. one product on each side, the motor should operate at higher speed and there should be 2-3 VDC on both output 1 and 2 (to fault common) and both GREEN LED's should be illuminated.
- ❑ With the pump running, a fault can be simulated by shorting, with a jumper wire, the "FAULT INPUT" (purple wire) to FAULT COMMON (orange). This should cause the motor to shut off, the solenoid valves to lose power and the dispenser to shut down. Also, as long as the short is maintained, the red LED will be illuminated. Removing the short will not automatically reset the module. To reset the module, remove the short, remove power to the dispenser for twenty seconds and restore power. The module should now be reset and the red led extinguished. This can also be accomplished by using the power reset (PWR RESET) on the module.
- ❑ If diagnosing a problem where the LED is already illuminated, a steady light indicates a low current condition, therefore expect a vane or rotor problem. If the LED is blinking, that indicates a high current condition and would expect to find a jammed rotor or vapor line flooded with product. See Start-up / New Installation / Warranty / Annual Testing Form.
- ❑ The electronics of the motor will make three attempts to have a successful start of the motor. If it detects a problem, on the fourth unsuccessful start, it will short the fault line to signal minus (DC-) and shut down the electronics.


### MC 100 Interface Module



## 17. VP1000 VANE & ROTOR SERVICE & REPLACEMENT GUIDE

**Caution**  **Disconnect power before beginning service.**

1. The work area **must** be clean and have sufficient lighting.
2. Disconnect the vapor piping connected to the **IN** and **OUT** ports of the VP1000 cover assembly.
3. Remove the four Allen head screws and lock washers that secure the pump cover assembly to the pump housing and remove the cover carefully.

**Caution**  **Use a spill cloth when removing the cover, as there may be some gasoline inside the pump cavity.**

4. Carefully turn the rotor assembly by hand until the shaft key notch is at the 12 o'clock position. (See Figures)
5. Remove the rotor, vanes and shaft key from the pump housing.

**Note:** Place your hand or a container under the rotor while removing. Do not use any sharp objects that would scratch the surfaces of the pump cavity, pump shaft, rotor, or vanes.

6. Rotate the shaft by hand. If the shaft does not rotate freely, the entire vacuum pump needs replacement (p/n VP1000-5 or RVP1000-5).
7. If the rotor and vanes are cracked, chipped, excessively worn or excessively dirty, the rotor and vanes should be replaced because cleaning will not remedy these conditions (p/n VP1000VRC-G, VP1000VRC-P or VP1000VRC).
8. If there is no visible damage, use a lint-free cloth with isopropyl alcohol to clean the rotor and vanes.
9. Using a lint-free cloth with isopropyl alcohol, thoroughly clean: the inside of the pump ring and rear of the pump cavity, the rotor shaft, and the inside of the pump cover.
10. Reposition the shaft (if necessary) so that the shaft key notch is in the 12 o'clock position. Install the cleaned original or new shaft key onto the shaft.
11. Carefully install the cleaned original or new rotor onto the shaft followed by the cleaned original or new vanes into the rotor.

**Note:** The rotor assembly should slide on to the shaft easily, without excessive force. (Rotors and vanes are reversible)

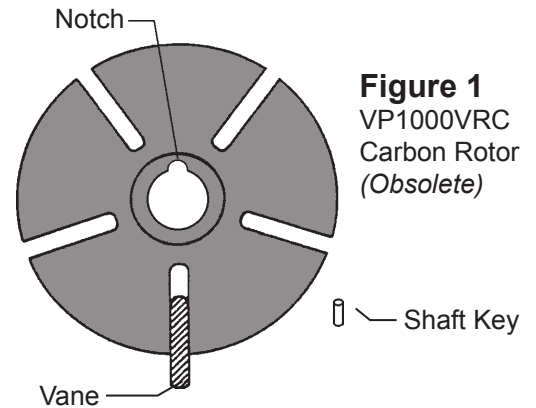
12. Lightly lubricate and install the new O-Ring for the pump housing.

**Note:** Do not allow any lubricant to get inside the pump housing.

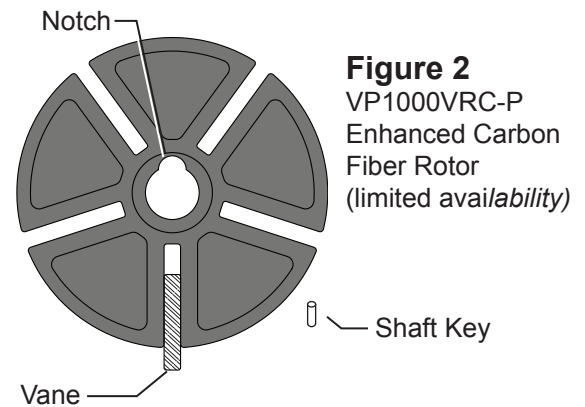
13. Install the pump cover using the four Allen head screws and lock washers removed in step 3 and cross tighten.

**Note:** Use caution when sliding the pump cover over the O-Ring seal to prevent cutting or tearing.

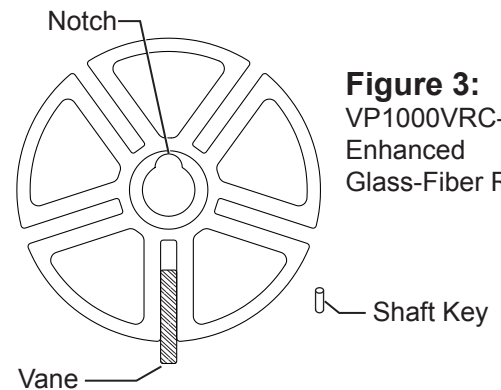
14. Re-connect the vapor piping to the **IN** and **OUT** ports of the pump cover assembly that was removed in Step 2.
15. Re-apply power. Test for normal operation. (See VP1000 Vacuum Performance Test Procedure)



**Figure 1**  
VP1000VRC  
Carbon Rotor  
(Obsolete)



**Figure 2**  
VP1000VRC-P  
Enhanced Carbon  
Fiber Rotor  
(limited availability)



**Figure 3:**  
VP1000VRC-G  
Enhanced  
Glass-Fiber Rotor

START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations – complete SIDE A and sections 3, 4, 5 and 6 of SIDE B. Submit forms to Healy Systems.**
- **Warranty Service or Annual Testing – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on SIDE A and conduct the appropriate tests specified on SIDE B. Submit Forms to Healy Systems.**

SERVICE COMPANY NAME	TELEPHONE	
SERVICE TECHNICIAN	HEALY TECH CERT #	
STATION ADDRESS	CITY	STATE
DISPENSER MAKE	VACUUM PUMP SERIAL #	

## SIDE A

DISPENSER EQUIPMENT CHECKLIST - Parts A-1 and A-2	YES	NO*
<b>A-1</b> Is all the installed dispenser hanging hardware listed in Exhibit 1 of Executive Order VR-201 or VR-202?	<input type="checkbox"/>	<input type="checkbox"/>
<b>A-2</b> Proper installation of the VP1000 requires the test port and ball valve on the inlet side of the vacuum pump. Are the test port and ball valve installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
<b>*If the answer to either A-1 or A-2 is NO, the Healy Warranty is Void.</b>		

### A-3

- THE FOLLOWING TEST WILL PERFORM A POSITIVE PRESSURE LEAK CHECK OF THE VACUUM PUMP, DISPENSER VAPOR PIPING, HANGING HARDWARE AND ALL NOZZLES ON BOTH SIDES OF THE DISPENSER.
- THE VP1000 OUTLET IS NOT CONNECTED TO UNDERGROUND PIPING DURING THIS TEST.

**CAUTION: REGULATE GASEOUS NITROGEN TO 2.5 PSI (~70" WC) MAXIMUM BEFORE TESTING**

1. Install a 0-100 inch water column (" wc) mechanical gauge at the VP1000 test port.
2. Use the water column gage positive (high) pressure port.
3. Gaseous nitrogen gas can now be connected to the outlet (exhaust) port of the VP1000.
4. Test pressure **cannot** exceed 70" wc.
5. **Slowly** introduce the gaseous nitrogen to a pressure between 60 – 70" wc.
6. After reaching the pressure range, close the valve supplying the gaseous nitrogen.
7. Record the initial pressure reading on the gauge - observe and record the final pressure reading after 60 seconds.
8. Leaks must be repaired when the pressure falls more than 4" wc in 60 seconds.
9. Retest until all leaks have been repaired.
10. Record test results in Section A-4.

<p><b>A-4</b></p> <p style="text-align: center;"><b>PRESSURE TEST</b></p> <p style="text-align: center;"><b>2.5 PSI (~70"wc) Maximum</b></p>	<p><b>Initial Pressure test reading ("wc)</b></p>	<p><b>Pressure test reading after 60 seconds ("wc)</b></p>
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START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections 3, 4, 5 and 6 of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

<b>SIDE B</b>			
<i>Warranty Service</i> Complete Troubleshooting Sections <b>B-1 and B-2</b>		<i>Start-up/ New Installations/ Annual Testing</i> Complete Sections <b>B-3 through B-6</b>	
<b>B-1</b>	<p style="text-align: center;"><b>Control Module Fault Light</b> (Circle one)                      <b>Flashing (LED)</b>                      <b>Steady (LED)</b></p> <p>1. All fault conditions require removal and cleaning or replacement of the rotor and vanes located inside the vacuum pumps round front cover assembly. Use the <b>VP1000 ROTOR &amp; VANE SERVICE AND REPLACEMENT GUIDE</b> in the applicable dispenser retrofit manual of the ARB Approved Installation, Operation and Maintenance Manual for Executive Orders VR-201-O and VR-202-O.</p> <p>2. Clean all surfaces including vanes, rotor, rotor housing and cover assembly.</p> <p>3. Manually spin and inspect the motor shaft for bearing wear before re-installing the rotor kit.</p> <p>4. Replace motor when bearings or shaft are damaged or worn.</p> <p>5. Check O-ring seal before replacing rotor cover assembly.</p>		
<b>B-2</b>	<p>Re-Assemble / Reset Vacuum Pump and Module. (Power must be removed from both the vacuum pump and the <b>module for 20 seconds to reset the system</b>) using the power reset switch on the MC100 module.</p>		
<b>B-3</b>  Dispenser Vapor Line Integrity Test	<p>1. Install 0-100 inch water column (" wc) vacuum mechanical gauge at the VP1000 test port.</p> <p>2. Authorize the dispenser for fueling. The VP1000 will begin to run.</p> <p>3. Close the ball valve at the pump inlet.</p> <p>4. Record the initial vacuum reading on the gauge – observe and record the final vacuum reading after 60 seconds.</p> <p>5. Open the ball valve at the pump inlet.</p> <p>6. Leaks must be repaired when the vacuum reading falls more than 4" wc in 60 seconds.</p> <p>7. Retest until all leaks have been repaired.</p> <p>8. Record data in Section B-4.</p> <p><b>Note: If the initial vacuum reading is less than 60" wc, it could indicate a problem with the VP1000. Remove the dispenser from service. Use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-4</b>	VACUUM TEST Using VP1000 as vacuum source	Initial Vacuum test reading (" wc)	Vacuum test reading after 60 sec. (" wc)
<b>B-5</b>  Dispenser Vacuum Test	<p>With one side of the dispenser authorized (VP1000 running) and the ball valve at the pump inlet open, dispense in handheld position a minimum of 0.5 gallons of fuel into a vehicle or test tank. Record the vacuum level while dispensing. Repeat test for the other side of the dispenser.</p> <p>1. Side "A" Dispensing Vacuum _____" wc</p> <p>2. Side "B" Dispensing Vacuum _____" wc</p> <p><b>Note: If the dispensing vacuum is less than 60" wc, remove the dispenser from service. See the troubleshooting section of the manual or contact FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-6</b>  Audible Increase Test	<p>Test the VP1000 Vacuum Pump for normal operation. Use the 6 step procedure titled, "Testing the VP1000 Vacuum Pump for normal operation using the following test procedure:" in Section 1.1 (Weekly Inspection and Testing) of the Healy Systems Scheduled Maintenance document in the ARB Approved Installation, Operation and Maintenance Manual for the Healy Phase II EVR System not Including ISD. This is to verify that the pump recognizes when both sides of the dispenser are activated for fueling.</p> <p>Does the VP1000 Vacuum Pump change speeds (audible increase) when both sides are activated for fueling?</p> <p style="text-align: center;">Yes No</p> <p>If the answer is no, <b>use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
Repairs - Comments		To Obtain Returned Materials Authorization number (RMA#) Call 800-984-6266 Forms can be faxed to Franklin Fueling Systems Customer Service at 800-225-9787	

Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



**WAYNE-DRESSER OVATION™ SERIES DISPENSER RETROFIT for  
HEALY SYSTEMS, INC.  
MODEL VP1000  
VAPOR RECOVERY ASSIST SYSTEM  
(KIT Z079)**

## **OUTLINE**

This Manual is to be used for new, replaced, retrofitted, or reconditioned dispensers/pumps.

- 1. Purpose**
  - 2. Safety**
  - 3. Models Covered**
  - 4. Parts Lists**
  - 5. Tools Required**
  - 6. Dispenser Access**
  - 7. Survey Scope Of Work**
  - 8. Wayne-VAC Removal**
  - 9. Balance Removal**
  - 10. Installing The Healy VP1000 System**
  - 11. Connecting Vapor Lines**
  - 12. Installing The Sealed Nipple Assembly**
  - 13. Wiring Inside The Electronics Compartment**
  - 14. Connecting Healy Systems Dispensing Equipment**
  - 15. VP1000 Theory Of Operation**
  - 16. Testing The System**
  - 17. Trouble Shooting The VP1000**
  - 18. VP1000 Vane & Rotor Service & Replacement Guide**
- Start-up/ New Installation/ Warranty/ Annual Testing Form**

## 1. PURPOSE:

This procedure describes the tools, methods and skill levels required to install a Healy Systems, Inc. Model VP1000 Vapor Recovery pump in vapor ready Wayne Dresser Ovation™ series gasoline dispensers. Only Healy trained and certified contractors will be able to perform these retrofits or warranty will be void. The installer shall be a skilled petroleum technician and thoroughly familiar with the requirements of State, Federal and local codes for installation and repair of gasoline dispensing equipment. Also, they shall be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

**NOTE:** All electrical and hydraulic plumbing fittings referred to in these instructions must be UL “listed” or “recognized” for the purpose.

**Note:** Installations of vapor piping into the inlet side of the vacuum pump should be sloped such that the natural flow direction is toward the vacuum pump. However, it is permissible to have a piping slope tilted away from the vacuum pump provided that all other applicable tests (Dispenser integrity and V/L) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

**Note:** For installations with In-Station Diagnostics (ISD), the vapor flow meter shall be installed on the down stream side of the vacuum pump. Every effort shall be made to install the vapor flow meter so that vapor piping between the vacuum pump and the vapor flow meter is sloped such that the natural flow direction is toward the vapor flow meter. However, it is permissible to have the piping slope away from the vapor flow meter provided that all other applicable tests (Dispenser integrity, V/L and ISD Operability) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

## 2. SAFETY:

Before installing the equipment, read, understand and follow:

- The National Electrical Code (NFPA 70)
- The Automotive and Marine Service Code (NFPA 30A)
- Any national, state and local codes that may apply

The failure to install the equipment in accordance with NFPA 30A and 70 may adversely affect the safe use and operation of the system.

Accurate, sound installations reduce service calls: Use experienced, licensed contractors that practice accurate, safe installation techniques. Careful installation provides a sound troubleshooting framework for field repairs and can eliminate potential problems.

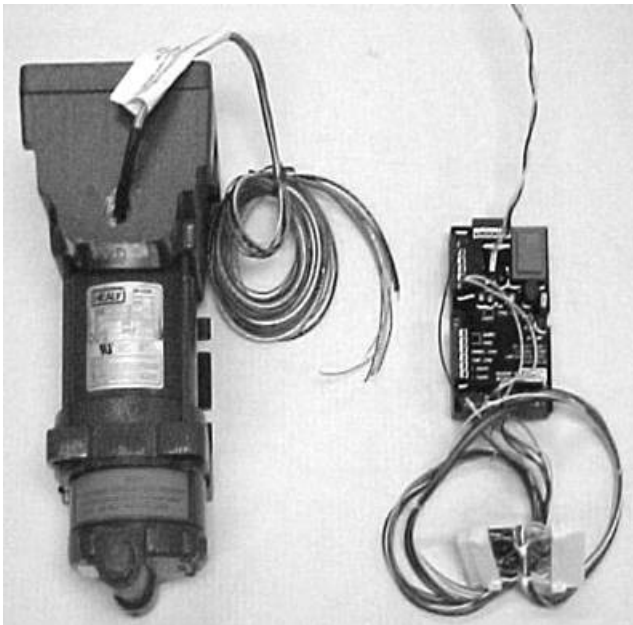
1. Read all instructions before beginning.
2. Follow all safety precautions:
  - ❑ Barricade the area.
  - ❑ Do not allow vehicles or unauthorized people in the area.
  - ❑ Do not smoke or allow open flames in the area.
  - ❑ Do not use power tools in the work area.
  - ❑ Wear eye protection during installation.
3. Use circuit breakers for multiple disconnects to turn off power and prevent feedback from other dispensers.

### 3. MODELS COVERED:

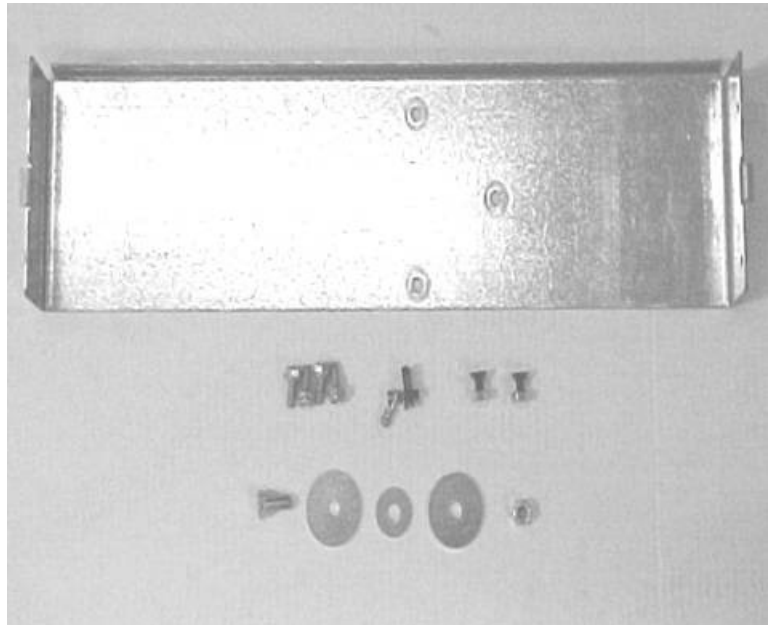
Wayne-Dresser Ovation™ series dispensers, all options except suffix “O”, non vapor ready.  
The addition of the Healy Systems VP1000 to the Ovation dispenser will increase the current draw of the dispenser by 2 amps. Use the label supplied to note this change.

### 4. PARTS LISTS: (See Photo A)

- 1 VP1000 Vacuum Pump
- 1 1365A Wire Harness / MC100 Series Interface Module Assembly



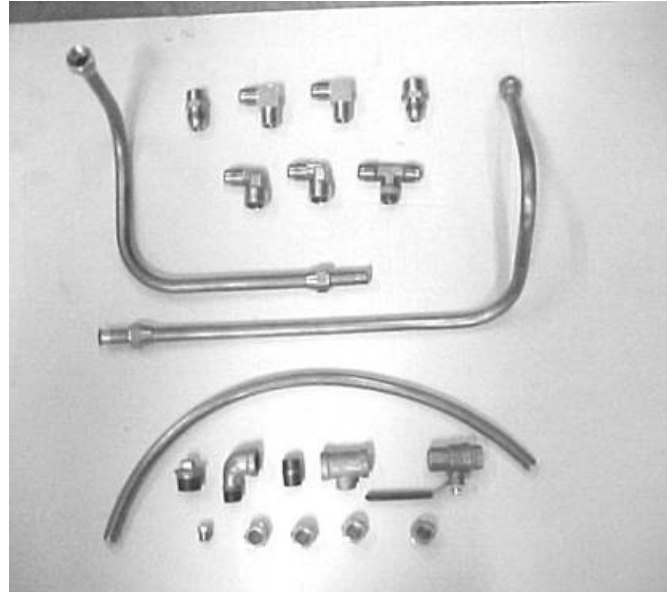
**Photo A**



**Photo B**



**Photo C**



**Photo D**

**HARDWARE KIT Z079H: (See Photo B)**

- 2 ea Flat head 1/4-20 x 5/8 bolts, washers, and nuts
- 4 1/4 - 20 x 1/2" sheet metal screws
- 1 Washer-seal assembly (For use when removing Wayne-VAC electrical)
- 1 Pump mounting bracket

**ELECTRICAL KIT Z079E: (See Photo C)**

- 1 Current change label (p/n 1405)
- 7 Wire nuts
- 1 8-32 Tinnerman™ threaded fastener
- 1 8-32 x 5/8" pan head screw with washer
- 1 1/2" x 3" electrical nipple
- 1 1/2" capped electrical elbow
- 1 1/2" electrical elbow
- 1 1/2" electrical union
- 3 1/2" x 3/4" electrical reducing bushings
- 1 Explosion proof J box
- 1 #1346 potted conduit nipple
- 1 #8 Ring tong terminal
- 1 Notice label (p/n 1406)
- 1 UL listed label (p/n 1410)

- 1 3/4" electrical elbow
- 2 1/2" electrical close nipples
- 1 1/2" electrical coupling
- 1 1/2" x 5" electrical nipple
- 1 1/2" x 7" electrical nipple

**VAPOR KIT Z079V: (See Photo D)**

- 1 1/2" NPT X 5/8 flare straight fitting
- 2 1/2" NPT X 5/8 flare elbow fittings
- 1 3/4" NPT x 5/8 flare straight fitting
- 2 3/4" NPT x 5/8 flare elbow fittings
- 1 1/2" NPT x 5/8 x 5/8 flare tee
- 2 Preformed copper tube segments
- 2' 5/8" OD copper tube, type 'L'
- 1 3/4" pipe plug
- 1 1/2" NPT street elbow
- 1 1/2" close nipple
- 1 1/2" x 1/4" x 1/2" reducing tee
- 1 1/2" ball valve
- 1 1/4" pipe plug
- 4 5/8" flare nuts

**MATERIALS SUPPLIED BY INSTALLER:**

- Thread Sealing Compound – non-Setting, UL Classified for use on all tapered threads, non-electrical, plumbing fittings
- Oil and gasoline compatible PTFE tape

**4. TOOLS REQUIRED:**

- 1/4" or 3/8" ratchet set w/ sockets 1/4" through 9/16" + 3" extension
- 9" lineman's pliers
- Assorted open end wrenches 1/4" through 3/4"
- Wire cutters/strippers 18 AWG and 26 AWG
- 1-1/8" greenlee type sheet metal punch
- Mechanical hand drill (egg-beater type)
- Assorted drill bits 1/16" through 7/16"

- ❑ Assorted screwdrivers (flat blade-one must be 1/8" wide and Phillips)
- ❑ 5/8" copper tube bending tool
- ❑ 5/8" copper tube flaring tool
- ❑ Copper tubing cutter
- ❑ Electrical multi-Oeter
- ❑ Small hand brush (1-1/2" thick, for clearing chips)
- ❑ 12" adjustable wrench
- ❑ 16" pipe wrench
- ❑ Tape measure
- ❑ Allen wrenches

**6. DISPENSER ACCESS: (See Photos E & F)**

- ❑ Secure Dispenser Access keys from Station Management.
- ❑ Lockout and tag-out all electrical power to dispenser being modified.
- ❑ Use keys to unlock and remove lower dress panels on dispenser and open access doors.



**Photo E**



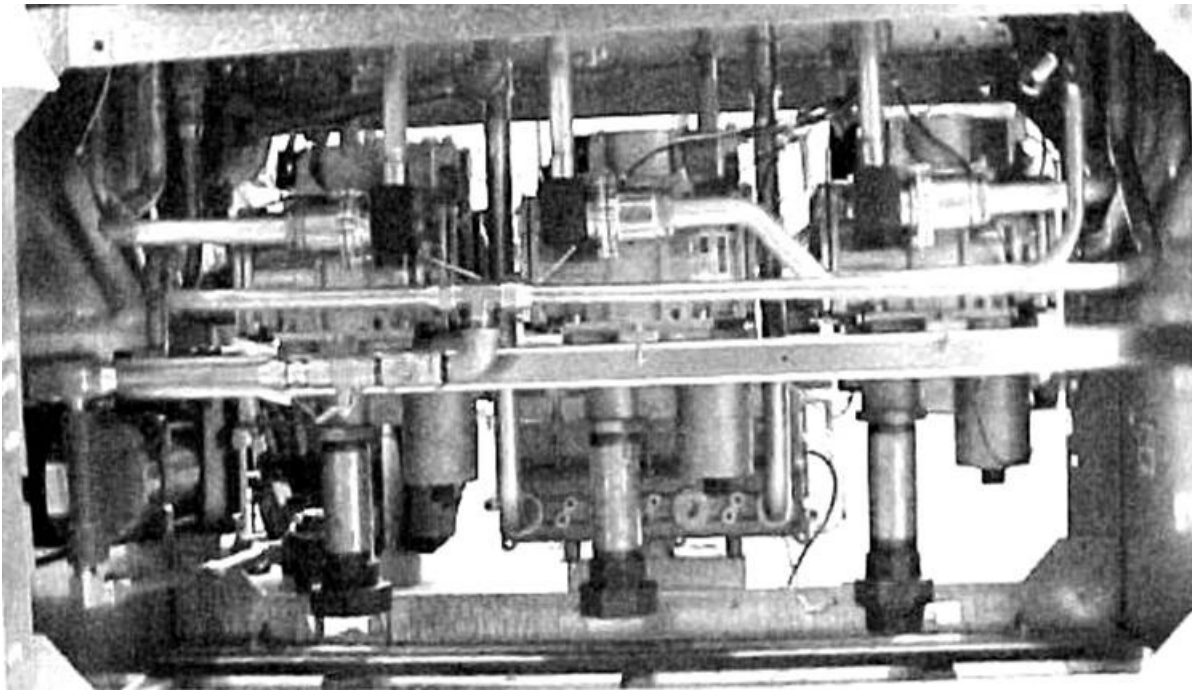
**Photo F**



**7. SURVEY – Scope of Work: *Perform this step before beginning steps 8 thru 13, (See Photo G)***

Read and familiarize yourself with the theory of operations sheet and wiring instructions for the VP1000 Vapor Pump. The installation of the pump is on the sheet metal bracket, supplied in the hardware kit, and then installed on the right side panel in the hydraulics area when facing the “A” side of the dispenser, (this is the side with the IGEM board #173976). From this survey, you will have an indication of where the vapor plumbing fittings need to go and where the electrical tubing will need to run. Notice also on the “B” side, lower left of the electronics board support column, there is either a plugged hole or a WayneVac conduit that goes from the hydraulics to the electronic compartment. The wires to the motor will pass through this hole. The sealed nipple is installed here. See Section 12.

**CAUTION: ALL POWER TO DISPENSER UNDER MODIFICATION SHOULD BE COMPLETELY DISCONNECTED AND CAPPED OFF AT THE JUNCTION BOX TO AVOID UNINTENTIONAL FEEDBACK FROM OTHER DISPENSERS!!**

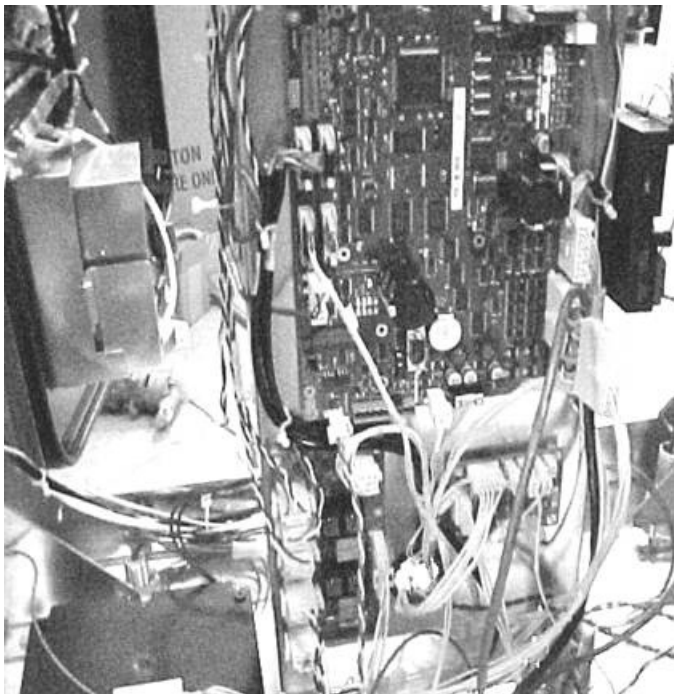


**Photo G**

**NOTICE:** Ovation dispensers may either be fitted with WayneVAC™ or Balance vapor recovery equipment. This equipment must be removed before the Healy VP1000 System is installed. See section 8 below for removal of a WayneVAC™ system. If Balance equipped, go to section 9 titled “Balance Removal”.

## 8. WAYNEVAC™ REMOVAL:

- ❑ Disconnect and lockout the power to the dispenser.
- ❑ Open the dispenser cabinet doors and observe vapor plumbing.
- ❑ Close the vapor recovery (Stage II vapor return line) impact valve. If there is no impact valve, be sure to have proper plugs or caps available to plug the Stage II line before disconnecting the WayneVAC™ equipment.
- ❑ On the 'B' side (side opposite IGEM board #173976, see photo H), of the dispenser locate the WayneVAC™ electronics control board #887227 photo I, and disconnect cables going to the WayneVac™ motors (4 connectors, 2 signal and 2 thermister). Also, remove 2 green ground wires going to the chassis.

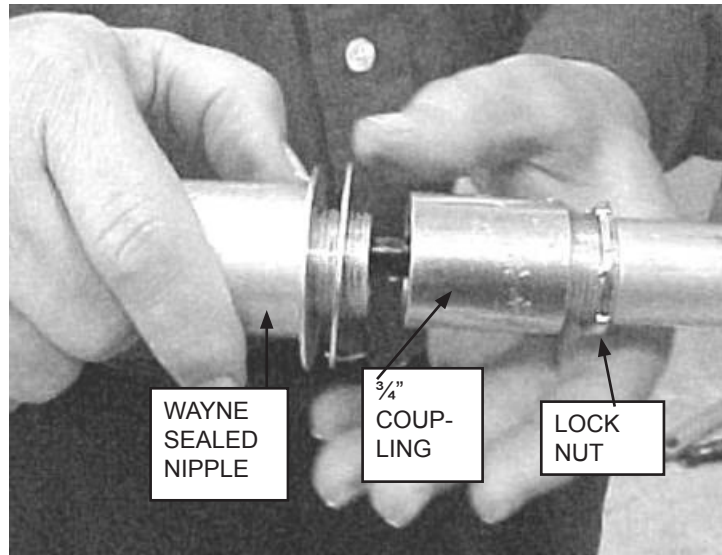


**Photo H**



**Photo I**

- ❑ On each motor, open the electrical union attached to the electronic housing, remove the covers, disconnect the cables, and ground wire inside.
- ❑ On each motor, follow the electronic wire conduit to where it penetrates the vapor barrier on the floor of the electronics compartment.
- ❑ On that conduit, back the lock nut off as far as it will go and then the coupling above the nut until the thread of the mating part, which is potted and comes from the electronic compartment through the barrier, is disengaged, see photo J.



**Photo J**

- ❑ In the electronics compartment, remove the potted assembly (with wires) from the tubing and discard all.
- ❑ The hole on the “A” side in the vapor barrier where the potted assembly was removed needs to be plugged. Get the washer seal assembly from the parts kit and install in this hole. (The small washer fits between the two large washers and is the same thickness as the sheet metal). The hole on the “B” side will be used when installing the Healy System.
- ❑ Remove the vapor tubes from the flare fittings attached to the 3/4” couplings under the barrier and the inlet of each pump, see photos K & L.
- ❑ Remove the 3/4” NPT fitting from both 3/4” couplings. CAUTION: Use a pipe wrench on the 3/4” couplings when removing the 3/4” NPT fittings to prevent loosening of the upper vapor piping.
- ❑ Loosen and slide back the nuts on the vapor tubes connected to the outlet side of both WayneVAC™ pumps and the vapor cross that’s mounted to the base of the dispenser. NOTE: The vapor tubes will stay in the fittings until the VAC pumps are removed.
- ❑ Remove the sheet metal screws on each side that secure the VAC pump mounting bracket to the frame and remove pump/bracket assembly from dispenser and vapor tubing. On one end, it will be necessary to remove the product filter in order to get the pump/bracket assembly out. Be sure you have petroleum ‘diapers’ available to absorb any spilled fuel. NOTE: Reinstall product filter after VAC pump removal.
- ❑ Remove the 3/4” flare fittings from each side of the vapor cross.

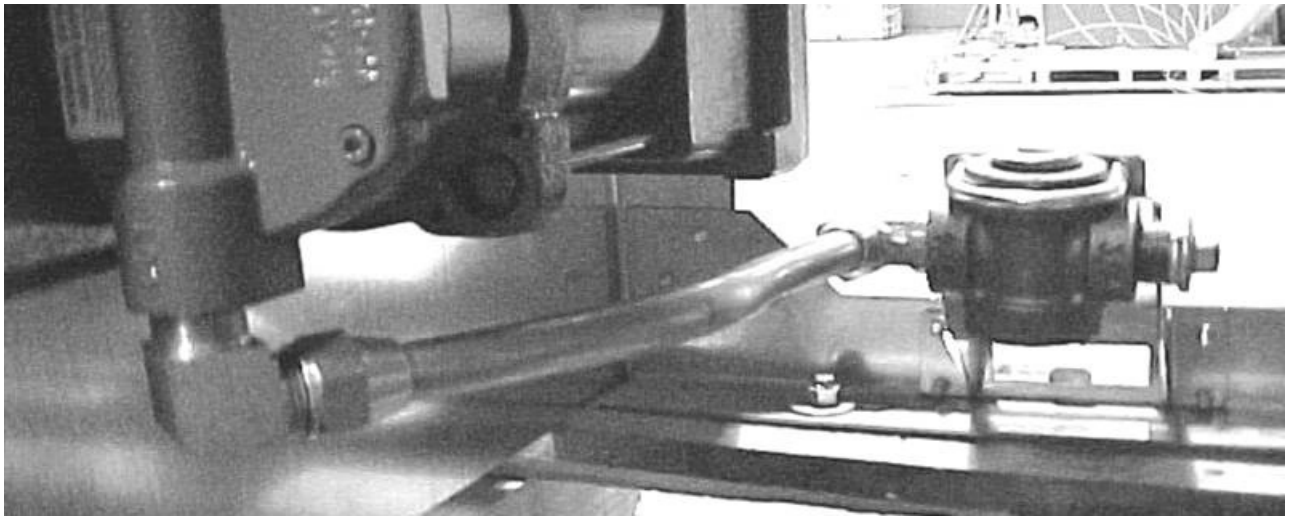


Photo K

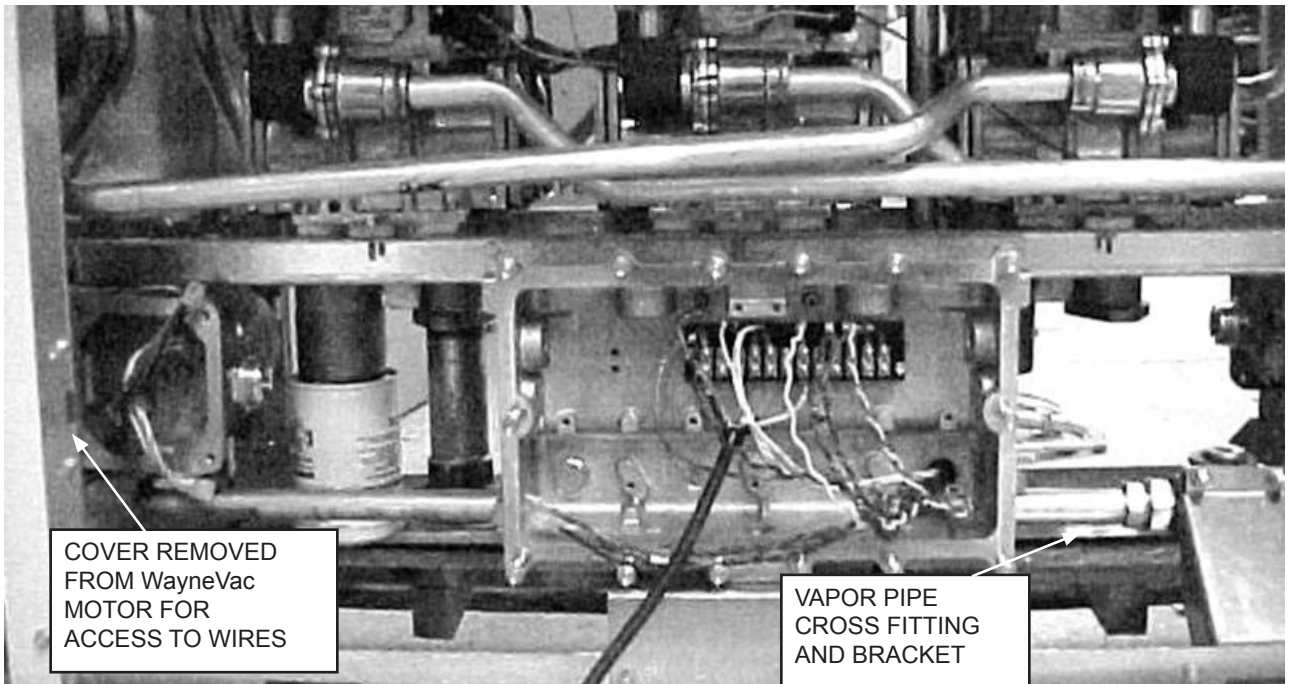


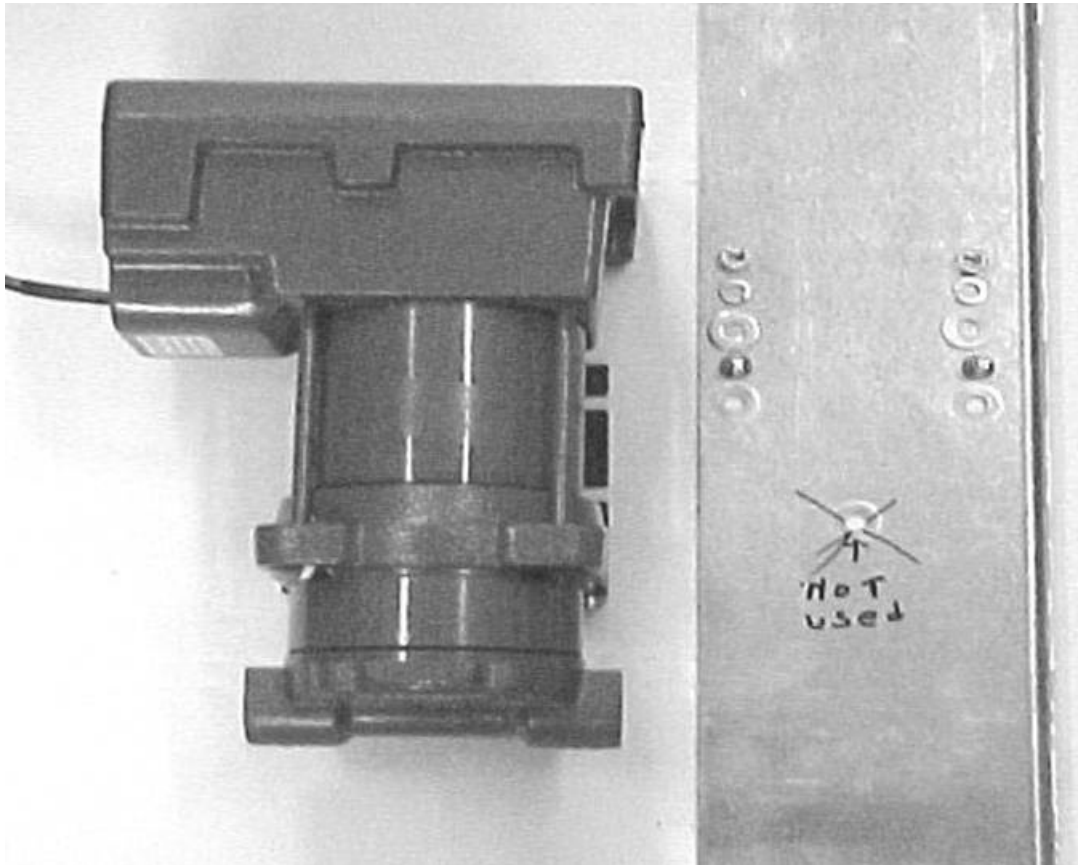
Photo L

## 9. BALANCE REMOVAL:

- ❑ Remove the vapor tubes from the flare fittings attached to the 3/4" couplings under the barrier and from the vapor cross.
- ❑ Remove the flare fitting from both 3/4" couplings of above. CAUTION: Use a pipe wrench on the 3/4" couplings when removing the flare fittings to prevent loosening of the upper vapor piping.
- ❑ Remove the flare fittings from each side of the vapor cross.

## 10. INSTALLING THE VP1000 SYSTEM:

**NOTE:** The mounting bracket on the VP1000 must be rotated 90° to secure the pump on this shelf. When installed in the dispenser, the vacuum pump INLET must be on top and the OUTLET on the bottom



**PHOTO M**

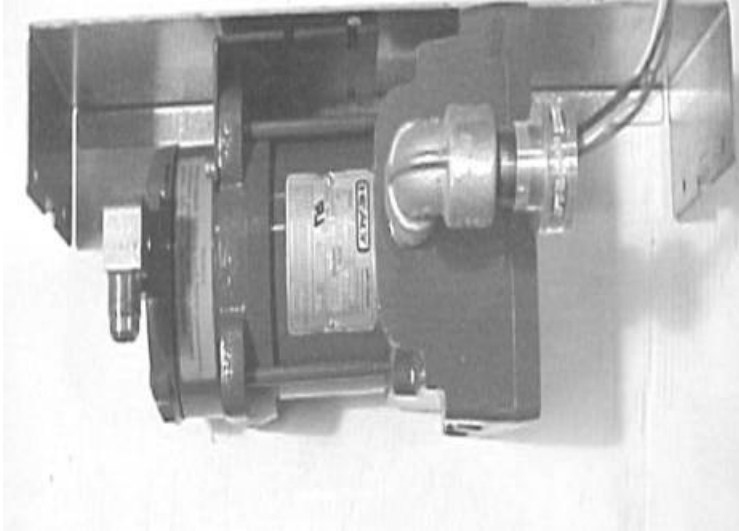
- Place the VP1000 vapor pump on the sheet metal bracket with the pump end towards the left, upturned flange, see photo M. Secure with one 1/4-20 x 5/8" flat head cap screw, washer and nut in each of the motor mounting holes closest to the electrical end.

**NOTE:** DO NOT USE PIPE SEALING COMPOUND ON ANY ELECTRICAL CONDUIT FITTINGS.

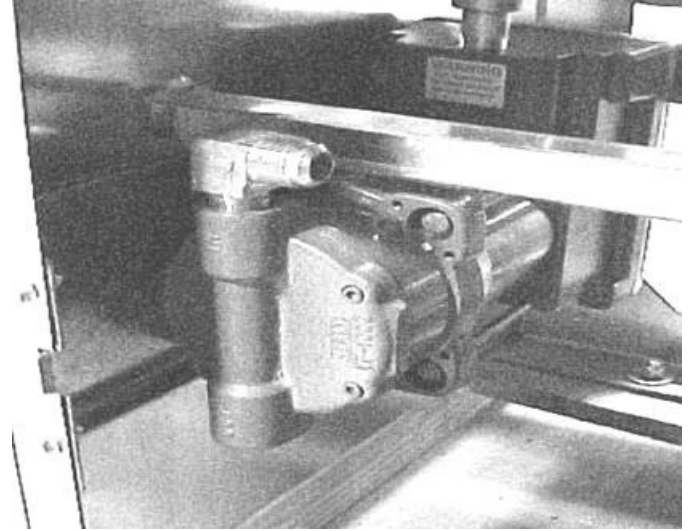
Mount the electrical conduit on the VP1000: (See Photo N Below)

- Get the 1/2" x 3" conduit nipple and thread through the motor wires to secure the nipple into the motor.
- Install the 1/2" electrical elbow to the nipple from above – use care not to twist the wires during the installation. Completely tighten the elbow to face toward the rear of the VP1000, see photo N.
- Next, install, in the elbow, the 1/2" close nipple, followed by the female half of the electrical union.

- Lastly, use Oil and gasoline compatible PTFE tape to install a 1/2" NPT x 5/8" flare elbow in the 'IN' port of the pump. Face the elbow to the right when looking at the front of the pump, see photo N.



**Photo N**

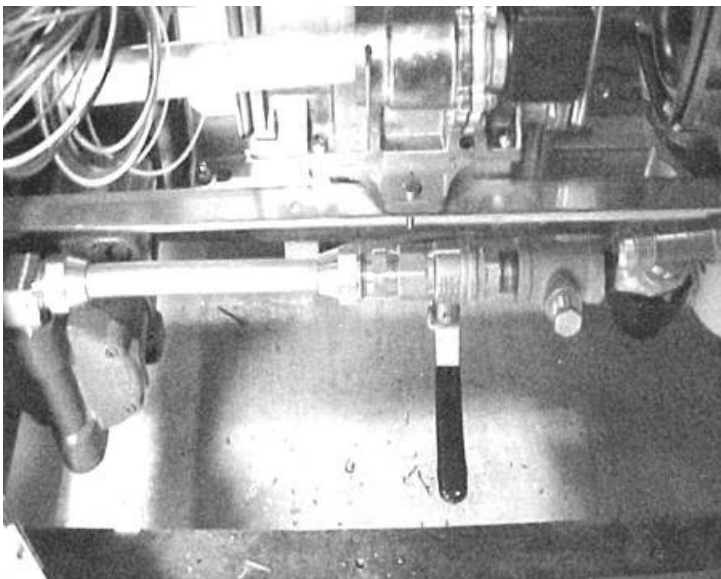


**Photo O**

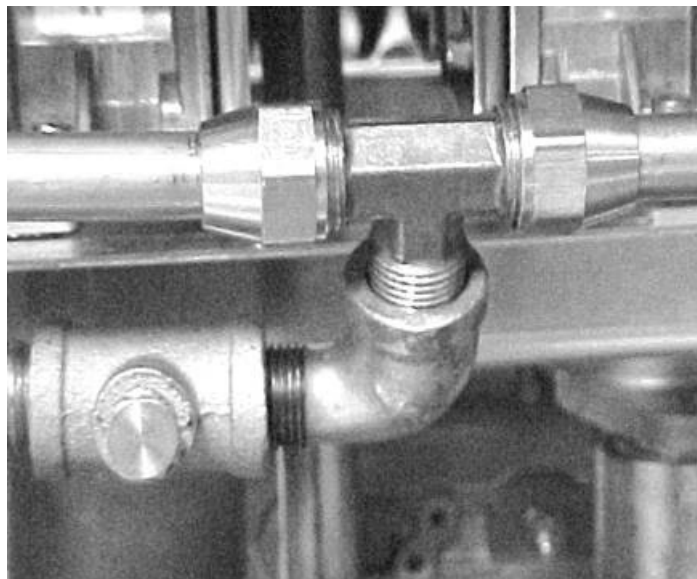
Mount the VP1000 and the vapor plumbing:

- Mount the pump/bracket assembly in the dispenser from the "B" side, (this is the side opposite the IGEM board #173976) using four 1/4" x 1/2 sheet metal screws, see photo O, View From "B" Side.
- On the 'B' side of the dispenser, in the hydraulics area, locate the 3/4" vapor coupling on the right hand side under the vapor barrier. Install a 3/4" NPT x 5/8" flare elbow into the 3/4" coupling, completely tighten to face directly toward the cover panel opening.
- Still on the 'B' side, locate the left end 3/4" vapor coupling protruding from the vapor barrier. Install a 3/4" NPT x 5/8" flare straight fitting into the threaded hole.
- Get the preformed 5/8" tube labeled left and attach the short leg to the left fitting just installed. Do not completely tighten at this time.
- Get the preformed tubing labeled right and install in the right end elbow fitting. Do not completely tighten at this time.

## 11. CONNECTING VAPOR LINES: (ref. Photos P, Q & R)



**Photo P**



**Photo Q**

- ❑ Make the pipe thread connections below using pipe thread compound as required.
- ❑ Get the 1/2" NPT x 5/8" x 5/8" flare tee and insert between the two preformed 5/8" copper tubes to be sure the tubes can be securely tightened, but **DO NOT COMPLETELY TIGHTEN**.
- ❑ Remove the tee and thread into the 1/2" street elbow, tighten to position shown in photo Q. To the elbow, add the 1/2" reducing tee and orient tee so the 1/4" branch opening is 75° to the elbow (facing the installer) with the elbow on the right and facing up. Install the 1/4" plug into the 1/4" opening on the tee.
- ❑ Install the 1/2" close nipple into the tee and follow with the 1/2" ball valve. Orient the ball valve so the lever is on the bottom when the 1/4" plug is facing sideways, see photo P.
- ❑ Install the 1/2" x 5/8" straight flare fitting into the ball valve.
- ❑ Reinstall the 5/8" flare tee back between the two preformed pipes, with the flare fitting facing the VP1000 and final tighten the flare nuts. The ball valve lever should be on the bottom and the 1/4" pipe plug horizontal facing you. Be sure the slope of the two pipes is downward and slopes to the tee.
- ❑ Measure and cut a length of 5/8" OD copper tube necessary to run from the pump inlet flare fitting to the flare fitting on the ball valve. Cut the copper tubing and slide on the flare nuts before flaring the ends. Carefully position this vapor tube to align fittings for tightening. Secure tubing connections to the pump and ball valve. Use care not to kink the tubing and maintain the slope downwards.
- ❑ On the "A" side of the dispenser, install the 3/4" pipe plug to the left end of the vapor cross and the 3/4" NPT x 5/8" flare elbow in the right end. Completely tighten the flare elbow so it is horizontal to slightly upward facing the out port of the VP1000.
- ❑ On the 'B' side, install the 1/2" NPT x 5/8" flare elbow into the out port of the VP1000. Completely tighten until horizontal to downward facing the flare elbow on the vapor tee. (Use tape, not pipe dope)

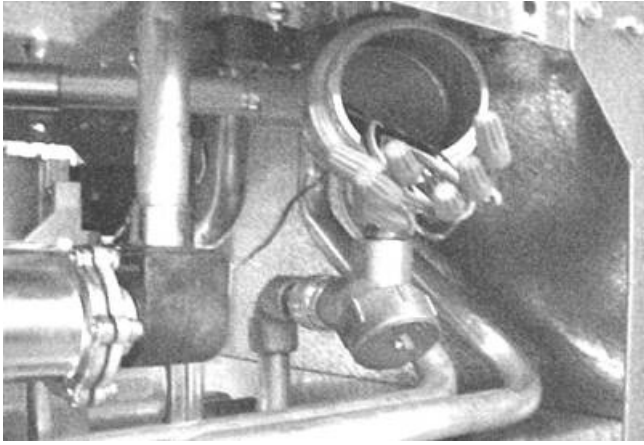
- ❑ Measure and cut appropriate length of 5/8" copper tubing to reach from the flare fitting on the vapor cross to the fitting in the VP1000 out port. Use 5/8" tubing bender to fit pipe appropriately to fittings if necessary see photo K.
- ❑ Slide on the flare nuts before flaring the ends.
- ❑ Carefully position this vapor tube to align fittings for tightening. Secure tubing connections to the pump and vapor cross. Use care not to kink the tubing and maintain the slope downwards.

## 12. INSTALLING THE SEALED NIPPLE ASSEMBLY: (See Photos R & S)

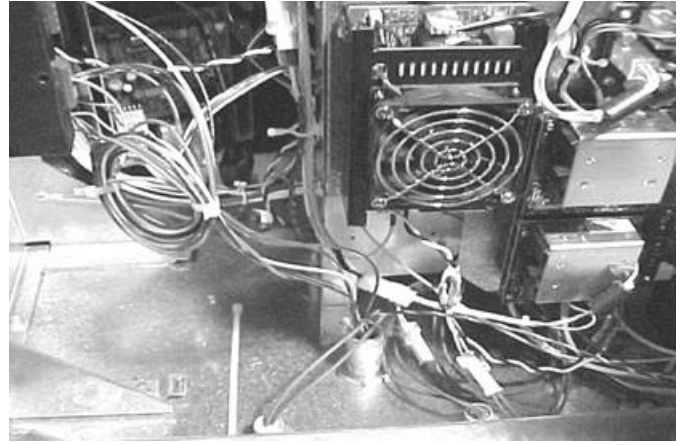
**NOTICE:** THE INTERFACE MODULE THAT IS SUPPLIED HAS A HARNESS ATTACHED AND A WIRING PLUG FOR THE AC CONNECTIONS. ALSO SUPPLIED IS THE SEALED NIPPLE ASSEMBLY (1346) THAT MUST BE INSTALLED BETWEEN THE ELECTRONICS AND HYDRAULIC AREAS OF THE DISPENSER CABINET.

- ❑ Looking in the "B" side of the electronics cabinet, notice on the lower left of the electronics board support column, there is either a plugged hole (remove plug at this time), or an open hole where the WayneVac™ conduit was removed from the hydraulics to the electronic compartment. Get the 1346 Sealed Nipple assembly and remove the first nut and washer. Turn the remaining nut down on the nipple as far as it will go.
- ❑ Carefully slide the threaded nipple end wires down from the electronics cabinet to the hydraulics area see photo S.
- ❑ Slide the washer and nut removed above, back over the wires and thread on to the nipple, approximately 4 turns, do not tighten until electrical is complete see photo S.
- ❑ Install a 3/4" electrical elbow onto the sealed nipple. Tighten to face the female half of the electrical union that's attached to the VP1000.
- ❑ Install a 3/4" x 1/2" electrical reducing bushing to the 3/4" elbow followed by a 1/2" x 7" electrical nipple, then a 1/2" electrical coupling followed by a 1/2" x 5" electrical nipple.
- ❑ Get the "J" box and install a 3/4" x 1/2" reducing bushing in each 3/4" threaded hub.
- ❑ Position the "J" box as shown in photo R, pull wires through and install onto the 1/2" x 5" electrical nipple being careful not to twist the wires.
- ❑ Install a 1/2" electrical close nipple to the bottom port of the "J" box.
- ❑ Get the 1/2" pull elbow and remove the cover. Install onto the 1/2" close nipple and tighten to the position shown in photo R.
- ❑ Attach the male half of the electrical union to the pull elbow. Pull wires from the female half of the union through the male half, through the pull elbow and into the "J" box.
- ❑ Tighten the union half's together being careful not to pinch wires and install cap on elbow.
- ❑ Tighten the nuts on the sealed nipple to secure to barrier panel.





**Photo R**

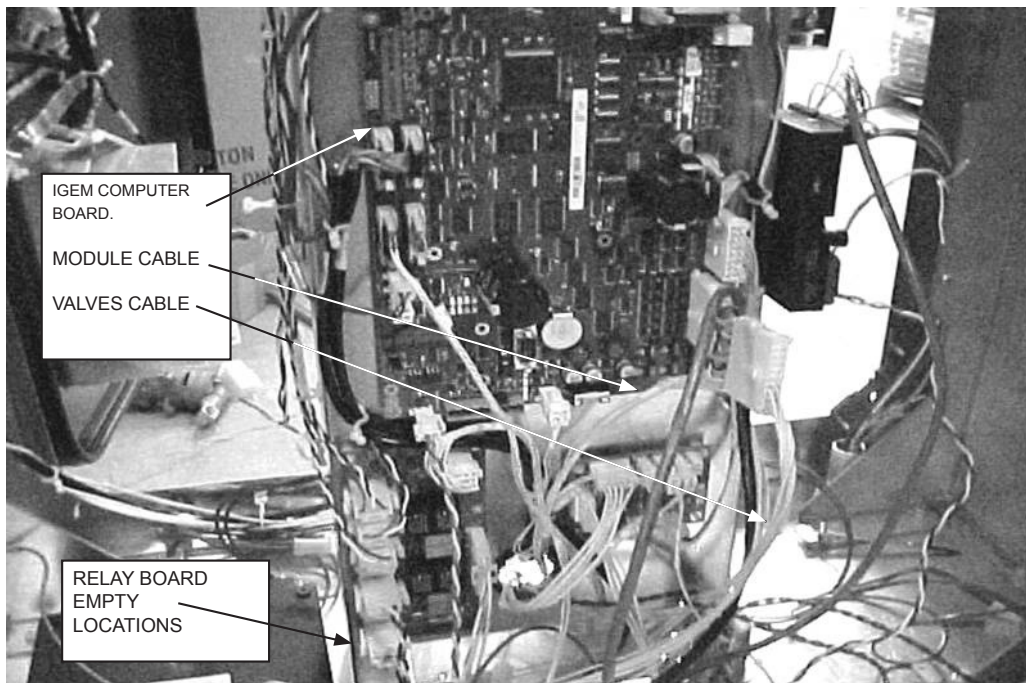


**Photo S**

- ❑ Leaving about 6" of wire on both the wires coming from the motor and from the sealed nipple, cut off excess wire and strip approximately 1/2" of insulation from all wires.
- ❑ Use wire nuts to join the wires, color for color, together. There may be some extra wires in some sealed nipples, cap these off and dress aside.
- ❑ Keep wires clear of pinch points and from interference, make sure no wires overhang the box openings and replace the cover on the junction box.

### 13. WIRING INSIDE THE ELECTRONICS COMPARTMENT

- ❑ Cut the wires coming from the sealed nipple assembly in the electronics cabinet at least twenty inches long and strip all wires 1/2".
- ❑ Connect the wires from the sealed nipple to the interface module as follows:
  - Black wire to 'motor ' on module
  - White wire to 'neutral' on module
  - Red wire (either) to 'output 1' on module
  - Red wire (other) to 'output 2' on module
  - Orange wire to 'fault common' on module
  - Purple wire to 'fault input' on module
  - Green wire needs a #8 ring tong lug installed and connected to any chassis ground (frame)
  - Some sealed nipples may have some extra wires, cap these and bundle them neatly out of the way.
- ❑ The black and white twisted pair of wires with a connector should be connected to an available AC outlet on the dispenser Relay Board #887225 see photo T.
- ❑ The male/female multiconductor cable that is wired to the interface module is routed up to the computer board, J3. Disconnect the valves cable already in J3 and install in the female side of the double connector on the harness. The entire assembly is then installed back into J3 on the Computer board #173976 see photo T.
- ❑ Carefully position the wired module on the edge of the center upright sheet metal panel "B" side, select a blank hole, and slide over the 8-32 Tinnerman nut supplied in the electronics kit. Mount the module to the Tinnerman clip using the 8-32 x 5/8" screw and washer supplied.



**Photo T**

- Install the following labels supplied:
  - NOTICE label for current increase (1405), install on the frame rail near the existing power consumption label.
  - Large NOTICE label (1406) relating to the vapor recovery upgrade and how to reset the electronic module should be installed near the module, where it will be readily visible to a service technician on the junction box cover.
  - UL, retrofit kit identification number (1410), install on the electronic module.

#### **14. CONNECTING HEALY SYSTEMS DISPENSING EQUIPMENT**

- Completing the connection of Healy Systems dispensing equipment requires the installation of Healy Systems Phase II dispenser adaptors, hoses and nozzles (Hanging Hardware).
- If applicable, remove existing non-Healy hanging hardware (from the dispenser product outlet adaptor to and including the nozzles).
- Vapor ready dispensers may require a Healy Systems adaptor to make the hose threads compatible with other Healy Systems equipment. Install necessary adaptor following instructions packed with the adaptor. Various adaptors and pigtails are available, depending on how the dispenser is configured: M34 metric (Healy designation F3 or S3) or balance ready (Healy designation S4).
- Healy Vapor Recovery Hoses are available in various lengths to satisfy local ordinances and still provide “far side” fueling capability. Install these following instructions contained on the shipping box.
- Breakaways are required: Install either Model 8701VV breakaway or Model 807 swivel breakaway; install using the instructions supplied with the unit.
- The Healy Systems nozzle Model 900 (EVR) is the only nozzle necessary to complete the upgrade. Check to be sure the nozzle hanger is mounted in the highest position. Be sure to check for proper fit in the nozzle holster and that the nozzle can be locked in the off position. Also, be sure that when the nozzle is locked, that the dispenser can not be activated from the locked position.

#### **15. VP1000 Theory of Operation**

The Healy Systems VP1000 is a self-contained rotary vane pump, designed for gasoline vapor recovery utilizing various parts of the Healy System Vapor Recovery product line. It is intended for use by either OEM dispenser/pump manufacturers or as an after market add-on to make existing equipment compatible with Healy System technology. In order to convert to ‘others’ equipment, an electronic interface is required to adapt the targeted pump/dispenser to the new vapor recovery equipment. The interface senses when authorization to dispense has been given and sends signals to the motor to operate at a low speed for one hose, or a higher speed for two hoses. It also functions to shut off the pump/dispenser if it senses that the vapor pump is not operating properly. The vacuum is regulated at a level sufficient to clear liquid gasoline from the vapor path in MPD applications. The actual amount of vapors withdrawn is controlled by the Healy nozzle, itself, in response to the liquid gasoline flow rate.

## MOTOR SPECIFICATIONS

Horsepower	1/8 HP
Voltage	120 VAC

## INTERFACE SPECIFICATIONS

Input voltage	120 VAC
Relay current capacity	5AAC
Input signals	AC and DC voltages up to 130 VAC max
Motor Input signal	5 VDC @ 20 Hz 50% Duty Cycle

### 16. TESTING THE SYSTEM:

- Carefully review all work completed, being sure all mechanical joints are thoroughly tightened and electrical connections sealed.
- Open the product crash valves and restore power to the dispenser.
- With the power on, but no nozzles authorized, the VP1000 should not be running (unless the ambient temperature is below 40°F), but the power LED (yellow) should be energized on the interface module.
- Authorize one handle and the vacuum system should activate when the gasoline flow control valve is engaged. Repeat for all other nozzles, individually testing each nozzle on each side of dispenser. With each authorization, one of the green LED's on the interface module should illuminate and the VP1000 activate.
- Note: For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the same LED activates for all grades on the same side. If the other LED activates, wiring needs to be corrected.
- Authorize one nozzle and listen to the speed of the VP1000. With only one nozzle activated, the speed will be slower than if a nozzle on each side is activated. Activate a nozzle on the other side of the dispenser and listen for the speed to change.
- To test the tightness of the vapor plumbing installed on the suction side of the system requires a 0-100" water column gauge. Connect the gauge into the 1/4" test port of the reducing tee installed earlier in section 11 Photo P. Continue by following and completing the START-UP / NEW INSTALLATION / WARRANTY / ANNUAL TESTING FORM.

## 17. TROUBLESHOOTING VP1000

- ❑ Use extreme care and caution when performing the tests listed below. If 120 VAC is accidentally applied to the fault or DC terminals, the module will be destroyed.
- ❑ With power applied to the dispenser, but no products authorized, there should be 120 VAC between neutral and power in on the module terminal strip.
- ❑ As above, with any product authorized, there should be single speed power applied to the VP1000. Verify this by checking for 2-3 VDC from OUTPUT 1 (RED WIRE) to FAULT COMMON (ORANGE WIRE), (or from OUTPUT 2 TO FAULT COMMON) also; one GREEN LED should be illuminated. With a second product authorized on the opposite side of the dispenser i.e. one product on each side, the motor should operate at higher speed and there should be 2-3 VDC on both output 1 and 2 (to fault common) and both GREEN LED's should be illuminated.
- ❑ With the pump running, a fault can be simulated by shorting, with a jumper wire, the "FAULT INPUT" (purple wire) to FAULT COMMON (orange). This should cause the motor to shut off, the solenoid valves to lose power and the dispenser to shut down. Also, as long as the short is maintained, the red LED will be illuminated. Removing the short will not automatically reset the module. To reset the module, remove the short, remove power to the dispenser for twenty seconds and restore power. The module should now be reset and the red led extinguished. This can also be accomplished by using the power reset (PWR RESET) on the module.
- ❑ If diagnosing a problem where the LED is already illuminated, a steady light indicates a low current condition, therefore expect a vane or rotor problem. If the LED is blinking, that indicates a high current condition and would expect to find a jammed rotor or vapor line flooded with product. See Start-up / New Installation / Warranty / Annual Testing Form.
- ❑ The electronics of the motor will make three attempts to have a successful start of the motor. If it detects a problem, on the fourth unsuccessful start, it will short the fault line to signal minus (DC-) and shut down the electronics.


### MC100 Interface Module



## 18. VP1000 VANE & ROTOR SERVICE & REPLACEMENT GUIDE

**Caution**  **Disconnect power before beginning service.**

1. The work area **must** be clean and have sufficient lighting.
2. Disconnect the vapor piping connected to the **IN** and **OUT** ports of the VP1000 cover assembly.
3. Remove the four Allen head screws and lock washers that secure the pump cover assembly to the pump housing and remove the cover carefully.

**Caution**  **Use a spill cloth when removing the cover, as there may be some gasoline inside the pump cavity.**

4. Carefully turn the rotor assembly by hand until the shaft key notch is at the 12 o'clock position. (See Figures)
5. Remove the rotor, vanes and shaft key from the pump housing.

**Note:** Place your hand or a container under the rotor while removing. Do not use any sharp objects that would scratch the surfaces of the pump cavity, pump shaft, rotor, or vanes.

6. Rotate the shaft by hand. If the shaft does not rotate freely, the entire vacuum pump needs replacement (p/n VP1000-5 or RVP1000-5).
7. If the rotor and vanes are cracked, chipped, excessively worn or excessively dirty, the rotor and vanes should be replaced because cleaning will not remedy these conditions (p/n VP1000VRC-G, VP1000VRC-P or VP1000VRC).
8. If there is no visible damage, use a lint-free cloth with isopropyl alcohol to clean the rotor and vanes.
9. Using a lint-free cloth with isopropyl alcohol, thoroughly clean: the inside of the pump ring and rear of the pump cavity, the rotor shaft, and the inside of the pump cover.
10. Reposition the shaft (if necessary) so that the shaft key notch is in the 12 o'clock position. Install the cleaned original or new shaft key onto the shaft.
11. Carefully install the cleaned original or new rotor onto the shaft followed by the cleaned original or new vanes into the rotor.

**Note:** The rotor assembly should slide on to the shaft easily, without excessive force. (Rotors and vanes are reversible)

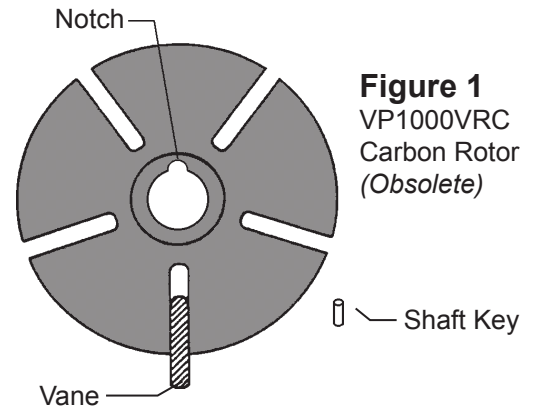
12. Lightly lubricate and install the new O-Ring for the pump housing.

**Note:** Do not allow any lubricant to get inside the pump housing.

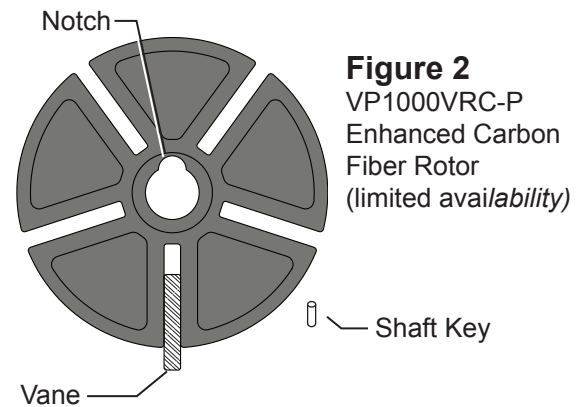
13. Install the pump cover using the four Allen head screws and lock washers removed in step 3 and cross tighten.

**Note:** Use caution when sliding the pump cover over the O-Ring seal to prevent cutting or tearing.

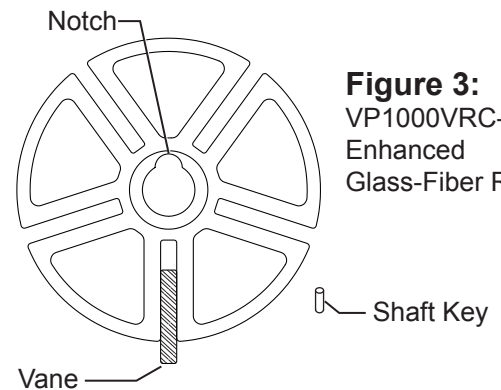
14. Re-connect the vapor piping to the **IN** and **OUT** ports of the pump cover assembly that was removed in Step 2.
15. Re-apply power. Test for normal operation. (See VP1000 Vacuum Performance Test Procedure)



**Figure 1**  
VP1000VRC  
Carbon Rotor  
(Obsolete)



**Figure 2**  
VP1000VRC-P  
Enhanced Carbon  
Fiber Rotor  
(limited availability)



**Figure 3:**  
VP1000VRC-G  
Enhanced  
Glass-Fiber Rotor

START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations – complete SIDE A and sections 3, 4, 5 and 6 of SIDE B. Submit forms to Healy Systems.**
- **Warranty Service or Annual Testing – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on SIDE A and conduct the appropriate tests specified on SIDE B. Submit Forms to Healy Systems.**

SERVICE COMPANY NAME	TELEPHONE	
SERVICE TECHNICIAN	HEALY TECH CERT #	
STATION ADDRESS	CITY	STATE
DISPENSER MAKE	VACUUM PUMP SERIAL #	

## SIDE A

DISPENSER EQUIPMENT CHECKLIST - Parts A-1 and A-2	YES	NO*
<b>A-1</b> Is all the installed dispenser hanging hardware listed in Exhibit 1 of Executive Order VR-201 or VR-202?	<input type="checkbox"/>	<input type="checkbox"/>
<b>A-2</b> Proper installation of the VP1000 requires the test port and ball valve on the inlet side of the vacuum pump. Are the test port and ball valve installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
<b>*If the answer to either A-1 or A-2 is NO, the Healy Warranty is Void.</b>		

### A-3

- THE FOLLOWING TEST WILL PERFORM A POSITIVE PRESSURE LEAK CHECK OF THE VACUUM PUMP, DISPENSER VAPOR PIPING, HANGING HARDWARE AND ALL NOZZLES ON BOTH SIDES OF THE DISPENSER.
- THE VP1000 OUTLET IS NOT CONNECTED TO UNDERGROUND PIPING DURING THIS TEST.

**CAUTION: REGULATE GASEOUS NITROGEN TO 2.5 PSI (~70" WC) MAXIMUM BEFORE TESTING**

1. Install a 0-100 inch water column (" wc) mechanical gauge at the VP1000 test port.
2. Use the water column gage positive (high) pressure port.
3. Gaseous nitrogen gas can now be connected to the outlet (exhaust) port of the VP1000.
4. Test pressure **cannot** exceed 70" wc.
5. **Slowly** introduce the gaseous nitrogen to a pressure between 60 – 70" wc.
6. After reaching the pressure range, close the valve supplying the gaseous nitrogen.
7. Record the initial pressure reading on the gauge - observe and record the final pressure reading after 60 seconds.
8. Leaks must be repaired when the pressure falls more than 4" wc in 60 seconds.
9. Retest until all leaks have been repaired.
10. Record test results in Section A-4.

<p><b>A-4</b></p> <p style="text-align: center;"><b>PRESSURE TEST</b></p> <p style="text-align: center;"><b>2.5 PSI (~70"wc) Maximum</b></p>	<p><b>Initial Pressure test reading ("wc)</b></p>	<p><b>Pressure test reading after 60 seconds ("wc)</b></p>
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START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations – complete SIDE A and sections 3, 4, 5 and 6 of SIDE B. Submit forms to Healy Systems.**
- **Warranty Service or Annual Testing – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on SIDE A and conduct the appropriate tests specified on SIDE B. Submit Forms to Healy Systems.**

<b>SIDE B</b>			
<i>Warranty Service</i> Complete Troubleshooting Sections <b>B-1 and B-2</b>		<i>Start-up/ New Installations/ Annual Testing</i> Complete Sections <b>B-3 through B-6</b>	
<b>B-1</b>	<p style="text-align: center;"><b>Control Module Fault Light</b> (Circle one)                      <b>Flashing (LED)</b>                      <b>Steady (LED)</b></p> <ol style="list-style-type: none"> <li>1. All fault conditions require removal and cleaning or replacement of the rotor and vanes located inside the vacuum pumps round front cover assembly. Use the <b>VP1000 ROTOR &amp; VANE SERVICE AND REPLACEMENT GUIDE</b> in the applicable dispenser retrofit manual of the ARB Approved Installation, Operation and Maintenance Manual for Executive Orders VR-201-O and VR-202-O.</li> <li>2. Clean all surfaces including vanes, rotor, rotor housing and cover assembly.</li> <li>3. Manually spin and inspect the motor shaft for bearing wear before re-installing the rotor kit.</li> <li>4. Replace motor when bearings or shaft are damaged or worn.</li> <li>5. Check O-ring seal before replacing rotor cover assembly.</li> </ol>		
<b>B-2</b>	<p>Re-Assemble / Reset Vacuum Pump and Module. (Power must be removed from both the vacuum pump and the <b>module for 20 seconds to reset the system</b>) using the power reset switch on the MC100 module.</p>		
<b>B-3</b>  Dispenser Vapor Line Integrity Test	<ol style="list-style-type: none"> <li>1. Install 0-100 inch water column (“ wc) vacuum mechanical gauge at the VP1000 test port.</li> <li>2. Authorize the dispenser for fueling. The VP1000 will begin to run.</li> <li>3. Close the ball valve at the pump inlet.</li> <li>4. Record the initial vacuum reading on the gauge – observe and record the final vacuum reading after 60 seconds.</li> <li>5. Open the ball valve at the pump inlet.</li> <li>6. Leaks must be repaired when the vacuum reading falls more than 4” wc in 60 seconds.</li> <li>7. Retest until all leaks have been repaired.</li> <li>8. Record data in Section B-4.</li> </ol> <p><b>Note: If the initial vacuum reading is less than 60” wc, it could indicate a problem with the VP1000. Remove the dispenser from service. Use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-4</b>	VACUUM TEST Using VP1000 as vacuum source	Initial Vacuum test reading (“ wc)	Vacuum test reading after 60 sec. (“ wc)
<b>B-5</b>  Dispenser Vacuum Test	<p>With one side of the dispenser authorized (VP1000 running) and the ball valve at the pump inlet open, dispense in handheld position a minimum of 0.5 gallons of fuel into a vehicle or test tank. Record the vacuum level while dispensing. Repeat test for the other side of the dispenser.</p> <ol style="list-style-type: none"> <li>1. Side “A” Dispensing Vacuum _____” wc</li> <li>2. Side “B” Dispensing Vacuum _____” wc</li> </ol> <p><b>Note: If the dispensing vacuum is less than 60” wc, remove the dispenser from service. See the troubleshooting section of the manual or contact FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-6</b>  Audible Increase Test	<p>Test the VP1000 Vacuum Pump for normal operation. Use the 6 step procedure titled, “Testing the VP1000 Vacuum Pump for normal operation using the following test procedure.” in Section 1.1 (Weekly Inspection and Testing) of the Healy Systems Scheduled Maintenance document in the ARB Approved Installation, Operation and Maintenance Manual for the Healy Phase II EVR System not Including ISD. This is to verify that the pump recognizes when both sides of the dispenser are activated for fueling.</p> <p>Does the VP1000 Vacuum Pump change speeds (audible increase) when both sides are activated for fueling?  <div style="text-align: center;">Yes    No</div> </p> <p>If the answer is no, <b>use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
Repairs - Comments		To Obtain Returned Materials Authorization number (RMA#) Call 800-984-6266 Forms can be faxed to Franklin Fueling Systems Customer Service at 800-225-9787	



Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



**WAYNE-DRESSER 1V, 2V, 3V, & 4V™ SERIES DISPENSER  
RETROFIT for HEALY SYSTEMS, INC.  
MODEL VP1000  
VAPOR RECOVERY ASSIST SYSTEM  
(KIT Z084)**

**OUTLINE**

**Notice: USE THIS PROCEDURE IF CONVERTING A BALANCE VAPOR RECOVERY SYSTEM TO A HEALY VAPOR RECOVERY ASSIST SYSTEM**

This Manual is to be used for new, replaced, retrofitted, or reconditioned dispensers/pumps.

- 1. Purpose**
  - 2. Safety**
  - 3. Models Covered**
  - 4. Parts Lists**
  - 5. Tools Required**
  - 6. Dispenser Access**
  - 7. Survey Scope of Work**
  - 8. Installing The Healy VP1000 System**
  - 9. Installing The Sealed Nipple Assembly**
  - 10. Wiring Inside The Electronics Compartment**
  - 11. Connecting Healy Systems Dispensing Equipment**
  - 12. VP1000 Theory Of Operation**
  - 13. Testing The System**
  - 14. Trouble Shooting The VP1000**
  - 15. VP1000 Vane & Rotor Service & Replacement Guide**
- Start-up / New Installation / Warranty / Annual Testing Form**

## 1. PURPOSE:

This procedure describes the tools, methods and skill levels required to install a Healy Systems, Inc. Model VP1000 Vapor Recovery pump in vapor ready Wayne-Dresser™ 1V, 2V, 3V, & 4V series gasoline dispenser. Only Healy trained and certified contractors will be able to perform these retrofits or warranty will be void. The installer shall be a skilled petroleum technician and thoroughly familiar with the requirements of State, Federal and local codes for installation and repair of gasoline dispensing equipment. Also, they shall be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation. NOTE: All electrical and hydraulic plumbing fittings referred to in these instructions must be UL “listed” or “recognized” for the purpose.

**Note:** Installations of vapor piping into the inlet side of the vacuum pump should be sloped such that the natural flow direction is toward the vacuum pump. However, it is permissible to have a piping slope tilted away from the vacuum pump provided that all other applicable tests (Dispenser integrity and V/L) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

**Note:** For installations with In-Station Diagnostics (ISD), the vapor flow meter shall be installed on the down stream side of the vacuum pump. Every effort shall be made to install the vapor flow meter so that vapor piping between the vacuum pump and the vapor flow meter is sloped such that the natural flow direction is toward the vapor flow meter. However, it is permissible to have the piping slope away from the vapor flow meter provided that all other applicable tests (Dispenser integrity, V/L and ISD Operability) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

## 2. SAFETY:

Before installing the equipment, read, understand and follow:

- The National Electrical Code (NFPA 70)
- The Automotive and Marine Service Code (NFPA 30A)
- Any national, state and local codes that may apply.

The failure to install the equipment in accordance with NFPA 30A and 70 may adversely affect the safe use and operation of the system.

Accurate, sound installations reduce service calls: Use experienced, licensed contractors that practice accurate, safe installation techniques. Careful installation provides a sound troubleshooting framework for field repairs and can eliminate potential problems.

1. Read all instructions before beginning.
2. Follow all safety precautions:
  - Barricade the area.
  - Do not allow vehicles or unauthorized people in the area.

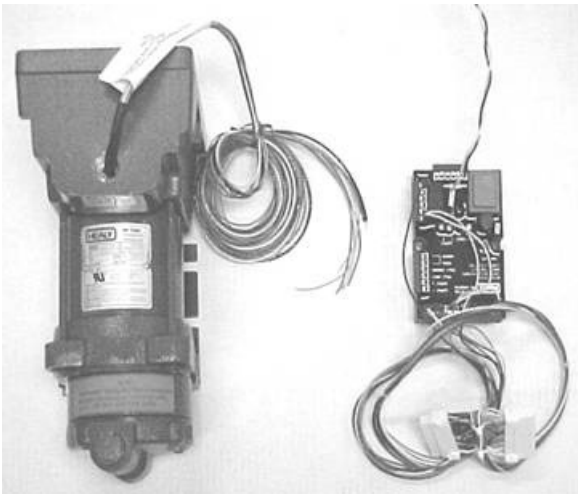
- ❑ Do not smoke or allow open flames in the area.
  - ❑ Do not use power tools in the work area.
  - ❑ Wear eye protection during installation.
3. Use circuit breakers for multiple disconnects to turn off power and prevent feedback from other dispensers.

**3. MODELS COVERED:**

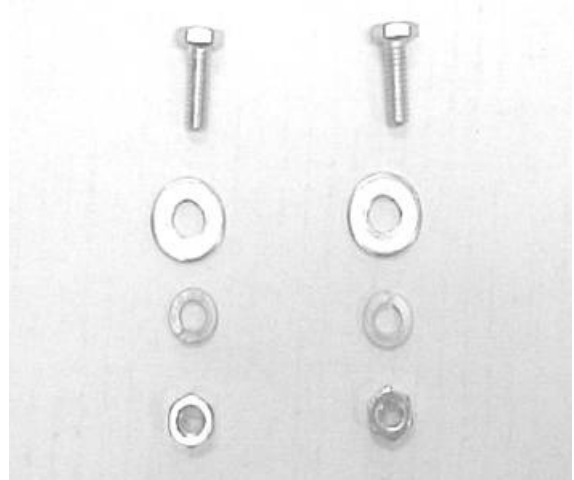
Wayne 1V, 2V, 3V, & 4V™ series of blending and non-blending dispensers. The addition of the Healy Systems VP1000 to these dispensers will increase the current draw of the dispenser by 2 amps. Use the label supplied to note this change.

**4. PARTS LISTS: (See Photo A)**

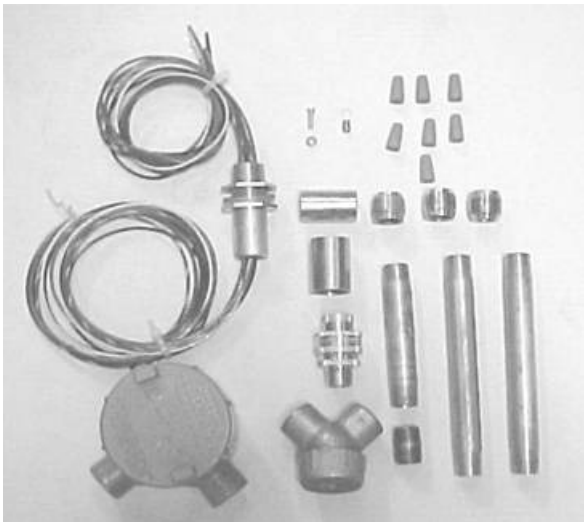
- 1 VP1000 Vacuum Pump
- 1 1365A Wire Harness / MC100 Series Interface Module Assembly (for 3V) or
- 1 1363A Wire Harness / MC100 Series Interface Module Assembly (for 1V & 2V)



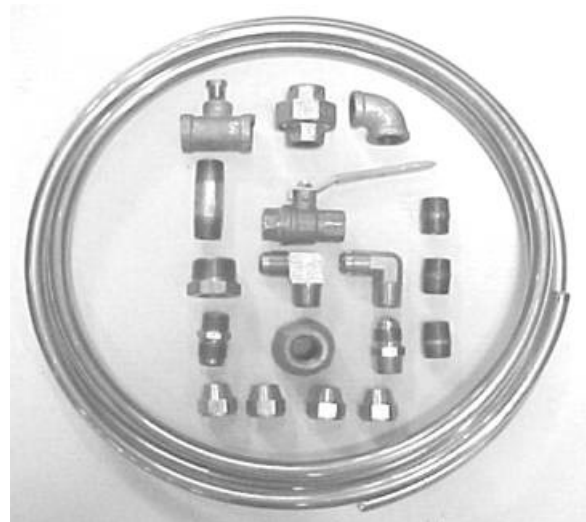
**PHOTO A**



**PHOTO B**



**PHOTO C**



**PHOTO D**

### **HARDWARE KIT Z084H: (See Photo B)**

- 1 1/4-20 bolts, washers, lock washers and nuts.

### **ELECTRICAL KIT Z084E: (See Photo C)**

- |   |                                 |   |                                  |
|---|---------------------------------|---|----------------------------------|
| 7 | Wire nuts                       | 1 | 8-32 x 3/4" machine screw w/ nut |
| 1 | 3/4" electrical coupling        | 1 | #1346 potted conduit nipple      |
| 1 | #8 Ring tong terminal           | 1 | Notice label (p/n 1406)          |
| 1 | UL Listed label (p/n 1410)      | 1 | 1/2" electrical capped elbow     |
| 3 | 3/4" x 1/2" electrical bushing  | 1 | 1/2" electrical close nipple     |
| 1 | 1/2" electrical union           | 2 | 1/2" x 7" electrical nipple      |
| 1 | 1/2" x 4 1/2" electrical nipple | 1 | 1/2" electrical coupling         |
| 1 | Explosion proof 'J' box         | 1 | Current change label (p/n 1405)  |

### **VAPOR KIT Z084V: (See Photo D)**

- |     |                                |   |                                 |
|-----|--------------------------------|---|---------------------------------|
| 2   | 1/2" NPT x 5/8" straight flare | 1 | 1/2" x 1" NPT bell reducer      |
| 12' | 5/8" OD copper tube, type 'L'  | 1 | 1/2" x 1/4" x 1/2" reducing tee |
| 1   | 1/2" ball valve                | 1 | 1/4" pipe plug                  |
| 4   | 5/8" flare nuts                | 1 | 1" x 1/2" NPT reducing bush.    |
| 1   | 1/2" NPT ell galv.             | 1 | 1/2" NPT galv. union            |
| 1   | 1/2" NPT x 2-1/2" galv. nipple | 3 | 1/2" NPT galv. close nipples    |
| 2   | 1/2" NPT x 5/8" flare elbow    |   |                                 |

### **MATERIALS SUPPLIED BY INSTALLER:**

- ❑ Thread Sealing Compound – non-Setting, UL Classified for use on all tapered thread, non-electrical, plumbing fittings.
- ❑ Oil and gasoline compatible PTFE tape

### **5. TOOLS REQUIRED:**

- ❑ 1/2" or 3/8" ratchet set w/ sockets 1/4" through 9/16" + 3" extension
- ❑ 9" lineman's pliers
- ❑ Assorted open end wrenches 1/4" through 3/4"
- ❑ Wire cutters/strippers 18 AWG and 26 AWG
- ❑ 1-1/8" Greenlee type sheet metal punch
- ❑ Mechanical hand drill (egg-beater type)
- ❑ Assorted drill bits 1/16" through 7/16"

- ❑ Assorted screwdrivers (flat blade-one must be 1/8" wide and Phillips)
- ❑ 5/8" copper tube bending tool
- ❑ 5/8" copper tube flaring tool
- ❑ Copper tubing cutter
- ❑ Electrical multi-Oeter
- ❑ Small hand brush (1-1/2" thick, for clearing chips)
- ❑ 12" adjustable wrench
- ❑ 10" pipe wrench
- ❑ Tape measure
- ❑ Allen wrenches

## 6. DISPENSER ACCESS:

- ❑ Secure Dispenser Access keys from Station Management.
- ❑ Lock-out and tag-out all electrical power to dispenser being modified.
- ❑ Remove both lower dress panels.
- ❑ Remove side skin on the left side as viewed from the 'A' side ('J' box). This is the side where the 1" balance vapor pipe is installed.
- ❑ Open both upper doors to the electronics compartment.

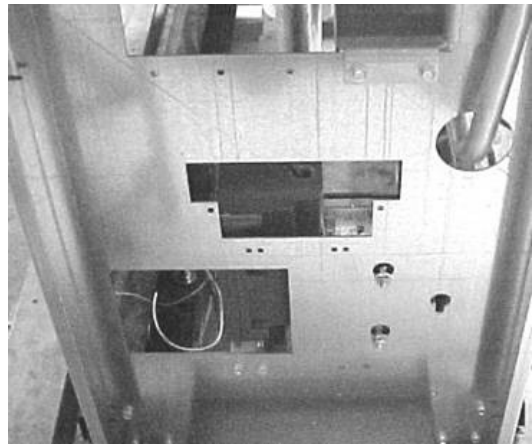
## 7. SURVEY – Scope of Work: *Perform this step before beginning steps 8 thru 10.*

Read and familiarize yourself with the theory of operations sheet and wiring instructions for the VP1000 Vapor Pump. The installation of the pump is accomplished by rotating the motor mounting bracket bolting it to the dispenser frame on the same side as the electrical 'J' box in the free space on the left hand side, see photos E & F. From this survey, you will have an indication of where the vapor plumbing fittings need to go and where the electrical conduits need to be routed. The Healy potted conduit nipple is installed in the vapor barrier above the meters, in a 1 1/8" hole that is already available but is plugged. See Photo K and Section 9.

**CAUTION: ALL POWER TO DISPENSER UNDER MODIFICATION SHOULD BE COMPLETELY DISCONNECTED AND CAPPED OFF AT JUNCTION BOX TO AVOID UNINTENTIONAL FEEDBACK FROM OTHER DISPENSERS!!**



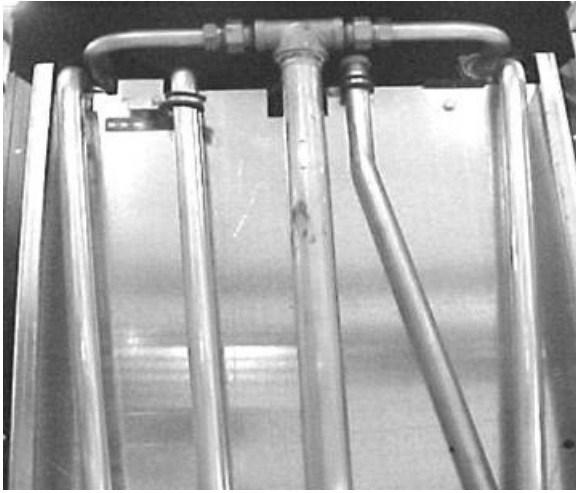
**Photo E**



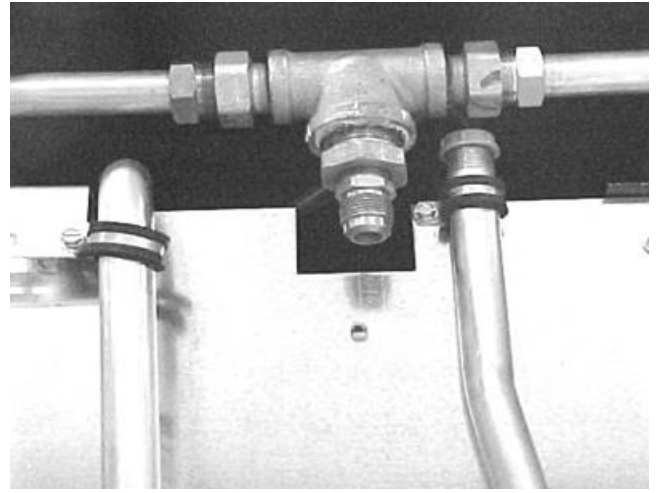
**Photo F**

## **8. INSTALLING THE HEALY VP1000 SYSTEM:**

- ❑ Locate the 1" vapor down pipe on the side of the cabinet and remove the 'U' bolt that secures the pipe to the cross rail in the hydraulics area.
- ❑ On the top of the down pipe, loosen the two flare nuts and release the two vapor pipes coming into the tee from each side of the dispenser. Caution: the pipe is now loose and could fall down, see photo G.
- ❑ Remove the pipe from the dispenser and remove the tee from the pipe. Save the tee, discard the pipe.
- ❑ Use pipe dope and install a 1" x 1/2" NPT reducer bushing into the branch of the tee.
- ❑ Install a 1/2" NPT x 5/8" straight flare fitting into the reducer installed above.
- ❑ Re-install the tee back into the dispenser with the branch facing downward and re-connect the vapor tubes removed earlier. Be sure to tighten the vapor tube flare nuts securely, see photo H.
- ❑ Get the VP1000 pump and looking from the front (pump end), remove the four screws holding the black mounting bracket to the motor and reposition the bracket 90° clockwise, then re-install the screws. This keeps the pump inlet in the correct "up" orientation when mounted in the cabinet, see photo E.
- ❑ Place two of the 1/4"- 20 mounting bolts, flat washers, lock washers and nuts loosely together and into the slots on the motor mounting base.
- ❑ On the left side of the cabinet ('A' side with 'J' Box), notice the three keyhole punch-outs, see photo F. Lift the motor and push the washer/nut combinations through from inside the cabinet to mount the motor tight to the side frame.



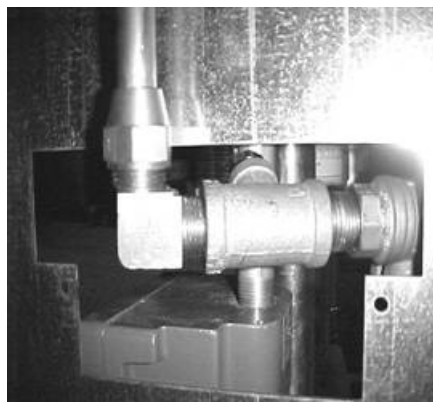
**Photo G**



**Photo H**



**Photo I**



**Photo J**



**Photo K**

Use Oil and gasoline compatible PTFE tape on the following steps.

- ❑ Get the 1/2" galvanized union and thread a 1/2" galvanized close nipple into each end.
- ❑ Separate the union and install the end that does not have the nut on it into the inlet of the vacuum pump. To the other end of the union, assemble the 1/2" galvanized elbow and then a 1/2" x 2-1/2" galvanized nipple into the elbow, see photo I.
- ❑ To the nipple above, thread on the 1/2" ball valve so that when the handle is in the open position it faces you. Completely tighten the ball valve to be about 30° below horizontal to the right, see photo I.
- ❑ To the valve, install a 1/2" close nipple then the 1/2" x 1/4" x 1/2" reducing tee and completely tighten with the branch of the tee facing to the right when looking from the union end, see photo I.
- ❑ Install the 1/4" pipe plug into the reducing tee and completely tighten.
- ❑ Install and completely tighten the 1/2" NPT x 5/8" flare elbow into the tee with the flare facing up, opposite the union fitting, see photo J.



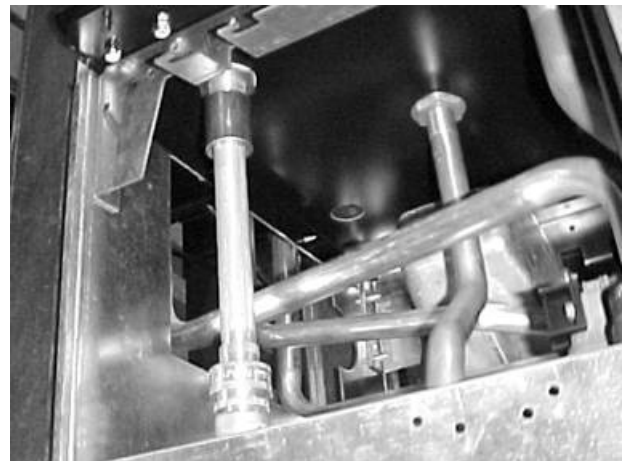
- ❑ Take the above assembly and feed over the pump motor so the flare elbow protrudes through hole in the side frame and assemble the union collar to hold the assembly in place on the motor. Completely tighten the union collar positioning the assembly as shown in photos I & J.
- ❑ Install a 1/2" x 5/8" flare elbow into the outlet of the VAC pump and tighten to face either the vapor tee mounted on the dispenser frame if available or the 1" vapor riser.
- ❑ Measure, cut, install flare nuts and flare a piece of 5/8" OD copper tube to fit between the flare fitting in the top vapor manifold and the flare elbow assembly just installed, see photo K.

## 9. INSTALLING THE SEALED NIPPLE ASSEMBLY:

- ❑ In the extreme left corner, "A" (J box) side of the vapor barrier there is a sealed knockout, (may be obscured by a plastic rain tray). Remove the bolt, nut and washer assembly to open the hole.
- ❑ Install the 1346 sealed nipple assembly by removing the first nut and washer, turn the other nut up fully on the threads and feed the wires down from the top of the vapor barrier to the hydraulics area, see photo L. Re-install the washer and nut over the wires and turn onto the first couple of threads leaving the nipple loose at this time.
- ❑ Get a 1/2" x 7" conduit nipple and install the female half of the electrical union on one end and a 3/4" x 1/2" reducer on the other end. To the reducer, attach the 3/4" electrical coupling. Install this assembly to the sealed nipple, see photo M. NOTE: Electrical fittings must be installed with a minimum of five threads.



**Photo L**



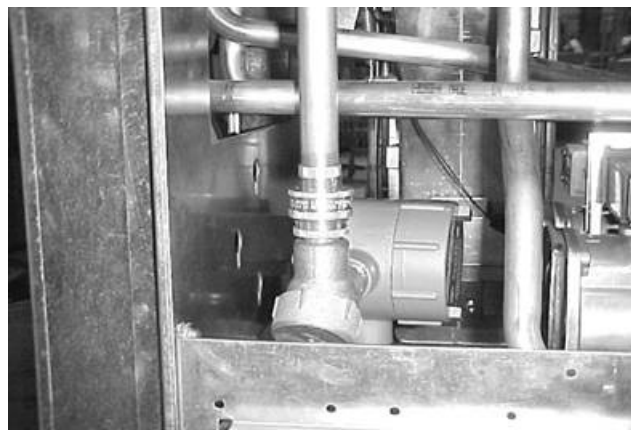
**Photo M**

- ❑ On the pump motor, install a 1/2" x 7" conduit nipple, a 1/2" electrical coupling and a 1/2" x 4-1/2" nipple, see photo N.
- ❑ Get the electrical "J" box, remove the cover and install a 3/4" x 1/2" reducer bushing into each hub. Install the "J" onto the 4-1/2" nipple positioned as shown in photo N.
- ❑ Install a 1/2" electrical close nipple to "J" box followed by the pull elbow, see photo O. Remove the pull elbow cover.

- ❑ Install the male half of the electrical union to the pull elbow. Run wires through the pull elbow and into the “J” box. Connect the union half’s together being careful not to pinch wires, reinstall the pull elbow cover and tighten the nut on the potted nipple.
- ❑ At the ‘J’ box, cut all the wires leaving at least 6” on each piece. Strip all wires about 1/2” and join the wires color for color, using wire nuts supplied. Coil all wires and place into box, replace the cover.



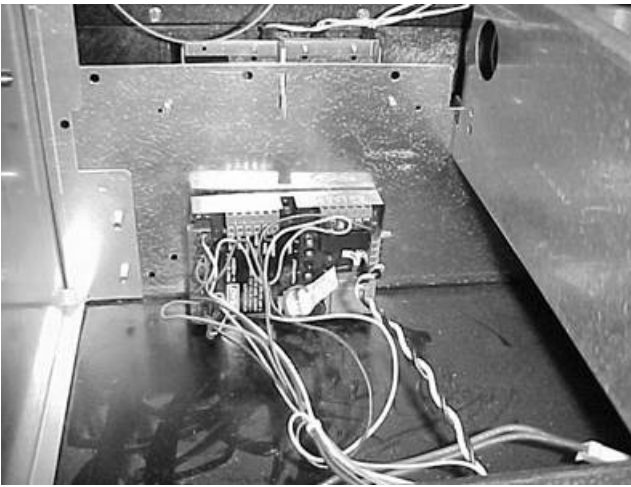
**Photo N**



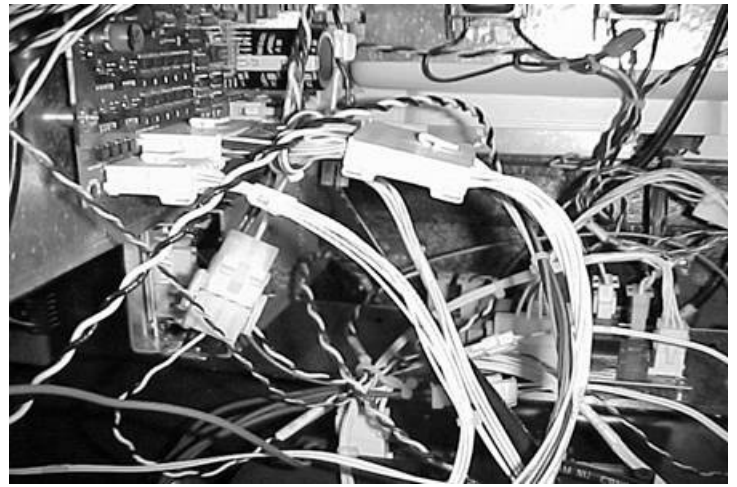
**Photo O**

## 10. WIRING THE ELECTRONICS

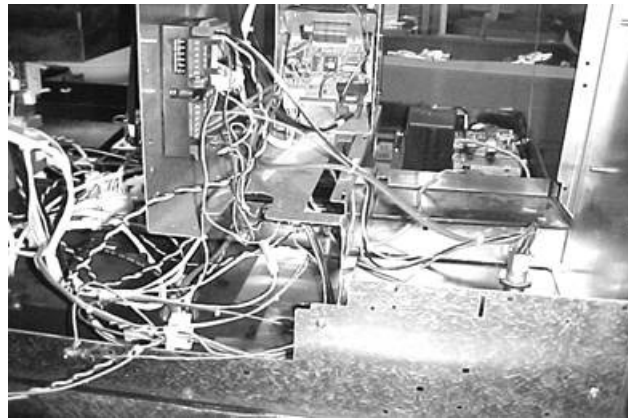
- ❑ Place the module loosely in the area for mounting, see photo P. Dress the harness wires from the module under the partition and up to the valves board in the center compartment, see photos P & Q.
- ❑ Connect the wires from the sealed nipple to the interface module as follows:
  - Black wire to ‘motor ‘ on module
  - White wire to ‘neutral’ on module
  - Red wire (either) to ‘output 1’ on module
  - Red wire (other) to ‘output 2’ on module
  - Orange wire to ‘fault common’ on module
  - Purple wire to ‘fault input’ on module
  - Green wire needs a #8 ring tong lug (provided) installed and connected to any chassis ground (frame)
- ❑ Locate the harness cable from the module and bring up to the valves board. Disconnect the existing valve wire connector in the board (J3 connector, labeled Solenoid Valves) and plug it into the harness male connector. Plug the original female connector into the male connector on the harness, see photo Q.
- ❑ Mount the module as shown in photo R, using the 8-32 x 3/4” screw and nut supplied in the electrical kit. There is an existing hole in the chassis that is the right size and in the right place for the screw.
- ❑ Locate the black and white twisted pair wire from the module with a connector and plug into any vacant receptacle on the power distribution board (CM301) located at the center of the front frame rail.



**Photo P**



**Photo Q**



**Photo R**

Install the following labels supplied:

- NOTICE label for current increase (1405), install on the inside of the cabinet panel near the existing power consumption label, see photo S.
- Large NOTICE label (1406) relating to the vapor recovery upgrade and how to reset the electronic module should be installed near the module, where it will be readily visible to a service technician on the inside of the cabinet near the nozzle spout housing, see photo T.
- UL, retrofit kit identification number (1410), install near the electronic module.



Photo S

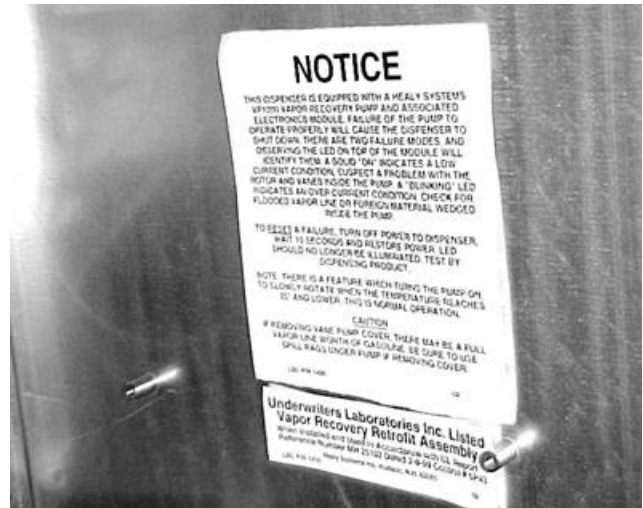


Photo T

## 11. CONNECTING HEALY SYSTEMS DISPENSING EQUIPMENT

- ❑ Completing the connection of Healy Systems dispensing equipment requires the installation of Healy Systems Phase II dispenser adaptors, hoses and nozzles (Hanging Hardware).
- ❑ If applicable, remove existing non-Healy hanging hardware (from the dispenser product outlet adaptor to and including the nozzles).
  - Vapor ready dispensers will require a Healy Systems adaptor to make the hose threads compatible with other Healy Systems equipment. Install following instructions packed with the adaptor. Various adaptors are available, depending on how the dispenser is configured: M34 metric (Healy designation F3 or S3) or balance ready (Healy designation S4).
  - Healy Vapor Recovery Hoses are available in various lengths to satisfy local ordinances and still provide “far side” fueling capability. Install these following instructions contained on the shipping box.
  - Breakaways are required: Install either Model 8701VV breakaway or Model 807 swivel breakaway; install using the instructions supplied with the unit.
  - The Healy Systems nozzle Model 900 (EVR) series is the only nozzle necessary to complete the upgrade. Check to be sure that the nozzle hanger is mounted in the highest position. Be sure to check for proper fit in the nozzle holster and that the nozzle can be locked in the off position. Also, be sure that when the nozzle is locked, that the dispenser cannot be activated from the locked position.

## 12. VP1000 THEORY OF OPERATION

The Healy Systems VP1000 is a self-contained rotary vane pump, designed for gasoline vapor recovery utilizing various parts of the Healy System Vapor Recovery product line. It is intended for use by either OEM dispenser/pump manufacturers or as an after market add-on to make existing equipment compatible with Healy System technology. In order to convert to 'others' equipment, an electronic interface is required to adapt the targeted pump/dispenser to the new vapor recovery equipment. The interface senses when authorization to dispense has been given and sends signals to the motor to operate at a low speed for one hose, or a higher speed for two hoses. It also functions to shut off the pump/dispenser if it senses that the vapor pump is not operating properly. The vacuum is regulated at a level sufficient to clear liquid gasoline from the vapor path in MPD applications. The actual amount of vapors withdrawn is controlled by the Healy nozzle, itself, in response to the liquid gasoline flow rate.

### MOTOR SPECIFICATIONS

Horsepower	1/8 HP
Voltage	120 VAC

### INTERFACE SPECIFICATIONS

Input voltage	120 VAC
Relay current capacity	5AAC
Input signals	AC and DC voltages up to 130 VAC max
Motor Input signal	5 VDC @ 20 Hz 50% Duty Cycle

### 13. TESTING THE SYSTEM:

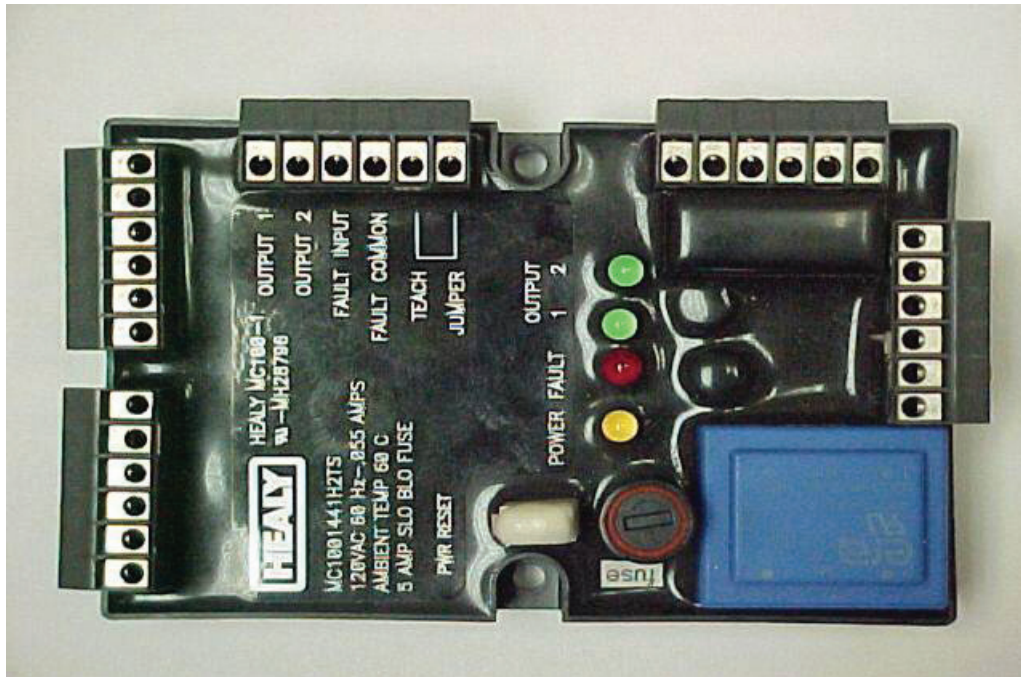
- Carefully review all work completed, being sure all mechanical joints are thoroughly tightened and electrical connections sealed.
- Open the product crash valves and restore power to the dispenser.
- With the power on, but no nozzles authorized, the VP1000 should not be running (unless the ambient temperature is below 40°F), but the power LED (yellow) should be energized on the interface module.
- Authorize one handle and the vacuum system should activate when the gasoline flow control valve is engaged. Repeat for all other nozzles, individually testing each nozzle on each side of dispenser. With each authorization, one of the green LED's on the interface module should illuminate and the VP1000 activate.
- Note: For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the same LED activates for all grades on the same side. If the other LED activates, wiring needs to be corrected.
- Authorize one nozzle and listen to the speed of the VP1000. With only one nozzle activated, the speed will be slower than if a nozzle on each side is activated. Activate a nozzle on the other side of the dispenser and listen for the speed to change.
- To test the tightness of the vapor plumbing installed on the suction side of the system requires a 0-100" water column gauge. Connect the gauge into the 1/4" test port of the reducing tee installed earlier in section 8, photo I. Continue by following and completing the START-UP / NEW INSTALLATION / WARRANTY / ANNUAL TESTING FORM.

### 14. TROUBLESHOOTING THE VP1000:

- Use extreme care and caution when performing the tests listed below. If 120 VAC is accidentally applied to the fault or DC terminals, the module will be destroyed.
- With power applied to the dispenser, but no products authorized, there should be 120 VAC between neutral and 120 VAC on the module terminal strip.
- As above, with any product authorized, there should be single speed power applied to the VP1000. Verify this by checking for 2-3 VDC from OUTPUT 1 (RED WIRE) to FAULT COMMON (ORANGE WIRE), (or from OUTPUT 2 TO FAULT COMMON) also; one GREEN LED should be illuminated. With a second product authorized on the opposite side of the dispenser i.e. one product on each side, the motor should operate at higher speed and there should be 2-3 VDC on both output 1 and 2 (to fault common) and both GREEN LED's should be illuminated.
- With the pump running, a fault can be simulated by shorting, with a jumper wire, the "FAULT INPUT" (purple wire) to FAULT COMMON (orange). This should cause the motor to shut off, the solenoid valves to lose power and the dispenser to shut down. Also, as long as the short is maintained, the red LED will be illuminated. Removing the short will not automatically reset the module. To reset the module, remove the short, remove power to the dispenser for twenty seconds and restore power. The module should now be reset and the red led extinguished. This can also be accomplished by using the power reset (PWR RESET) on the module.

- If diagnosing a problem where the LED is already illuminated, a steady light indicates a low current condition, therefore expect a vane or rotor problem. If the LED is blinking, that indicates a high current condition and would expect to find a jammed rotor or vapor line flooded with product. See Start-up / New Installation / Warranty / Annual Testing Form.
- The electronics of the motor will make three attempts to have a successful start of the motor. If it detects a problem, on the fourth unsuccessful start, it will short the fault line to signal minus (DC-) and shut down the electronics.

### MC100 Interface Module



## 15. VP1000 VANE & ROTOR SERVICE & REPLACEMENT GUIDE

**Caution**  **Disconnect power before beginning service.**

1. The work area **must** be clean and have sufficient lighting.
2. Disconnect the vapor piping connected to the **IN** and **OUT** ports of the VP1000 cover assembly.
3. Remove the four Allen head screws and lock washers that secure the pump cover assembly to the pump housing and remove the cover carefully.

**Caution**  **Use a spill cloth when removing the cover, as there may be some gasoline inside the pump cavity.**

4. Carefully turn the rotor assembly by hand until the shaft key notch is at the 12 o'clock position. (See Figures)
5. Remove the rotor, vanes and shaft key from the pump housing.

**Note:** Place your hand or a container under the rotor while removing. Do not use any sharp objects that would scratch the surfaces of the pump cavity, pump shaft, rotor, or vanes.

6. Rotate the shaft by hand. If the shaft does not rotate freely, the entire vacuum pump needs replacement (p/n VP1000-5 or RVP1000-5).
7. If the rotor and vanes are cracked, chipped, excessively worn or excessively dirty, the rotor and vanes should be replaced because cleaning will not remedy these conditions (p/n VP1000VRC-G, VP1000VRC-P or VP1000VRC).
8. If there is no visible damage, use a lint-free cloth with isopropyl alcohol to clean the rotor and vanes.
9. Using a lint-free cloth with isopropyl alcohol, thoroughly clean: the inside of the pump ring and rear of the pump cavity, the rotor shaft, and the inside of the pump cover.
10. Reposition the shaft (if necessary) so that the shaft key notch is in the 12 o'clock position. Install the cleaned original or new shaft key onto the shaft.
11. Carefully install the cleaned original or new rotor onto the shaft followed by the cleaned original or new vanes into the rotor.

**Note:** The rotor assembly should slide on to the shaft easily, without excessive force. (Rotors and vanes are reversible)

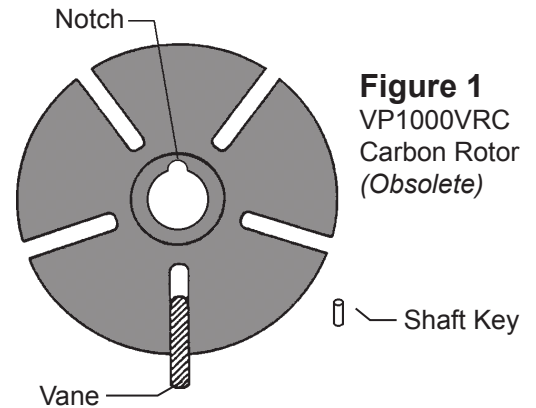
12. Lightly lubricate and install the new O-Ring for the pump housing.

**Note:** Do not allow any lubricant to get inside the pump housing.

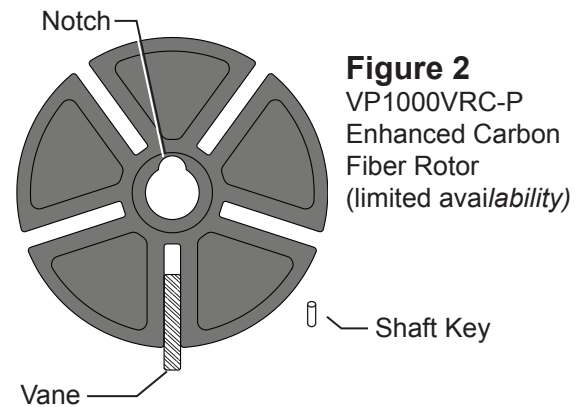
13. Install the pump cover using the four Allen head screws and lock washers removed in step 3 and cross tighten.

**Note:** Use caution when sliding the pump cover over the O-Ring seal to prevent cutting or tearing.

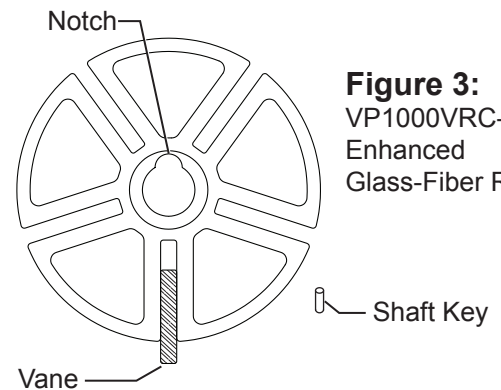
14. Re-connect the vapor piping to the **IN** and **OUT** ports of the pump cover assembly that was removed in Step 2.
15. Re-apply power. Test for normal operation. (See VP1000 Vacuum Performance Test Procedure)



**Figure 1**  
VP1000VRC  
Carbon Rotor  
(Obsolete)



**Figure 2**  
VP1000VRC-P  
Enhanced Carbon  
Fiber Rotor  
(limited availability)



**Figure 3:**  
VP1000VRC-G  
Enhanced  
Glass-Fiber Rotor



START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections 3, 4, 5 and 6 of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

SERVICE COMPANY NAME	TELEPHONE	
SERVICE TECHNICIAN	HEALY TECH CERT #	
STATION ADDRESS	CITY	STATE
DISPENSER MAKE	VACUUM PUMP SERIAL #	

## SIDE A

DISPENSER EQUIPMENT CHECKLIST - Parts A-1 and A-2	YES	NO*
<b>A-1</b> Is all the installed dispenser hanging hardware listed in Exhibit 1 of Executive Order VR-201 or VR-202?	<input type="checkbox"/>	<input type="checkbox"/>
<b>A-2</b> Proper installation of the VP1000 requires the test port and ball valve on the inlet side of the vacuum pump. Are the test port and ball valve installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
<b>*If the answer to either A-1 or A-2 is NO, the Healy Warranty is Void.</b>		

### A-3

- THE FOLLOWING TEST WILL PERFORM A POSITIVE PRESSURE LEAK CHECK OF THE VACUUM PUMP, DISPENSER VAPOR PIPING, HANGING HARDWARE AND ALL NOZZLES ON BOTH SIDES OF THE DISPENSER.
- THE VP1000 OUTLET IS NOT CONNECTED TO UNDERGROUND PIPING DURING THIS TEST.

**CAUTION: REGULATE GASEOUS NITROGEN TO 2.5 PSI (~70" WC) MAXIMUM BEFORE TESTING**

1. Install a 0-100 inch water column (" wc) mechanical gauge at the VP1000 test port.
2. Use the water column gage positive (high) pressure port.
3. Gaseous nitrogen gas can now be connected to the outlet (exhaust) port of the VP1000.
4. Test pressure **cannot** exceed 70" wc.
5. **Slowly** introduce the gaseous nitrogen to a pressure between 60 – 70" wc.
6. After reaching the pressure range, close the valve supplying the gaseous nitrogen.
7. Record the initial pressure reading on the gauge - observe and record the final pressure reading after 60 seconds.
8. Leaks must be repaired when the pressure falls more than 4" wc in 60 seconds.
9. Retest until all leaks have been repaired.
10. Record test results in Section A-4.

<b>A-4</b> <b>PRESSURE TEST</b> 2.5 PSI (~70"wc) Maximum	Initial Pressure test reading ("wc)	Pressure test reading after 60 seconds ("wc)
--	-------------------------------------	--

START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

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<b>SIDE B</b>				
	<i>Warranty Service</i> Complete Troubleshooting Sections <b>B-1 and B-2</b>	<i>Start-up/ New Installations/ Annual Testing</i> Complete Sections <b>B-3 through B-6</b>		
<b>B-1</b>	<p style="text-align: center;"><b>Control Module Fault Light</b> (Circle one)                      <b>Flashing (LED)</b>                      <b>Steady (LED)</b></p> <p>1. All fault conditions require removal and cleaning or replacement of the rotor and vanes located inside the vacuum pumps round front cover assembly. Use the <b>VP1000 ROTOR &amp; VANE SERVICE AND REPLACEMENT GUIDE</b> in the applicable dispenser retrofit manual of the ARB Approved Installation, Operation and Maintenance Manual for Executive Orders VR-201-O and VR-202-O.</p> <p>2. Clean all surfaces including vanes, rotor, rotor housing and cover assembly.</p> <p>3. Manually spin and inspect the motor shaft for bearing wear before re-installing the rotor kit.</p> <p>4. Replace motor when bearings or shaft are damaged or worn.</p> <p>5. Check O-ring seal before replacing rotor cover assembly.</p>			
<b>B-2</b>	<p>Re-Assemble / Reset Vacuum Pump and Module. (Power must be removed from both the vacuum pump and the <b>module for 20 seconds to reset the system</b>) using the power reset switch on the MC100 module.</p>			
<b>B-3</b>  Dispenser Vapor Line Integrity Test	<p>1. Install 0-100 inch water column (“ wc) vacuum mechanical gauge at the VP1000 test port.</p> <p>2. Authorize the dispenser for fueling. The VP1000 will begin to run.</p> <p>3. Close the ball valve at the pump inlet.</p> <p>4. Record the initial vacuum reading on the gauge – observe and record the final vacuum reading after 60 seconds.</p> <p>5. Open the ball valve at the pump inlet.</p> <p>6. Leaks must be repaired when the vacuum reading falls more than 4” wc in 60 seconds.</p> <p>7. Retest until all leaks have been repaired.</p> <p>8. Record data in Section B-4.</p> <p><b>Note: If the initial vacuum reading is less than 60” wc, it could indicate a problem with the VP1000. Remove the dispenser from service. Use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>			
<b>B-4</b>	VACUUM TEST Using VP1000 as vacuum source	<table style="width: 100%; border: none;"> <tr> <td style="border: none; width: 30%;">Initial Vacuum test reading (“ wc)</td> <td style="border: none; width: 70%;">Vacuum test reading after 60 sec. (“ wc)</td> </tr> </table>	Initial Vacuum test reading (“ wc)	Vacuum test reading after 60 sec. (“ wc)
Initial Vacuum test reading (“ wc)	Vacuum test reading after 60 sec. (“ wc)			
<b>B-5</b>  Dispenser Vacuum Test	<p>With one side of the dispenser authorized (VP1000 running) and the ball valve at the pump inlet open, dispense in handheld position a minimum of 0.5 gallons of fuel into a vehicle or test tank. Record the vacuum level while dispensing. Repeat test for the other side of the dispenser.</p> <p>1. Side “A” Dispensing Vacuum _____” wc</p> <p>2. Side “B” Dispensing Vacuum _____” wc</p> <p><b>Note: If the dispensing vacuum is less than 60” wc, remove the dispenser from service. See the troubleshooting section of the manual or contact FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>			
<b>B-6</b>  Audible Increase Test	<p>Test the VP1000 Vacuum Pump for normal operation. Use the 6 step procedure titled, “Testing the VP1000 Vacuum Pump for normal operation using the following test procedure:” in Section 1.1 (Weekly Inspection and Testing) of the Healy Systems Scheduled Maintenance document in the ARB Approved Installation, Operation and Maintenance Manual for the Healy Phase II EVR System not including ISD. This is to verify that the pump recognizes when both sides of the dispenser are activated for fueling.</p> <p>Does the VP1000 Vacuum Pump change speeds (audible increase) when both sides are activated for fueling?</p> <p style="text-align: center;">Yes    No</p> <p>If the answer is no, <b>use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>			
Repairs - Comments	To Obtain Returned Materials Authorization number (RMA#) Call 800-984-6266 Forms can be faxed to Franklin Fueling Systems Customer Service at 800-225-9787			

Franklin Fueling Systems  
3760 Marsh Road  
Madison, Wisconsin 53718 USA  
ARB Approved Installation, Operation and Maintenance Manual

Website: <http://www.franklinfueling.com>  
Email: [sales@franklinfueling.com](mailto:sales@franklinfueling.com)  
Telephone: 800-225-9787  
Fax: 608-838-6433



# INSTALLATION OPERATION

## Wayne Healy Phase II EVR System (Assist) for

**Reliance G5200 Series**  
**Reliance G6200 Series**  
**Select 3/G7200 Series**  
**Century 3/G2200 Series**

This Manual is to be used for new, replaced, retrofitted, or reconditioned dispensers/pumps.





**DANGER**

## PLEASE READ THIS MANUAL BEFORE YOU BEGIN

Dispensers have both electricity and a hazardous, flammable, and potentially explosive liquid. Failure to follow the below precautions and the Warning and Caution instructions in this manual may result in serious injury or death. Read every tag attached to the pump before commencing installation. Follow all rules, codes, and laws that apply to your area and installation. *Consult the full Installation/Operation manual that came with your dispenser for information NOT pertaining to the Healy portion of the installation.*

### SAFETY PRECAUTIONS - INSTALLATION AND MAINTENANCE

Always make sure ALL power to the dispenser is turned OFF before you open the dispenser cabinet for maintenance. Physically lock, restrict access to, or tag the circuit breakers you turn off when servicing the dispenser. If applicable, be sure to trip (close) the emergency valve(s) under the dispenser BEFORE beginning maintenance.

Make sure that you know how to turn OFF power to the dispenser and submersible pumps in an emergency. Have all leaks or defects repaired immediately.

### EQUIPMENT PRECAUTIONS

Be sure to bleed all air from the product lines of remote dispensers and prime suction pumps before dispensing product, otherwise, damage to the equipment may occur. Always use the approved method for lifting the dispenser. Never lift by the nozzle boot, sheet metal, etc., otherwise equipment damage or personal injury may occur.

### USE ONLY GENUINE PARTS

For product liability to be valid, no changes may be made to the equipment without the written consent of Dresser Wayne.

### HOW TO CONTACT DRESSER WAYNE

Trouble with the installation and operation of the pump should be referred to your authorized Wayne® service personnel or Wayne Technical Support (1-800-926-3737).

### INDICATORS AND NOTATIONS



**DANGER**

Danger indicates a hazard or unsafe practice which, if not avoided, will result in severe injury or possibly death.



**WARNING**

Warning indicates a hazard or unsafe practice which, if not avoided, may result in severe injury or possibly death.



**CAUTION**

Caution indicates a hazard or unsafe practice which, if not avoided, may result in minor injury.

**NOTE:**

Important information to consider, otherwise, improper installation and/or damage to components may occur.

# Table of Contents

## Title

### **1 Purpose**

### **2 Safety**

### **3 Models Covered**

### **4 Wiring**

4.1 Select & Century Wiring

4.2 Reliance Wiring – G6201D/ and G5201D/

4.3 Reliance Wiring – G6202D/, G5202D/, G6203D/ and G5203D/

### **5 Hydraulic Connections**

5.1 Select & Century Base Layout

5.2 Reliance Base Layout

### **6 VP1000 Theory of Operation**

### **7 Testing the System**

### **8 Troubleshooting the VP1000**

### **9 VP1000 Vane & Rotor Service & Replacement Guide**

### **10 View of Dispensers**

10.1 View of Reliance Dispenser

10.2 View of Select & Century Dispenser

### **Start-Up/New Installation/Warranty/Annual Testing Form**

# 1 Purpose

This procedure describes how to connect to and operate a Healy Systems, Inc. Model VP1000 Vapor Recovery pump in Wayne Reliance™ G6200 and G5200 series, Wayne Select 3/G7200 series, and Wayne Century series 3/G2200 gasoline dispensers. The installer shall be a skilled petroleum technician and thoroughly familiar with the requirements of State, Federal, and local codes for installation and repair of gasoline dispensing equipment. Also, they shall be aware of all the necessary safety precautions and site safety requirements to assure a safe and trouble free installation.

**Note:** All electrical and hydraulic plumbing fittings referred to in these instructions must be UL “listed” or “recognized” for the purpose.

**Note:** Installations of vapor piping into the inlet side of the vacuum pump should be sloped such that the natural flow direction is toward the vacuum pump. However, it is permissible to have a piping slope tilted away from the vacuum pump provided that all other applicable tests (Dispenser integrity and V/L) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

**Note:** For installations with In-Station Diagnostics (ISD), the vapor flow meter shall be installed on the down stream side of the vacuum pump. Every effort shall be made to install the vapor flow meter so that vapor piping between the vacuum pump and the vapor flow meter is sloped such that the natural flow direction is toward the vapor flow meter. However, it is permissible to have the piping slope away from the vapor flow meter provided that all other applicable tests (Dispenser integrity, V/L and ISD Operability) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

# 2 Safety

Before installing the equipment, read, understand and follow:

- The National Electrical Code (NFPA 70)
- The Automotive and Marine Service Code (NFPA 30A)
- Any national, state and local codes that may apply.

The failure to install the equipment in accordance with NFPA 30A and 70 may adversely affect the safe use and operation of the system.

Accurate, sound installations reduce service calls: Use experienced, licensed contractors that practice accurate, safe installation techniques. Careful installation provides a sound troubleshooting framework for field repairs and can eliminate potential problems.

1. Read all instructions before beginning.
2. Follow all safety precautions:
  - Barricade the area.
  - Do not allow vehicles or unauthorized people in the area.
  - Do not smoke or allow open flames in the area.
  - Do not use power tools in the work area.
  - Wear eye protection during installation.
3. Use circuit breakers for multiple disconnects to turn off power and prevent feedback from other dispensers.

### 3 Models Covered

Series	Model	Description
Reliance	G6201D/ & G5201D/ G6202D/ & G5202D/ G6203D/ & G5203D/	Single Remote Twin I Remote Twin II Remote
Select	3/G7201D/ 3/G7242D/ 3/G7203D/ 3/G7207D/ 3/G7247D/ 3/G7208D/	Single Remote, Island-Oriented Twin I Remote, Island-Oriented Twin II Remote, Island-Oriented Single Remote, Lane-Oriented Twin I Remote, Lane-Oriented Twin II Remote, Lane-Oriented
Century	3/G2201D/ 3/G2202D/ 3/G2203D/ 3/G2207D/	Single Remote, Island-Oriented Twin I Remote, Island-Oriented Twin II Remote, Island-Oriented Twin I Remote, Lane-Oriented

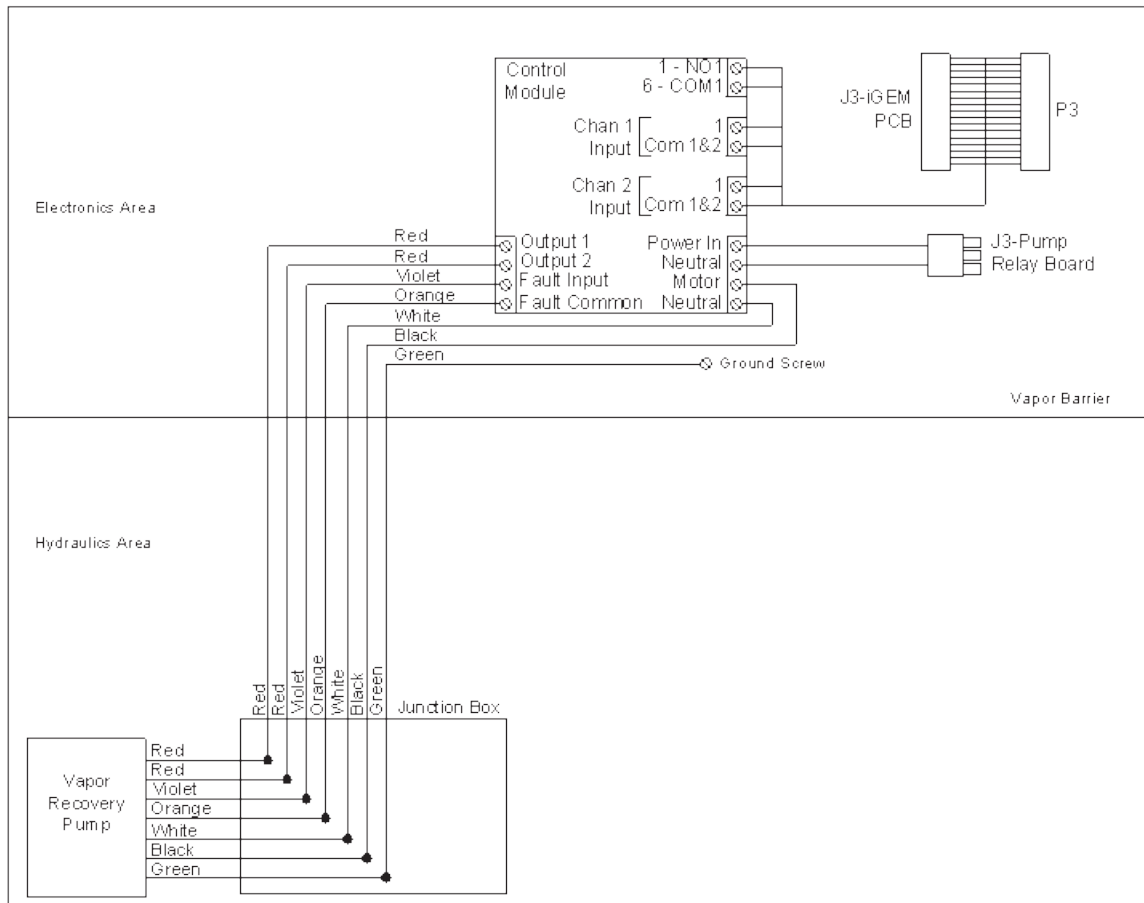
Note: All Wayne models with the Healy Systems, Inc. Model VP1000 Vapor Recovery pump have a suffix "D3."

### 4 Wiring

This vapor recovery system is installed into the dispenser, at the factory, and does not require any additional wiring in the field. The field wiring for the Select 3/G7200 series and Century 3/G2200 series is exactly as is shown in the respective Installation/Operation manual. For the Reliance G6200 and G5200 series, while the field wiring remains the same, there are subtle differences in the solenoid valve wiring. Field wiring for the Reliance G6200 and G5200 series is shown in the diagrams in Sections 4.2 & 4.3.

#### 4.1 Select & Century Wiring

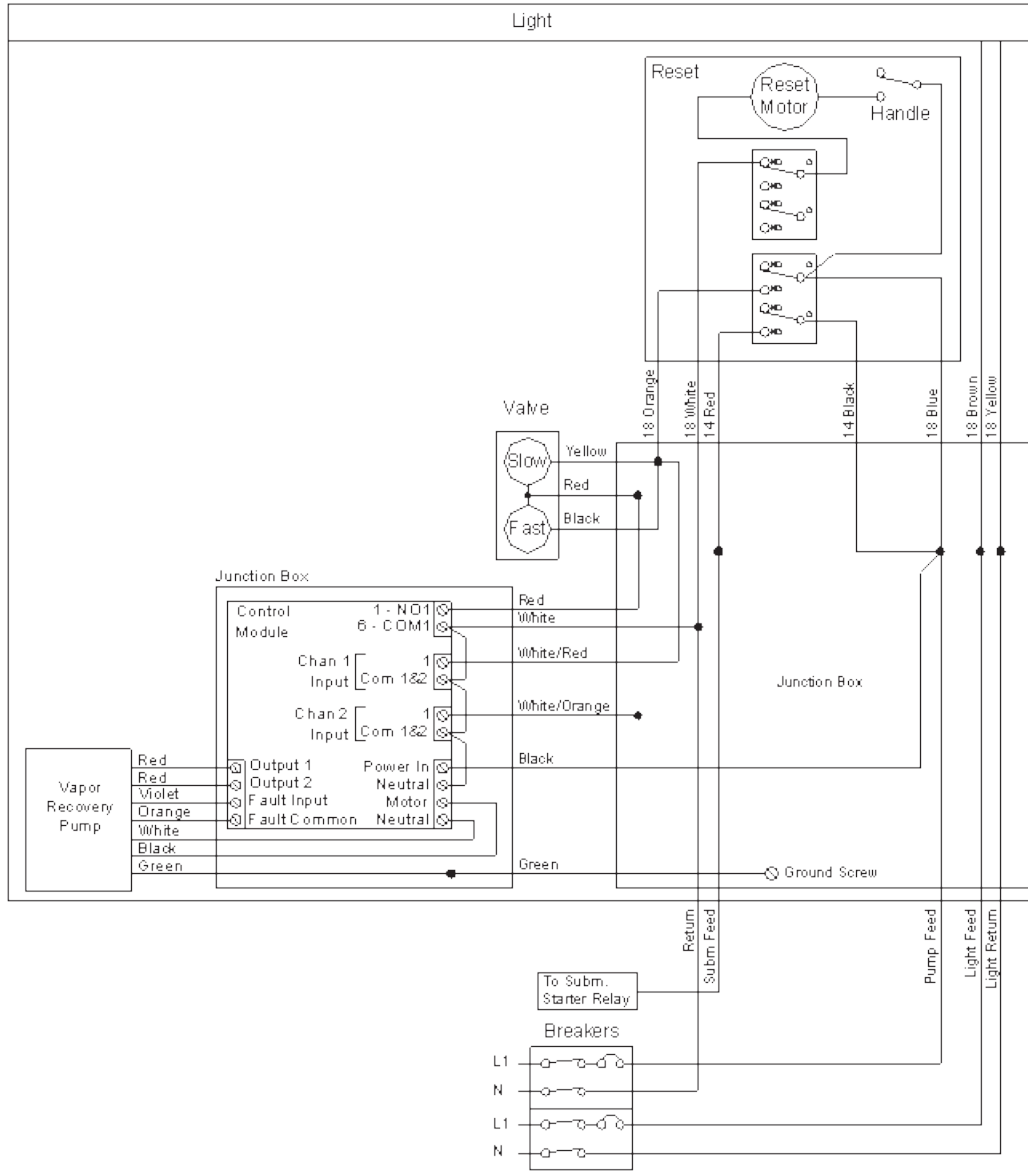
The Select (3/G7200 Series) and Century (3/G2200 Series) field wiring does not change as is already shown in the respective installation manuals. The wiring diagram shown below shows the internal wiring for the Healy components as they relate to the existing dispenser wiring.





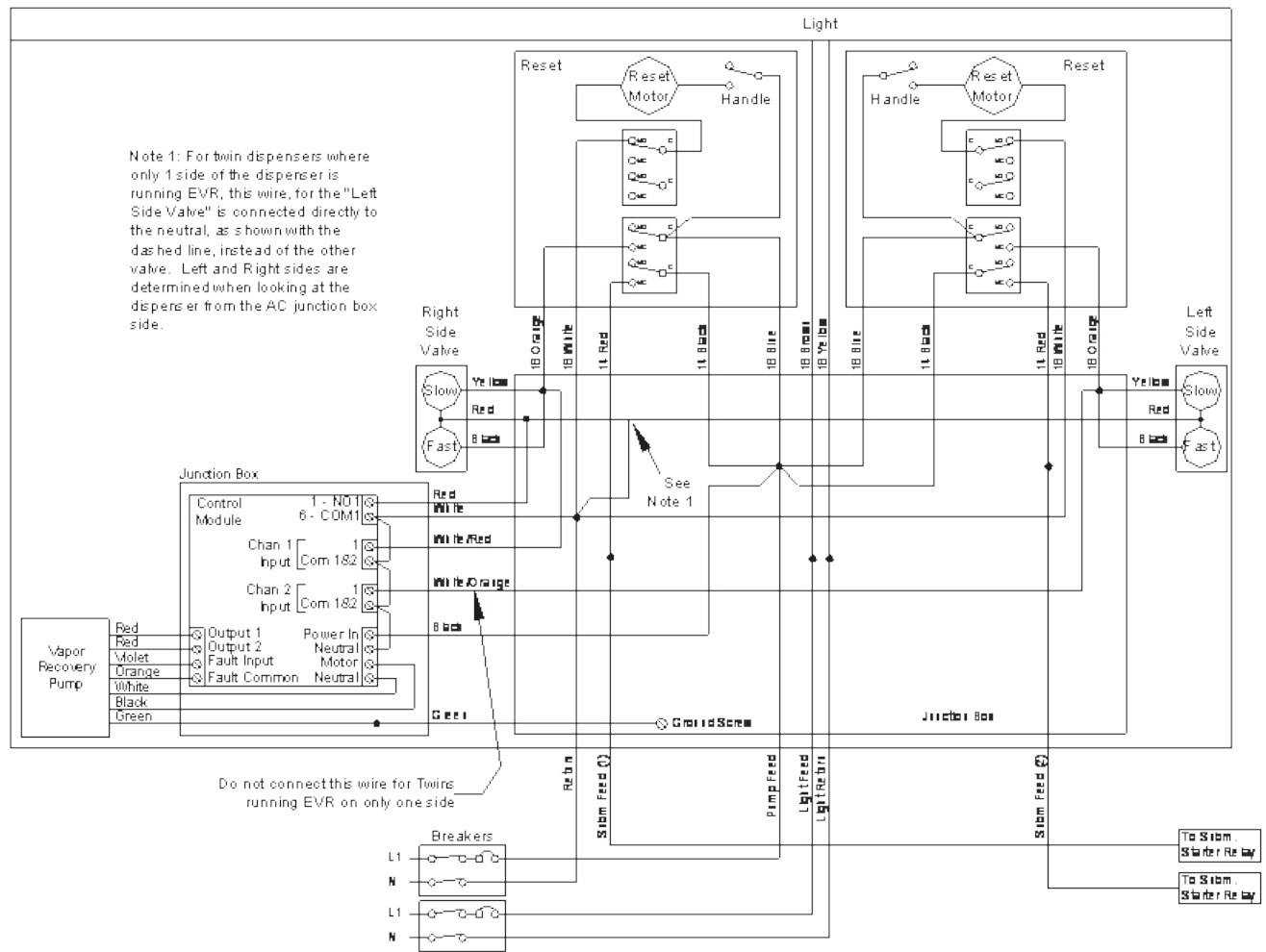
## 4.2 Reliance Wiring – G6201D/ and G5201D/

There are minor changes to the field wiring for this model as compared to what is shown in the Reliance installation manual.



### 4.3 Reliance Wiring – G6202D/, G5202D/, G6203D/ and G5203D/

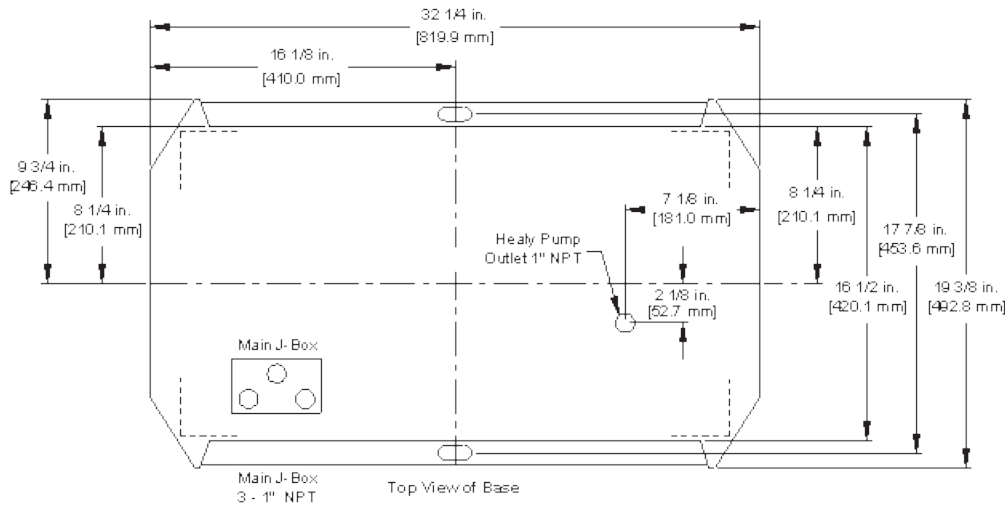
There are minor changes to the field wiring for these models as compared to what is shown in the Reliance installation manual.



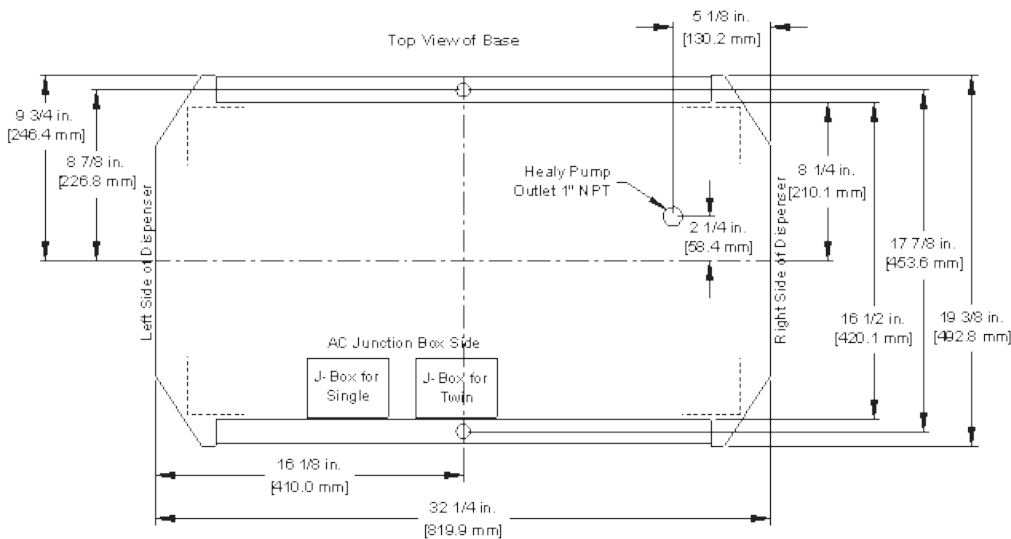
## 5 Hydraulic Connections

- A 1" NPT connection is supplied on the bottom of the Healy VP1000 pump. The location of this outlet is shown on the base layouts in Sections 5.1 & 5.2. This connection is used to return the vapors collected back to the tank.
- Completing the connection of Healy Systems dispensing equipment requires the installation of Healy Systems Phase II dispenser adapters, hoses, breakaways and nozzles (hanging hardware).
- Healy Vapor Recovery Hoses are available in various lengths to satisfy local ordinances and still provide "far side" fueling capability. Install these following the instructions contained on the shipping box.
- The Healy Systems nozzle Model 900 is the nozzle necessary to complete the upgrade. Be sure to check for proper fit in the nozzle holster and that the nozzle can be locked in the off position. Also, be sure that when the nozzle is locked, that the dispenser cannot be activated from the locked position.
- For Reliance G6200 and G5200 series dispensers, a Healy Model 1301 or 1302 Flow Limiter may be needed to keep the flow from going over 10.0 GPM.

### 5.1 Select (3/G7200) & Century (3/G2200) Base Layout



### 5.2 Reliance (G6200 & G5200) Base Layout



## 6 VP1000 Theory of Operation

The Healy Systems VP1000 is a self-contained rotary vane pump, designed for gasoline vapor recovery utilizing various parts of the Healy System Vapor Recovery product line. It is intended for use by either OEM dispenser/pump manufacturers or as an after market add-on to make existing equipment compatible with Healy System technology. In order to convert to 'others' equipment, an electronic interface is required to adapt the targeted pump/dispenser to the new vapor recovery equipment. The interface senses when authorization to dispense has been given and sends signals to the motor to operate at a low speed for one hose, or a higher speed for two hoses. It also functions to shut off the pump/dispenser if it senses that the vapor pump is not operating properly. The vacuum is regulated at a level sufficient to clear liquid gasoline from the vapor path in MPD applications. The actual amount of vapors withdrawn is controlled by the Healy nozzle, itself, in response to the liquid gasoline flow rate.

### MOTOR SPECIFICATIONS

Horsepower	1/8 HP
Voltage	120 VAC

### INTERFACE SPECIFICATIONS

Input voltage	120 VAC
Relay current capacity	5A AC
Input signals	AC and DC voltages up to 130 VAC max
Motor Input signal	5 VDC @ 20 Hz 50% Duty Cycle

## 7 Testing the System

- Carefully review all work completed, being sure all mechanical joints are thoroughly tightened and electrical connections sealed.
- Open the product crash valves and restore power to the dispenser.
- With the power on, but no nozzles authorized, the VP1000 should not be running (unless the ambient temperature is below 40°F), but the power LED (yellow) should be energized on the interface module.
- Authorize one handle and the vacuum system should activate when the gasoline flow control valve is engaged. Repeat for all other nozzles, individually testing each nozzle on each side of dispenser. With each authorization, one of the green LED's on the interface module should illuminate and the VP1000 activate.
- Note: For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the same LED activates for all grades on the same side. If the other LED activates, wiring needs to be corrected.
- Authorize one nozzle and listen to the speed of the VP1000. With only one nozzle activated, the speed will be slower than if a nozzle on each side is activated. Activate a nozzle on the other side of the dispenser and listen

for the speed to change.

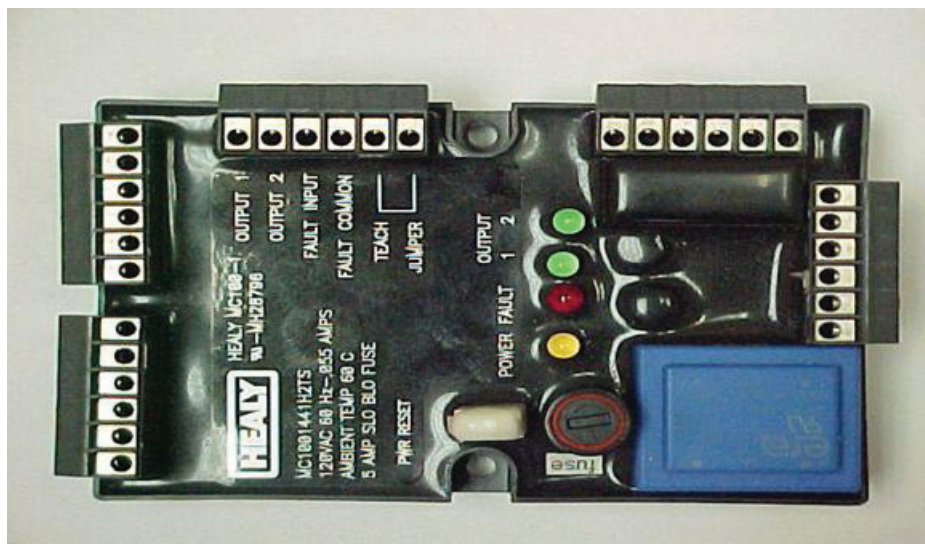
Note: Some dispenser configurations may only have one side of the dispenser configured for vapor recovery. For these dispensers, verify that the VP1000 does not change speed if the other side is authorized to dispense a fuel other than gasoline.

- To test the tightness of the vapor plumbing installed on the suction side of the system requires a 0-100" water column gauge. Connect the gauge into the 1/4" test port of the reducing tee. For the location of the test port, reference the dispenser views in Section 10. Continue by following and completing the START-UP / NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM.

## 8 Troubleshooting the VP1000

- Use extreme care and caution when performing the tests listed below. If 120 VAC is accidentally applied to the fault or DC terminals, the module will be destroyed.
- With power applied to the dispenser, but no products authorized, there should be 120 VAC between neutral and 120 VAC on the module terminal strip.
- As above, with any product authorized, there should be single speed power applied to the VP1000. Verify this by checking for 2-3 VDC from OUTPUT 1 (RED WIRE) to FAULT COMMON (ORANGE WIRE), (or from OUTPUT 2 TO FAULT COMMON) also; one GREEN LED should be illuminated. With a second product authorized on the opposite side of the dispenser *i.e.* one product on each side, the motor should operate at higher speed and there should be 2-3 VDC on both output 1 and 2 (to fault common) and both GREEN LED's should be illuminated.
- With the pump running, a fault can be simulated by shorting, with a jumper wire, the "FAULT INPUT" (purple wire) to FAULT COMMON (orange). This should cause the motor to shut off, the solenoid valves to lose power and the dispenser to shut down. Also, as long as the short is maintained, the red LED will be illuminated. Removing the short will not automatically reset the module. To reset the module, remove the short, remove power to the dispenser for twenty seconds and restore power. The module should now be reset and the red LED extinguished. This can also be accomplished by using the power reset (PWR RESET) on the module.
- If diagnosing a problem where the LED is already illuminated, a steady light indicates a low current condition, therefore expect a vane or rotor problem. If the LED is blinking, that indicates a high current condition and one would expect to find a jammed rotor or vapor line flooded with product. See Start-up/ New Installation/ Warranty/ Annual Testing Form.
- The electronics of the motor will make three attempts to have a successful start of the motor. If it detects a problem, on the fourth unsuccessful start, it will short the fault line to signal minus (DC-) and shut down the electronics.


MC100 Interface Module



## 9 VP1000 VANE & ROTOR SERVICE & REPLACEMENT GUIDE

**Caution**  **Disconnect power before beginning service.**

1. The work area **must** be clean and have sufficient lighting.
2. Disconnect the vapor piping connected to the **IN** and **OUT** ports of the VP1000 cover assembly.
3. Remove the four Allen head screws and lock washers that secure the pump cover assembly to the pump housing and remove the cover carefully.

**Caution**  **Use a spill cloth when removing the cover, as there may be some gasoline inside the pump cavity.**

4. Carefully turn the rotor assembly by hand until the shaft key notch is at the 12 o'clock position. (See Figures)
5. Remove the rotor, vanes and shaft key from the pump housing.

**Note:** Place your hand or a container under the rotor while removing. Do not use any sharp objects that would scratch the surfaces of the pump cavity, pump shaft, rotor, or vanes.

6. Rotate the shaft by hand. If the shaft does not rotate freely, the entire vacuum pump needs replacement (p/n VP1000-5 or RVP1000-5).
7. If the rotor and vanes are cracked, chipped, excessively worn or excessively dirty, the rotor and vanes should be replaced because cleaning will not remedy these conditions (p/n VP1000VRC-G, VP1000VRC-P or VP1000VRC).
8. If there is no visible damage, use a lint-free cloth with isopropyl alcohol to clean the rotor and vanes.
9. Using a lint-free cloth with isopropyl alcohol, thoroughly clean: the inside of the pump ring and rear of the pump cavity, the rotor shaft, and the inside of the pump cover.
10. Reposition the shaft (if necessary) so that the shaft key notch is in the 12 o'clock position. Install the cleaned original or new shaft key onto the shaft.
11. Carefully install the cleaned original or new rotor onto the shaft followed by the cleaned original or new vanes into the rotor.

**Note:** The rotor assembly should slide on to the shaft easily, without excessive force. (Rotors and vanes are reversible)

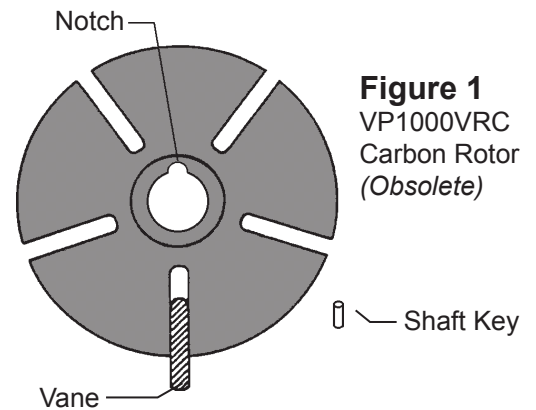
12. Lightly lubricate and install the new O-Ring for the pump housing.

**Note:** Do not allow any lubricant to get inside the pump housing.

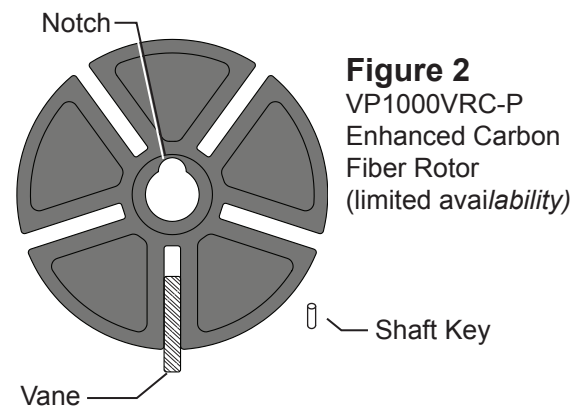
13. Install the pump cover using the four Allen head screws and lock washers removed in step 3 and cross tighten.

**Note:** Use caution when sliding the pump cover over the O-Ring seal to prevent cutting or tearing.

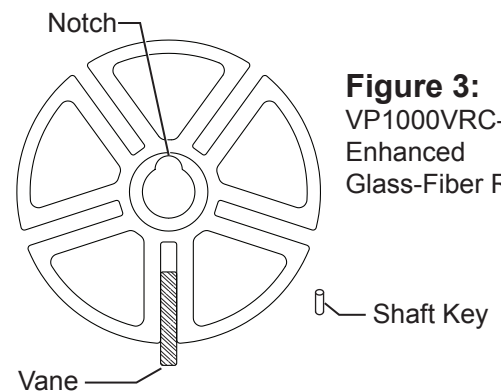
14. Re-connect the vapor piping to the **IN** and **OUT** ports of the pump cover assembly that was removed in Step 2.
15. Re-apply power. Test for normal operation. (See VP1000 Vacuum Performance Test Procedure)



**Figure 1**  
VP1000VRC  
Carbon Rotor  
(Obsolete)



**Figure 2**  
VP1000VRC-P  
Enhanced Carbon  
Fiber Rotor  
(limited availability)

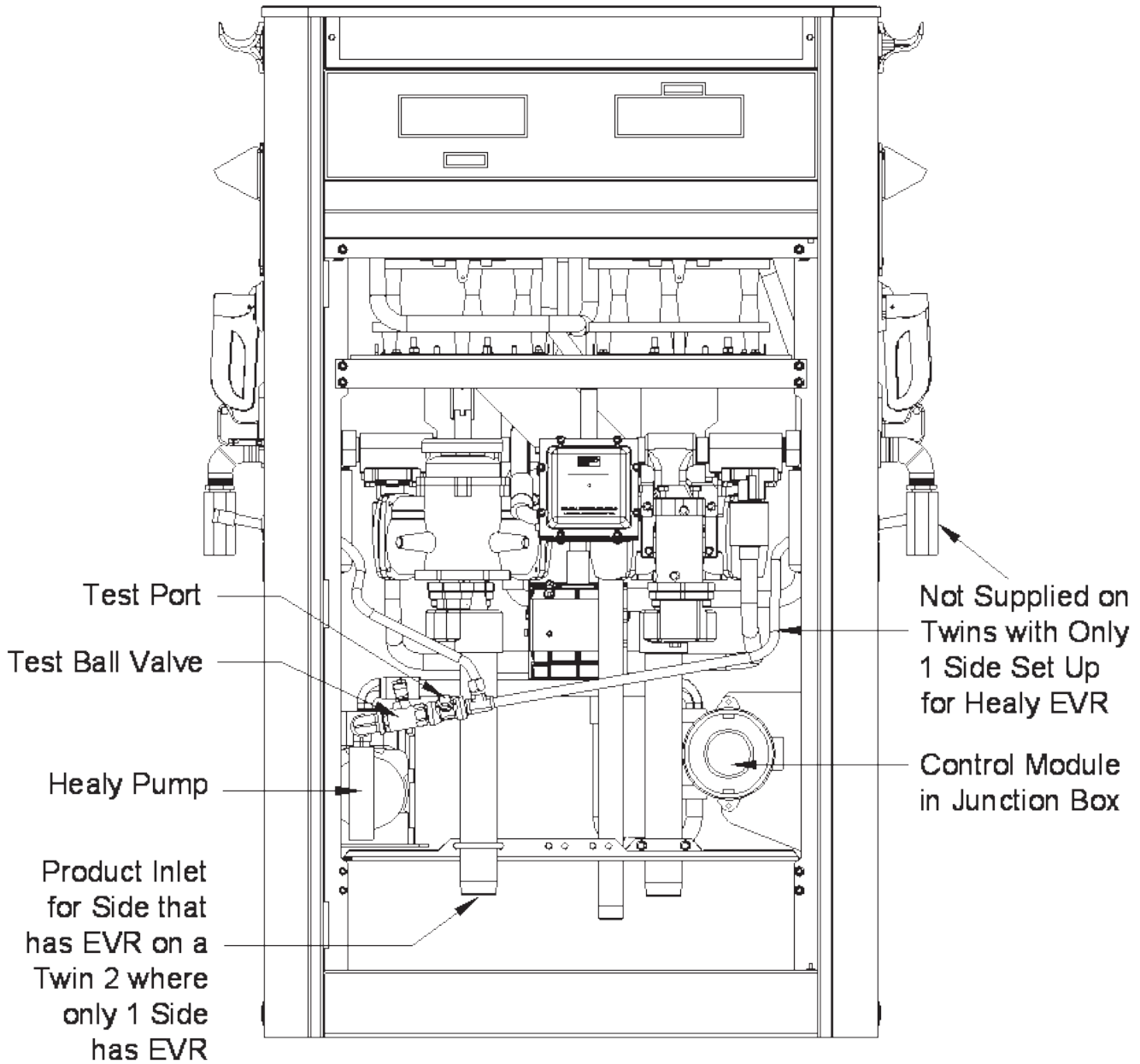


**Figure 3:**  
VP1000VRC-G  
Enhanced  
Glass-Fiber Rotor

## 10 VIEW OF DISPENSERS

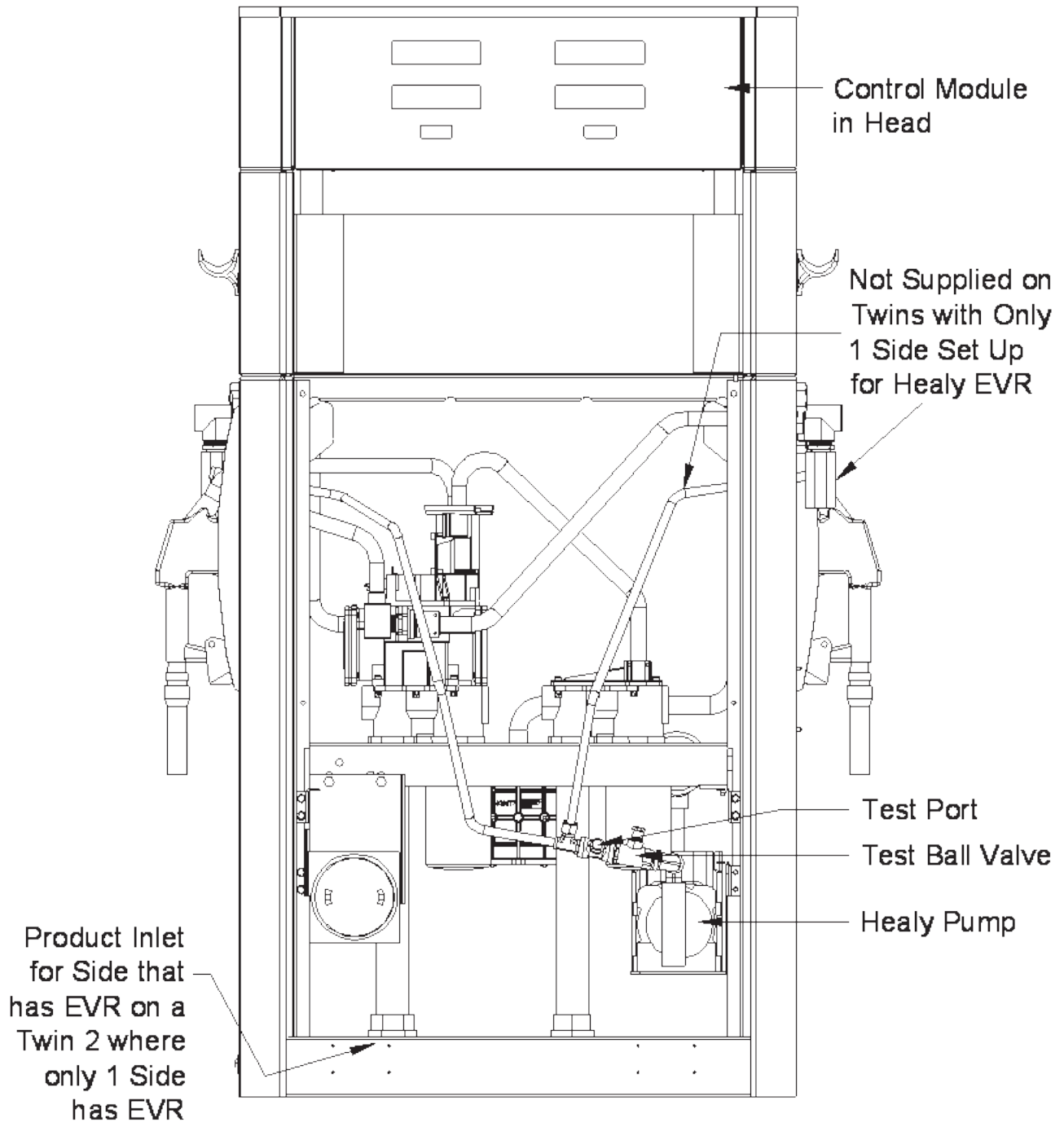
### 10.1 View of Reliance Dispenser (G6200 & G5200)

While the Twin II model is shown, the location of the Healy components for the Twin I and the Single are the same.



## 10.2 View of Select (3/G7200) & Century (3/G2200) Dispenser

While the Select Twin II model is shown, the location of the Healy components for all of the other Select & Century models are the same.





START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections 3, 4, 5 and 6 of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

SERVICE COMPANY NAME	TELEPHONE	
SERVICE TECHNICIAN	HEALY TECH CERT #	
STATION ADDRESS	CITY	STATE
DISPENSER MAKE	VACUUM PUMP SERIAL #	

**SIDE A**

DISPENSER EQUIPMENT CHECKLIST - Parts A-1 and A-2	YES	NO*
<b>A-1</b> Is all the installed dispenser hanging hardware listed in Exhibit 1 of Executive Order VR-201 or VR-202?	<input type="checkbox"/>	<input type="checkbox"/>
<b>A-2</b> Proper installation of the VP1000 requires the test port and ball valve on the inlet side of the vacuum pump. Are the test port and ball valve installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
<b>*If the answer to either A-1 or A-2 is NO, the Healy Warranty is Void.</b>		

**A-3**

- THE FOLLOWING TEST WILL PERFORM A POSITIVE PRESSURE LEAK CHECK OF THE VACUUM PUMP, DISPENSER VAPOR PIPING, HANGING HARDWARE AND ALL NOZZLES ON BOTH SIDES OF THE DISPENSER.
- THE VP1000 OUTLET IS NOT CONNECTED TO UNDERGROUND PIPING DURING THIS TEST.

**CAUTION: REGULATE GASEOUS NITROGEN TO 2.5 PSI (~70" WC) MAXIMUM BEFORE TESTING**

1. Install a 0-100 inch water column (" wc) mechanical gauge at the VP1000 test port.
2. Use the water column gage positive (high) pressure port.
3. Gaseous nitrogen gas can now be connected to the outlet (exhaust) port of the VP1000.
4. Test pressure **cannot** exceed 70" wc.
5. **Slowly** introduce the gaseous nitrogen to a pressure between 60 – 70" wc.
6. After reaching the pressure range, close the valve supplying the gaseous nitrogen.
7. Record the initial pressure reading on the gauge - observe and record the final pressure reading after 60 seconds.
8. Leaks must be repaired when the pressure falls more than 4" wc in 60 seconds.
9. Retest until all leaks have been repaired.
10. Record test results in Section A-4.

<b>A-4</b> <b>PRESSURE TEST</b> <b>2.5 PSI (~70"wc) Maximum</b>	Initial Pressure test reading ("wc)	Pressure test reading after 60 seconds ("wc)
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START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations – complete SIDE A and sections 3, 4, 5 and 6 of SIDE B. Submit forms to Healy Systems.**
- **Warranty Service or Annual Testing – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on SIDE A and conduct the appropriate tests specified on SIDE B. Submit Forms to Healy Systems.**

<b>SIDE B</b>			
<i>Warranty Service</i> Complete Troubleshooting Sections <b>B-1 and B-2</b>		<i>Start-up/ New Installations/ Annual Testing</i> Complete Sections <b>B-3 through B-6</b>	
<b>B-1</b>	<p style="text-align: center;"><b>Control Module Fault Light</b> (Circle one)                      <b>Flashing (LED)</b>                      <b>Steady (LED)</b></p> <p>1. All fault conditions require removal and cleaning or replacement of the rotor and vanes located inside the vacuum pumps round front cover assembly. Use the <b>VP1000 ROTOR &amp; VANE SERVICE AND REPLACEMENT GUIDE</b> in the applicable dispenser retrofit manual of the ARB Approved Installation, Operation and Maintenance Manual for Executive Orders VR-201-O and VR-202-O.</p> <p>2. Clean all surfaces including vanes, rotor, rotor housing and cover assembly.</p> <p>3. Manually spin and inspect the motor shaft for bearing wear before re-installing the rotor kit.</p> <p>4. Replace motor when bearings or shaft are damaged or worn.</p> <p>5. Check O-ring seal before replacing rotor cover assembly.</p>		
<b>B-2</b>	<p>Re-Assemble / Reset Vacuum Pump and Module. (Power must be removed from both the vacuum pump and the <b>module for 20 seconds to reset the system</b>) using the power reset switch on the MC100 module.</p>		
<b>B-3</b>  Dispenser Vapor Line Integrity Test	<p>1. Install 0-100 inch water column (“ wc) vacuum mechanical gauge at the VP1000 test port.</p> <p>2. Authorize the dispenser for fueling. The VP1000 will begin to run.</p> <p>3. Close the ball valve at the pump inlet.</p> <p>4. Record the initial vacuum reading on the gauge – observe and record the final vacuum reading after 60 seconds.</p> <p>5. Open the ball valve at the pump inlet.</p> <p>6. Leaks must be repaired when the vacuum reading falls more than 4” wc in 60 seconds.</p> <p>7. Retest until all leaks have been repaired.</p> <p>8. Record data in Section B-4.</p> <p><b>Note: If the initial vacuum reading is less than 60” wc, it could indicate a problem with the VP1000. Remove the dispenser from service. Use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-4</b>	VACUUM TEST Using VP1000 as vacuum source	Initial Vacuum test reading (“ wc)	Vacuum test reading after 60 sec. (“ wc)
<b>B-5</b>  Dispenser Vacuum Test	<p>With one side of the dispenser authorized (VP1000 running) and the ball valve at the pump inlet open, dispense in handheld position a minimum of 0.5 gallons of fuel into a vehicle or test tank. Record the vacuum level while dispensing. Repeat test for the other side of the dispenser.</p> <p>1. Side “A” Dispensing Vacuum _____” wc</p> <p>2. Side “B” Dispensing Vacuum _____” wc</p> <p><b>Note: If the dispensing vacuum is less than 60” wc, remove the dispenser from service. See the troubleshooting section of the manual or contact FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		
<b>B-6</b>  Audible Increase Test	<p>Test the VP1000 Vacuum Pump for normal operation. Use the 6 step procedure titled, “Testing the VP1000 Vacuum Pump for normal operation using the following test procedure:” in Section 1.1 (Weekly Inspection and Testing) of the Healy Systems Scheduled Maintenance document in the ARB Approved Installation, Operation and Maintenance Manual for the Healy Phase II EVR System not Including ISD. This is to verify that the pump recognizes when both sides of the dispenser are activated for fueling.</p> <p>Does the VP1000 Vacuum Pump change speeds (audible increase) when both sides are activated for fueling?</p> <p style="text-align: center;">Yes    No</p> <p>If the answer is no, <b>use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>		

Repairs - Comments	To Obtain Returned Materials Authorization number (RMA#) Call 800-984-6266 Forms can be faxed to Franklin Fueling Systems Customer Service at 800-225-9787
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# INSTALLATION & OPERATION MANUAL

Wayne  
Healy Phase II  
EVR System  
(Assist)

For  
Reliance G5200 Series  
Reliance G6200 Series  
Select 3/G7200 Series  
Century 3/G2200 Series

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**Franklin Fueling Systems**

# **Vapor Recovery Assist System**

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## **Universal Manual**

*VP1000*

This Universal Manual is to be used for new, replaced, retrofitted, or reconditioned dispensers/pumps that do not have a dispenser-specific installation manual listed in Franklin Fueling Systems Executive Order VR-201 or VR-202.

# **Contents**

## **Important Safety Messages**

## **Introduction**

## **Description of Operation**

Vacuum Pump Features

## **Preparation**

### **Parts List**

VP1000 (A-K) Kit

VP1000 Kit Table

Electrical Kit Z070E (Universal)

Vapor Kit Z071V (Universal)

### **Tools Required**

Dispenser Access

Dispenser Survey

Before Mounting the Vacuum Pump

## **Installing the VP1000 System**

Mounting the Vacuum Pump & Electrical Conduit Assembly

## **Installing the MC100 Control Module**

Overview

Mounting the MC100 Control Module

## **Dispenser Specific Wire Harness Installation**

AC Power to the module

## **Generic Dispenser Wire Harness Installation - 1360A**

A Side

B Side

## **1316 Potted Conduit Wiring**

## **Installing Dispensing Hanging Hardware**

Installing Dispensing Equipment

Hose Adapters

## **Testing the System**

## **Troubleshooting the VP1000**


## **VP1000 Vane & Rotor Service & Replacement Guide**


## **Start-up/New Installation/Warranty/Annual Testing Form**


# Important Safety Messages


Franklin Fueling Systems (FFS)/Healy equipment is designed to be installed in association with volatile hydrocarbon liquids such as gasoline and diesel fuel. Installing or working on this equipment means working in an environment in which these highly flammable liquids may be present. Working in such a hazardous environment presents a risk of severe injury or death if these instructions and standard industry practices are not followed. Read and follow all instructions thoroughly before installing or working on this, or any other related, equipment.


As you read this guide, please be aware of the following symbols and their meanings:

**Warning**  This symbol identifies a warning. A warning sign will appear in the text of this document when a potentially hazardous situation may arise if the instructions that follow are not adhered to closely. A potentially hazardous situation may involve the possibility of severe bodily harm or even death.

**Caution**  This is a caution symbol. A caution sign will appear in the text of this document when a potentially hazardous environmental situation may arise if the instructions that follow are not adhered to closely. A potentially hazardous environmental situation may involve the leakage of fuel from equipment that could severely harm the environment.

**Warning**  **Follow all applicable codes governing the installation and servicing of this product and the entire system. Always lock out and tag electrical circuit breakers while installing or servicing this equipment and any related equipment. A potentially lethal electrical shock hazard and the possibility of an explosion or fire from a spark can result if the electrical circuit breakers are accidentally turned on during installation or servicing. Please refer to the Installation and Owner's Manual for this equipment, and the appropriate documentation for any other related equipment, for complete installation and safety information.**

**Warning**  **Follow all federal, state and local laws governing the installation of this product and its associated systems. When no other regulations apply, follow NFPA codes 30A and 70 from the National Fire Protection Association. Failure to follow these codes could result in severe injury, death, serious property damage and/or environmental contamination.**

**Warning**  **Always secure the work area from moving vehicles. The equipment in this manual is usually mounted underground, so reduced visibility puts service personnel working on this equipment in danger from moving vehicles entering the work area. To help eliminate these unsafe conditions, secure the area by using a service truck to block access to the work environment, or by using any other reasonable means available to ensure the safety of service personnel.**

**Warning**  **Use circuit breakers for multiple disconnect to turn off power and prevent feedback from other dispensers.**

## Introduction

This procedure describes the tools, methods and skill levels required to install a Healy Systems, Inc. Model VP1000 Vapor Recovery Pump in new, replaced, retrofitted, or reconditioned dispensers that do not have a dispenser specific installation manual listed in Franklin Fueling Systems Executive Order VR-201 or VR-202. Only Healy trained and certified contractors may perform these retrofits or the warranty will be voided. The installer must also be a skilled petroleum technician and thoroughly familiar with the State, Federal and local code requirements for the installation and repair of gasoline dispensing equipment. In addition, they shall be aware of all the necessary safety precautions and site safety requirements in order to assure a safe, trouble-free installation.

**Note:** Installations of vapor piping into the inlet side of the vacuum pump should be sloped such that the natural flow direction is toward the vacuum pump. However, it is permissible to have a piping slope tilted away from the vacuum pump provided that all other applicable tests (Dispenser integrity and V/L) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

**Note:** For installations with In-Station Diagnostics (ISD), the vapor flow meter shall be installed on the down stream side of the vacuum pump. Every effort shall be made to install the vapor flow meter so that vapor piping between the vacuum pump and the vapor flow meter is sloped such that the natural flow direction is toward the vapor flow meter. However, it is permissible to have the piping slope away from the vapor flow meter provided that all other applicable tests (Dispenser integrity, V/L and ISD Operability) meet the specifications outlined in the appropriate section of the Executive Order and **CARB Approved Installation, Operation and Maintenance Manual**.

## Description of Operation

The Healy Systems VP1000 Vacuum Pump is typically mounted in the lower hydraulic area of a dispenser or self-contained gasoline pump. It works as a component of a complete Stage II system which also includes a single universal control module and Healy Systems hanging hardware. It is intended for use by either OEM dispenser / pump manufactures or as an aftermarket retrofit to make existing equipment compatible with Healy Systems technology.

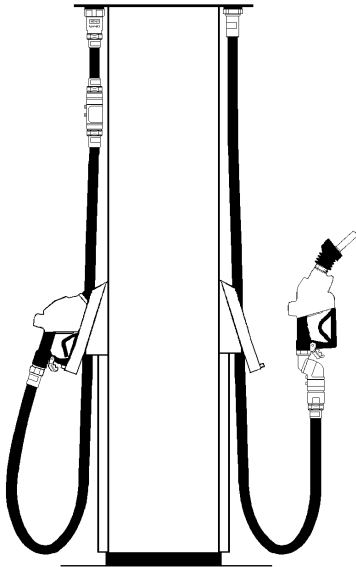
**Specifications: 1/8 Hp, 120 VAC input, 2 Amp AC**

**Important: All electrical and hydraulic plumbing fittings referred to in these instructions must be UL “listed” or “recognized” for the purpose.**

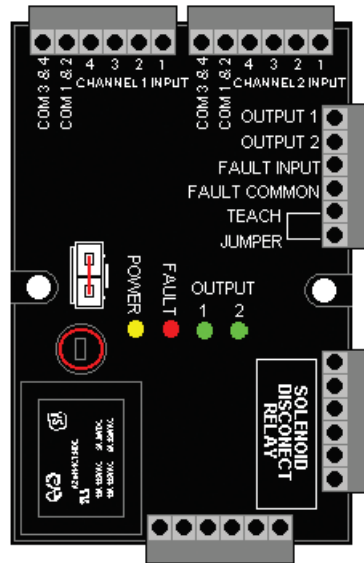
**Important: The VP1000 will increase the current draw of the dispenser by two amps. Use the label supplied to note this change.**

The preferred mounting position of the VP1000 Vacuum Pump is with the vacuum pump inlet and electrical connections facing upwards, towards the top of the dispenser (see Figure 1 below). If other mounting positions are desired because of mechanical constraints within the dispenser, please contact FFS Technical Services at 1-800-984-6266.

### Nozzle & Hanging Hardware



### MC100 Control Module



### VP1000 & Bracket

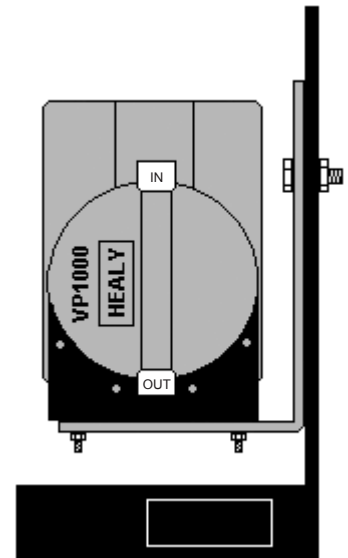


Figure 1

## Vacuum Pump Features

- Operates at two speeds: Low Speed in response to one fueling point being activated, or High Speed if both fueling points are activated simultaneously.
- Contains performance protection devices that will shut off the vacuum pump and disable dispensing if the vacuum pump is not operating properly.
- Operates only with input signals from the control module, cannot be operated 'stand alone'.
- Contains low temperature activation circuits that turn the vacuum pump on at slow speed when the temperature drops below 40°F to prevent freezing.



# Preparation

## Parts List

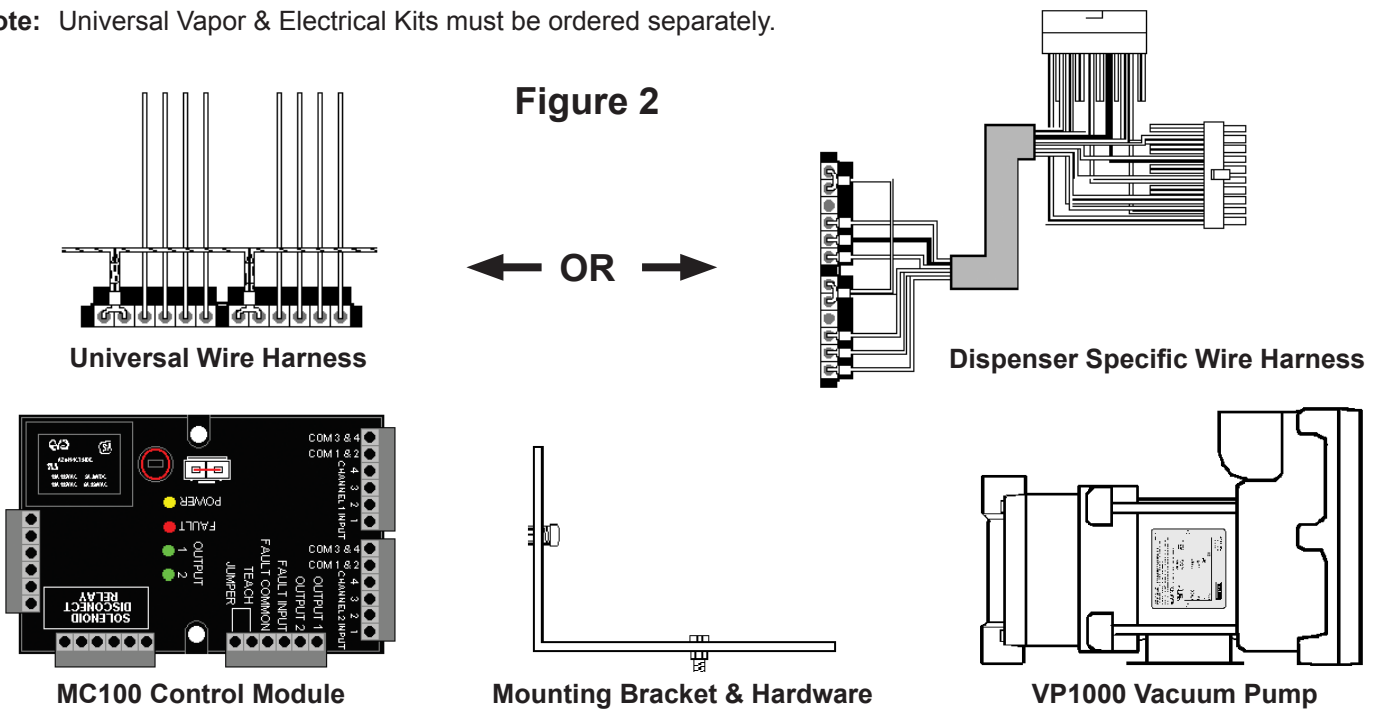
This section illustrates the basic components needed to retrofit a VP1000 Vacuum Pump into any new, replaced, retrofitted, or reconditioned dispenser. This system can be installed in any “Non-Vapor or Vapor Ready” dispenser including dispensers with existing “Balance” or “VacAssist” piping. Three kits are required for complete retrofit installations: VP1000, Vapor, and Electrical. Other supplies beyond the three kits may also be needed to complete your installation (i.e. electrical nipples and, possibly, additional vapor connections).

Assorted lengths of “UL Listed” electrical nipples as well as pipe or electrical elbows and couplings will be required to complete vacuum pump installation.

### VP1000 (A-J) Kit

Part	Quantity
MC100 Control Module	1
Wire Harness	1
VP1000 Vacuum Pump	1
Mounting Bracket with Hardware	1

**Note:** Universal Vapor & Electrical Kits must be ordered separately.



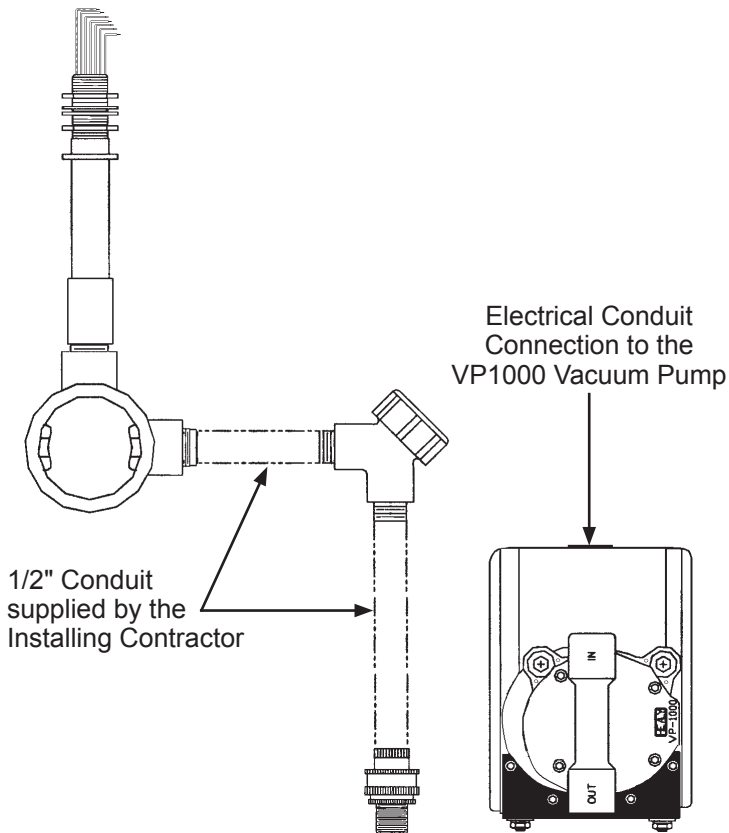
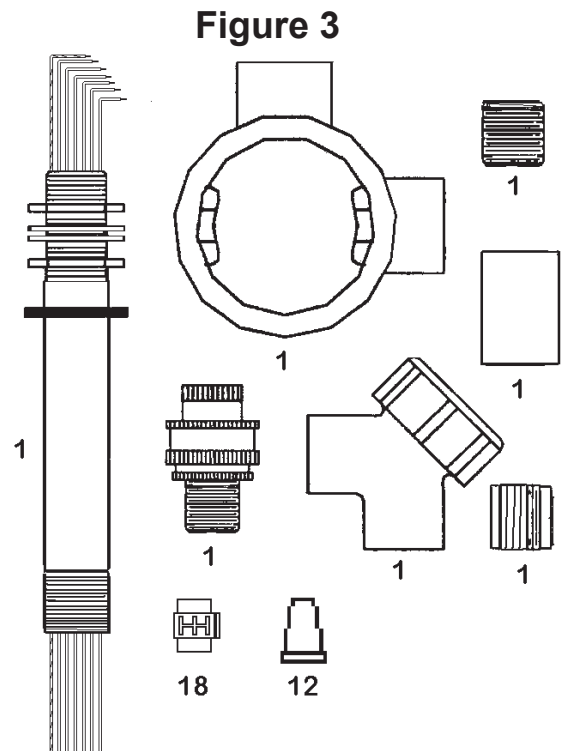
### VP1000 Kit Table

Order Kit #	Description	Wire Harness
VP1000A	This Universal Wire Harness can be installed in any dispenser make or model. For use with any VAC or VDC Solenoid Valves.	1360
VP1000D	Early Gilbarco Encore 300 Blender Dispensers – 120 VAC Valves (manufactured before May 2003)	1368
VP1000G	Wayne & DL Non-Blender Dispensers – 120 VAC Valves	1354
VP1000H	Tokheim Premier C Blender Dispensers – 24 VDC Valves	1362
VP1000J	Early Tokheim Blender Dispensers – Combination 120 VAC & 24 VDC Valves	1372

**Important:** The VP1000 Kits listed above contain a specialized wire harness connection for each specific dispenser listed. All other components are identical and interchangeable.

## Electrical Kit Z070E (Universal)

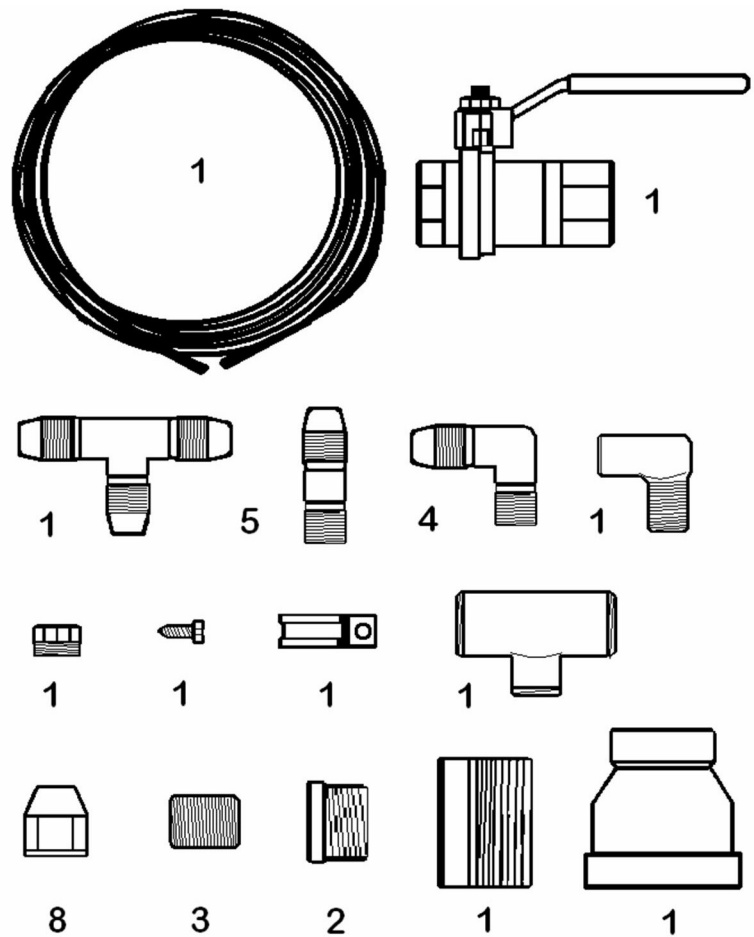
Part	Quantity
Explosion Proof Junction Box	1
Capped 90° Elbow	1
1/2" Union	1
Potted Conduit Nipple	1
1/2" x 3/4" Reducing Bushing	1
3/4" Coupling	1
3/4" Close Nipple	1
Electrical Current Change Label (p/n 1405)	1
Electrical Wire Nuts	12
Scotchlok® Wire Connectors	18



## Vapor Kit Z071V (Universal)

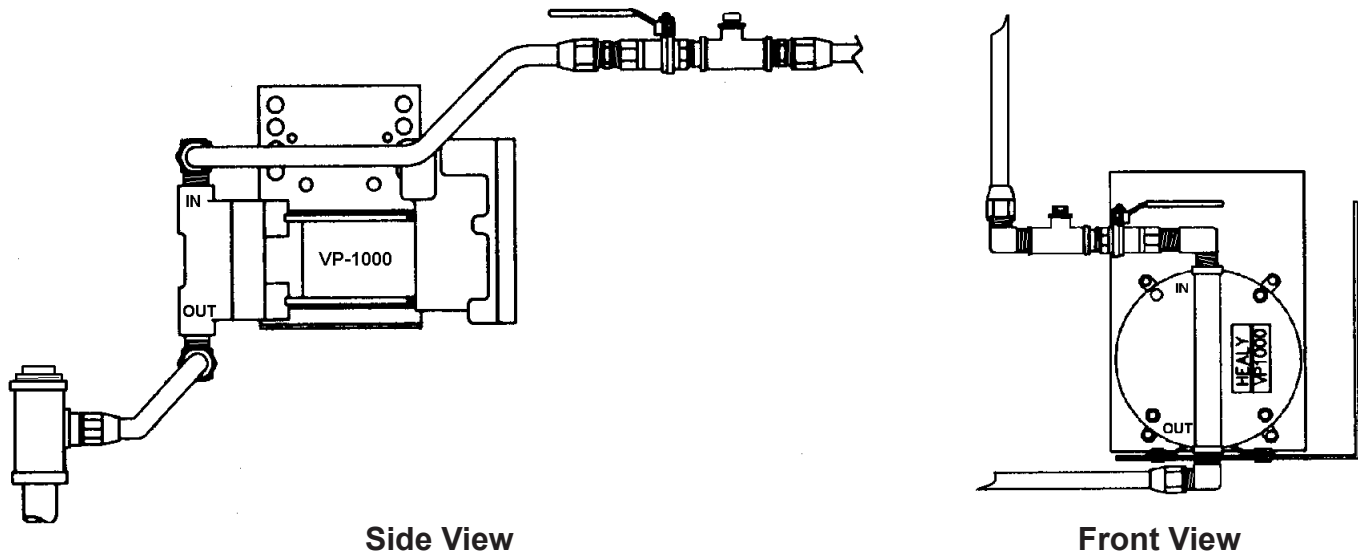
Part	Quantity
12' Length type "L" Copper Tubing	1
1/2" Ball Valve	1
1/2" x 1/4" x 1/2" NPT Tee	1
1/4" NPT Hex Pipe Plug	1
1x1/2" NPT Reducing Bell	1
1x1/2" NPT Reducing Bushing	1
5/8" Flare Tee	1
1/2" NPT Street Elbow	1
Sheet Metal Screw	1
Cushioned Hold Strap	1
3/4"x1/2" NPT Bushing	2
1/2" NPT Close Nipple	3
1/2" NPT x 5/8" Flare Elbow	4
1/2" NPT x 5/8" Flare Straight	5
5/8" Flare Nut	8

## Figure 5



## Figure 6

Example - Universal Vapor Piping Inlet / Outlet Configurations



- VP1000 inlet and outlet piping/tubing can be installed in many different configurations to adapt to the available space within a dispenser/pump.
- Inlet piping must contain a test port and ball valve in the order shown above.
- Use Oil and gasoline compatible PTFE tape on all threaded vapor connections for both the inlet and outlet ports of the VP1000 vacuum pump. **NO PIPE DOPE ALLOWED.**
- Both Inlet and Outlet Piping requires the use of 5/8" O.D. "Type L" copper tubing in combination with 1/2" NPT x 5/8" Flare Fittings when connecting to existing dispenser vapor piping. **NO COMPRESSION FITTINGS ALLOWED.**
- Additional connectors or fittings may be required to adapt to the original dispenser piping.

## Tools Required

- 0-100" Water Column Vacuum Gauge
- 9" Lineman's Pliers
- Assorted Open End Wrenches 1/4" through 3/4"
- Assorted Allen Wrenches
- Wire Cutters/Strippers 18 AWG and 26 AWG
- 3/8" Drill Assembly
- Assorted Drill Bits 1/16" through 7/16"
- 1/2" (5/8" O.D.) Copper Tube Bending Tool
- 1/2" (5/8" O.D.) Copper Flaring Tool
- Assorted Screwdrivers (Flat blade-one must be 1/8" wide)
- 1 1/8" Sheet Metal Hole Punch (for Potted Conduit Assembly)
- Copper Tubing Cutter
- Electrical Multi-Oeter
- 12" adjustable Wrench
- 18" Channel lock Pliers
- (2) 18" Pipe Wrench
- Hand Pipe Threader (for up to 1" pipe)
- Pipe Cutter (for up to 1" pipe)
- Tape Measure
- Oil and gasoline compatible PTFE Tape
- Thread Sealing Compound
- 1/2" or 3/8" Ratchet set w/Sockets 1/4" through 9/16" + 3" Extension

## Dispenser Access

- Secure dispenser access keys from station management.
- Lock-out and tag-out all electrical power to dispenser being modified.
- Remove dispenser panels and open doors as required for installation.

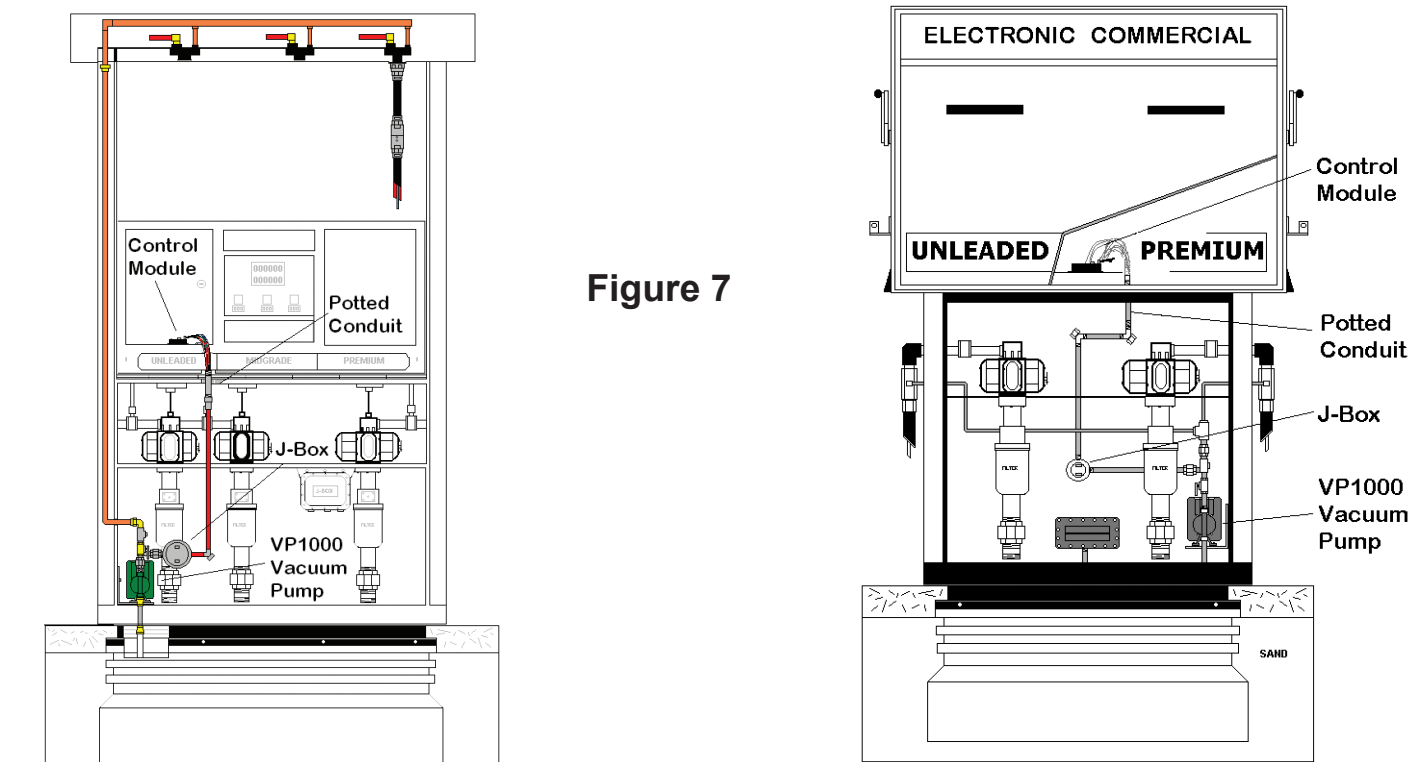
## Dispenser Survey

Close inspection of the dispenser is needed before any work begins. The survey should include the following observations:

- What vapor recovery system (if any) is currently installed – Balance or VAC Assist?
- Does the existing vapor piping have any obstructions inline such as solenoid valves or ball valves?
- The installer should take note of any possible obstructions that would effect the proper installation of the vacuum pump.

## Before Mounting the Vacuum Pump

- The vacuum pump inlet cover must be accessible for service.
- Allow spacing for inlet piping test port and ball valve.
- An unobstructed path for the installation of vapor tubing.
- Allow space for electrical conduit components.
- Access point for the potted conduit through the vapor barrier.



# Installing the VP1000 System

## Mounting the Vacuum Pump & Electrical Conduit Assembly

The VP1000 System must be installed by a Healy Certified Technician following all applicable federal, state and local codes & regulations.

**Warning**  **Disable and tag-out all electrical feeds into the dispenser. No Electrical Power is allowed to the dispenser during the installation of the vacuum pump and control module.**

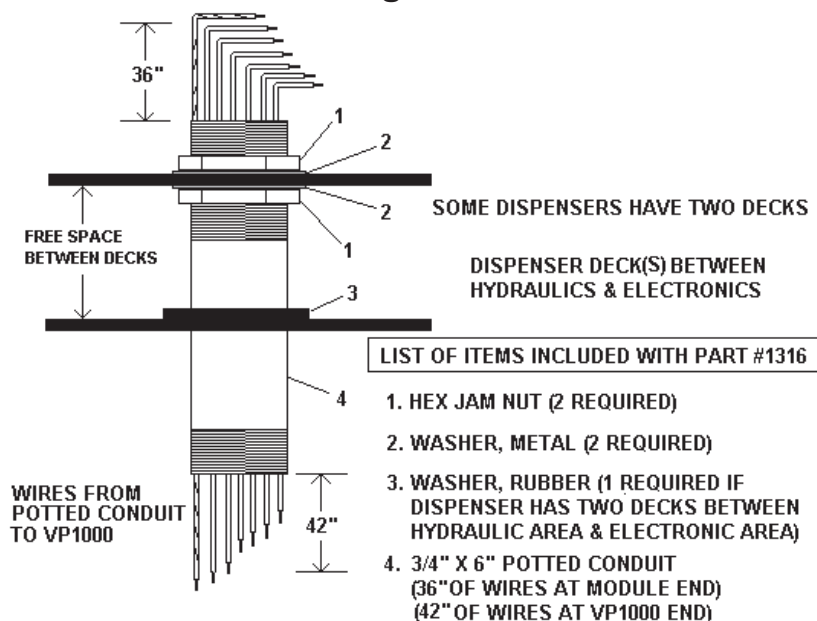
The recommended mounting position of the VP1000 vacuum pump is with the vacuum inlet and the electrical connection facing upwards towards the top of the dispenser.

- The vacuum pump's performance is not affected by the mounting location within a dispenser.
- The vacuum pump can be mounted at any location within the hazardous area of a dispenser if all applicable NFPA codes are followed.
- The installation must use "UL" approved electrical conduit, explosion-proof junction box and electrical union as required components connecting the VP1000 vacuum pump to the MC100 control module.
- For mechanical type dispensers the MC100 control module must be mounted in a dedicated "UL" listed explosion proof junction box.

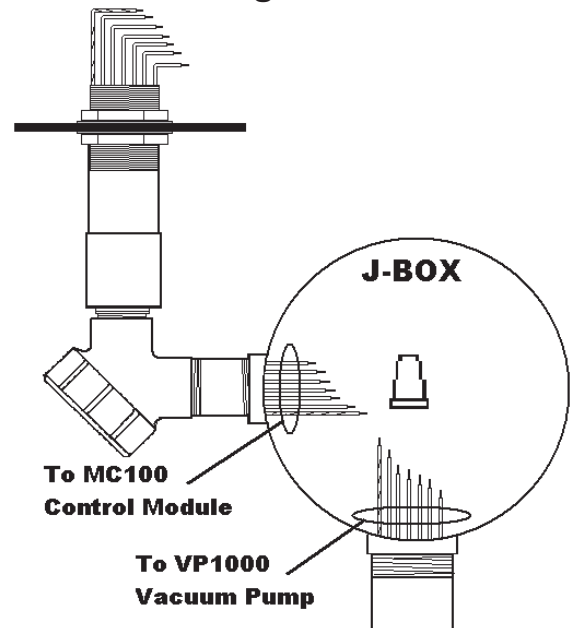
The vacuum pump can be mounted on any solid surface or dispenser brace suitable to support the weight of the pump (32 lbs). The black steel bracket that is attached to the VP1000 Vacuum Pump can be removed and rotated (3 different mounting positions) so as to achieve the recommended mounting position of the pump as mentioned above. If additional support is needed, the use of the universal steel bracket supplied in each kit is recommended. Each VP1000 kit comes with enough hardware and fasteners to secure both brackets.

1. Begin the installation by mounting the vapor pump in the location pre-determined by the Dispenser Survey in the Preparation Section of this manual. Do not final tighten the mounting bolts at this time.
2. Install the Potted Conduit Assembly (PN# 1316) in the location pre-determined by your survey (Figure 8). The potted assembly is used for the electrical conduit transition from the hazardous area into the electronic area where the MC100 Control Module will be located.
3. The opening required through the vapor barrier for the potted assembly must be 1-1/8" in diameter. Installers can use a sheet metal punch to create the opening or use an existing "punch-out" if available.
4. Remove the top hex nut and washer from the potted conduit assembly. Guide the potted assembly through the "punch-out" then replace the washer and thread the hex nut back onto the assembly and hand-tighten the assembly into place. If the dispenser has dual vapor barriers, the rubber washer is installed on the top side of the lower deck. (See Figure 8)

**Figure 8**



**Figure 9**



5. After the potted conduit and the VP1000 vacuum pump are in place (do not final tighten), you can begin to make up the electrical conduit that will connect the two components. Keep in mind that an electrical union and the explosion proof junction box must be installed between the two points.
6. Measure and select the proper size “UL” listed electrical nipples (not included). Feed the wiring from the potted conduit and the vacuum pump through the necessary electrical conduit components and nipples making sure that each piece is connected by a minimum of five threads. All electrical conduit connections must have at least five threads of engagement to be in compliance with the installation procedure.
7. Final tighten the mount for the VP1000 vacuum pump and also the hex locking nuts for the potted conduit assembly only after all the electrical conduit components have been correctly installed according to NFPA codes.
8. Pull the excess wire from the potted conduit and the vacuum pump through to the explosion proof junction box as required.
9. After the electrical conduit connections are completed and the wiring has been pulled into and through the explosion proof junction box the excess wire can be measured and cut. The length of the wires should allow for stripping and a wire nut connection for each wire (approximately 6"). The wires from the potted conduit and the vacuum pump are color coded and should be connected like for like.

## **Installing the MC100 Control Module**

### **Overview**

The MC100 control module is universal to all Healy VP1000 installations. The unit can accept up to four individual signals from each side of the dispenser and is designed to perform these specific functions:

- To accept a constant 120 Volt AC power supply from the dispenser.
- To supply a constant 120 Volt AC power supply to the VP1000 vacuum pump.
- To receive a separate signal from each side of a dispenser for authorization to dispense. Solenoid valves are most commonly used but any signal of 5 volts or above (AC or DC) will be accepted by the MC100.
- To send a low volt DC signal to the VP1000 vacuum pump to begin operation and to send a second low volt DC signal if the dispenser has both sides authorized to dispense simultaneously.
- To disable the dispenser if the vacuum pump is not operating properly.

### **Mounting the MC100 Control Module**

The MC100 control module is mounted in the electronics area of the dispenser. If the dispenser is a mechanical type with no vapor barrier the module must be located in a suitable “UL listed” explosion proof J-box.

The mounting location must be easily accessible to a service technician. The control module contains diagnostic LED lights and a power reset needed to service the system.

1. Identify the wire harness / control module part number to be installed. (See the Dispenser Models section in this manual)
2. The MC100 Control Module must be mounted to the inner framework of the dispenser following all applicable installation codes.
3. The MC100 Control Module is used with all wire harnesses described in the Dispenser Models chapter in this manual.
  - The 1360A module / wire harness includes 3M ScotchLok wire connectors to interface with the dispensers existing solenoid wiring.
  - All other dispenser specific wire harnesses use mating plug connectors. (See the Dispenser Models chapter in this manual)

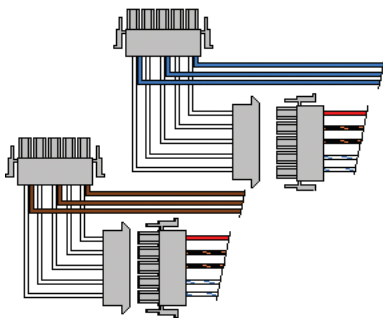
# **Dispenser Specific Wire Harness Installation**

1. Locate the solenoid valve control board used to supply power to the product solenoid valves.
2. Locate the plug connector or connectors that supply power or signals from the solenoid valve control board to the individual solenoid valves.
3. Remove the existing connection between the solenoid valve control board and the solenoid wire connecting plug(s).
4. Some dispensers will have separate solenoid valve connection points on the solenoid valve control board. The Healy control module wire harness for these dispensers will also be separated. Channel 1 input harness connects to the "A" side of the solenoid valve control board. Channel 2 input harness connects to the "B" side of the solenoid valve control board.
5. Plug the cable connector(s) from the Healy Control Module into the mating connector(s) located on the solenoid valve control board. Do not force the connection. The connector installed on the Healy Control Module should match the original connector removed from the solenoid valve control board.
6. The Healy wire harness is now connected at the solenoid valve control board. Be sure the plug connector(s) have properly locked into place ensuring a tight connection.
7. Plug the previously removed solenoid wire connecting plug(s) into the mating connection on the Healy control module wire harness. This step will complete the dispenser interface wiring to the Healy Module.

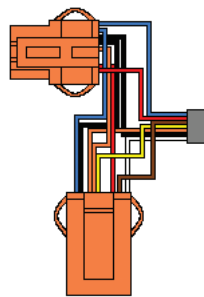
## **AC Power to the module**

1. The MC100 Module requires a constant 120vac - 2 amp power source from the dispenser. The power should be supplied from the main power strip or accessory connections capable of sustaining a 2 amp load.
2. Using a 3M ScotchLok supplied with the 1360A Module assembly, connect the factory installed black & white twisted pair on the MC100 Module to the black and white (power & neutral) from the main power source or accessory connection of the dispenser.

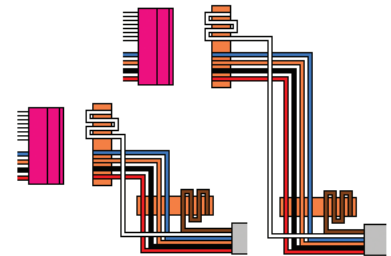
Shown below are the Dispenser Specific Interface Wire Harnesses listed in the Dispenser Models chapter of this manual.



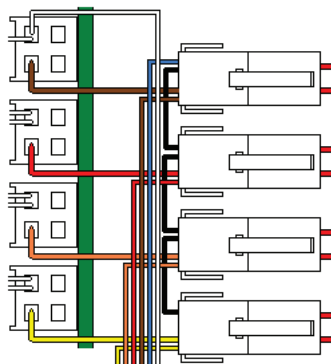
**1354 Wayne & DL Non-Blender**



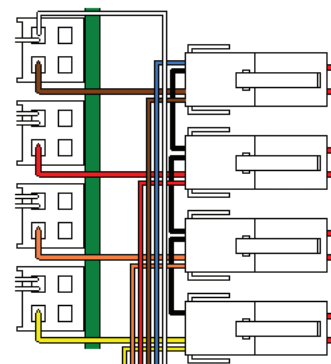
**1363 Wayne 1V & 2V Blender**



**1368 Early Gilbarco Encore 300 Blender**



**1362 Tokheim Premier C Blender**



**1372 Early Tokheim Blender**

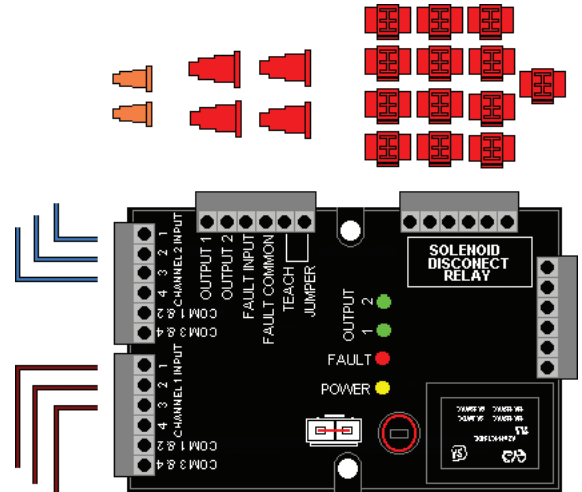
# Generic Dispenser Wire Harness Installation - 1360A

The 1360A Generic Wire Harness/Control Module is universal and can be installed in any dispenser or suction pump.

Description	Quantity
MC100 Control Module	1
Wire Nuts Red	4
Wire Nuts Orange	2
ScotchLok Red	13
12' Brown #16 Wire	1
12' Blue #16 Wire	1

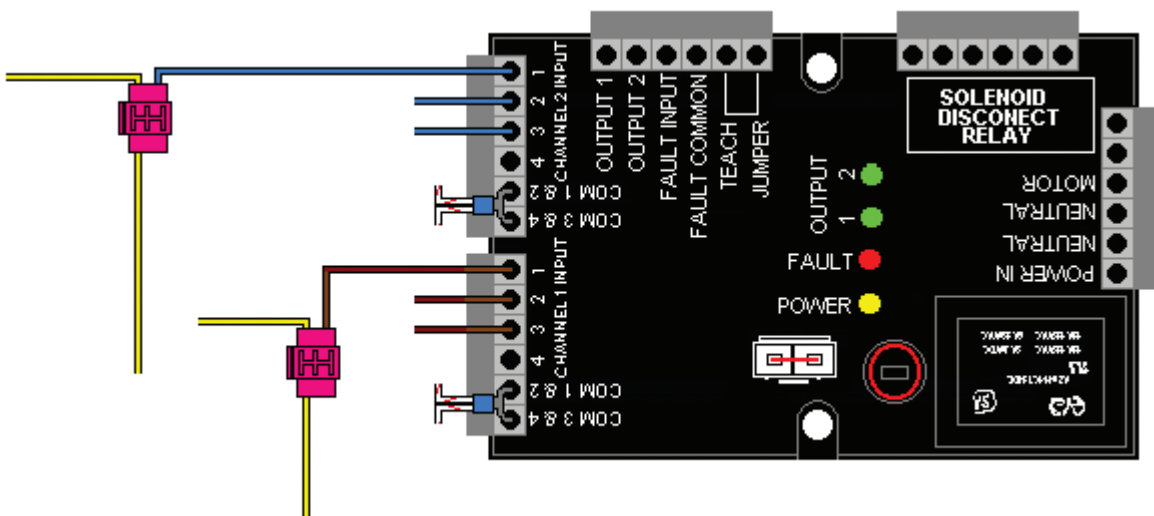
**Note:** Solenoid valves that supply diesel do not connect to the MC100 Control Module.

1. Locate the solenoid valve board that controls the signals (AC or DC) entering or exiting the product solenoid valves.
2. Locate the dispenser wire harness that carries the signals from the solenoid valve control to the individual solenoid valves on each side of the dispenser.



## A Side

3. Starting on the “A” side of the dispenser and using a multi-Oeter, determine which harness wire is carrying the voltage signal to the “A” side – grade 1 solenoid valve.
4. If a solenoid valve assembly has more than one signal wire, the signal wire that is first energized and remains energized throughout the fueling is labeled.
5. Each individual solenoid valve signal wire supplying the “A” side of the dispenser must be located and labeled; for example: A grade 1, A grade 2, A grade 3.
6. Loosely place a 3M ScotchLok onto the first signal wire (“A grade 1”) then measure and cut the appropriate length of blue wire supplied with the 1360A module assembly. One end of the blue wire is placed in the Scotchlok connector and fastened to the signal wire. The other end is stripped and placed into the Channel 1 Input / Position 1 of the MC100 Control Module.
7. Repeat Step 6 for the next solenoid valve and all remaining valves that supply the “A” side of the dispenser. Attach each of the “piggy-back” signal wires separately into the next available position(s) 2,3,4 on the Channel 1 Input side of the MC100 Module.



**Attaching the Voltage Signal Wire(s) to the MC100 Control Module**



## B Side

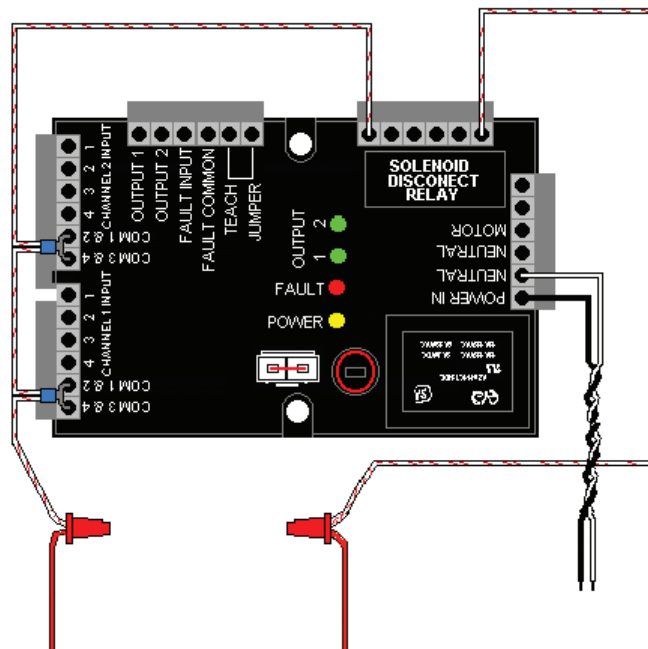
8. Repeat steps 3-7 for the “B” side solenoid valve signal wires using the Channel 2 Input side of the MC100 Module.
9. Each and every product solenoid valve supplying gasoline to the nozzles should have a voltage signal “piggy-back” wire installed terminating at the MC100 Module.
  - “A” side valves to Input CH 1 – 1,2,3,4
  - “B” side valves to Input CH 2 – 1,2,3,4

### Solenoid Disconnect Relay Wiring (1360A only)

10. Factory installed on the 1360A module / harness, the red & white “jumper” wire has two separate wire leads and is attached at four locations on the module: CH 1 Com 1,2,3,4; CH 2 Com 1,2,3,4; and the “Solenoid Disconnect Relay” position 1 & 6.
11. The red & white “jumper” wire leads are connected to the neutral or common wiring for the solenoid valves. This jumper allows the module to reference the signal voltage from an authorized solenoid valve and also have the ability to disable the dispenser solenoids using the solenoid disconnect relay if the vacuum pump is not working properly.
12. To connect the jumper properly, locate the neutral or common wire that is associated with the control of the dispenser solenoid valves, this wire will be cut and each end separated and attached by a wire nut to the red & white “jumper” wire that has been factory installed on the MC100 Module.

### AC Power to the module

13. The MC100 Module requires a constant 120vac - 2 amp power source from the dispenser. The power should be supplied from the main power strip or accessory connections capable of sustaining a 2 amp load.
14. Using a 3M ScotchLok supplied with the 1360A Module assembly, connect the factory installed black & white twisted pair on the MC100 Module to the black and white (power & neutral) from the main power strip or accessory connection of the dispenser.

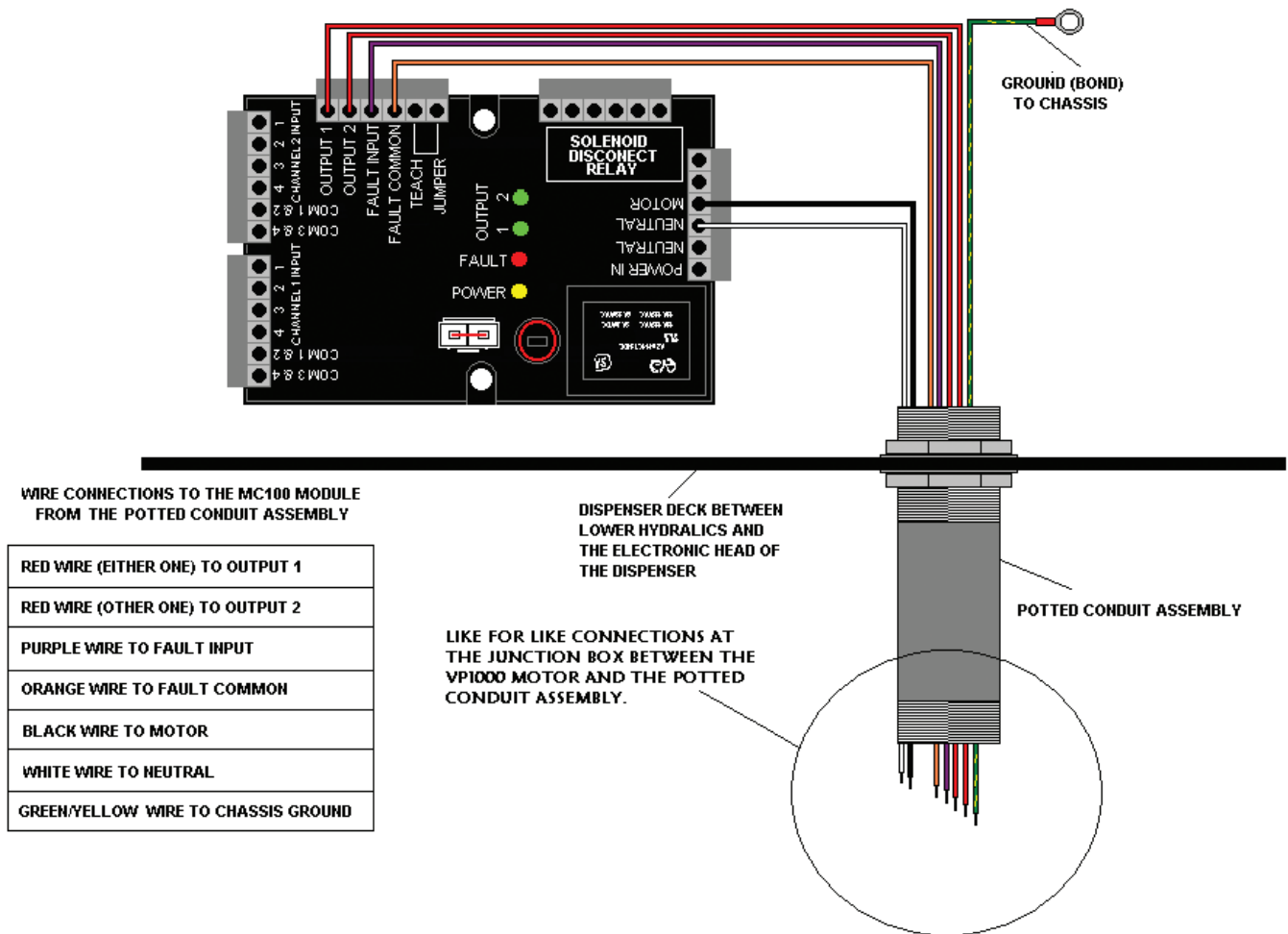


**Solenoid Valve Neutral Wire Interrupt**

**Note:** The neutral wire color (AC valves) will typically be red, but may be a different color depending on solenoid type.

# 1316 Potted Conduit Wiring

- The power and signal wires that operate the VP1000 Vacuum Pump originate at the MC100 Control Module. These wires connect the module to the explosion proof junction box through the 1316 potted conduit assembly previously installed in the "Mounting the Vacuum Pump & Electrical Conduit Assembly" section of this manual.
- Cut the wires from the 1316 potted conduit assembly an appropriate length to reach the MC100 Control Module terminal blocks, strip each wire end 1/2 inch.
- Connect the low voltage (DC) signal wires:
  - Begin with one RED wire (either) and connect to OUTPUT 1 on the terminal block.
  - Connect the second RED wire to the OUTPUT 2 on the terminal block.
  - Connect the PURPLE wire to the FAULT INPUT on the terminal block.
  - Connect the ORANGE wire to the FAULT COMMON on the terminal block.
- Connect the high voltage (AC) power wires:
  - Connect the WHITE wire to the NEUTRAL position on the AC terminal block.
  - Connect the BLACK wire to the MOTOR position on the AC terminal block.
  - Connect the GREEN/YELLOW wire to chassis ground.



# Installing Dispensing Hanging Hardware

Dispensing Hanging Hardware is defined as the connecting point on a dispenser where the Healy System Hose Assembly or the Healy System Hose Adapter connects to the original dispenser product outlet.

## Installing Dispensing Equipment

1. Completing the connection of Healy Systems dispensing equipment requires the installation of Healy Systems Phase II dispenser adapters, hoses and nozzles (Hanging Hardware). So, if applicable, remove existing non-Healy hanging hardware (from the dispenser product outlet adapter to, and including, the nozzles).
2. Vapor ready dispensers will require a Healy Systems adapter to make the hose threads compatible with other Healy Systems equipment. Install the adapter according to the instructions that come with it. Various adapters are available, depending on how the dispenser is configured: M34 metric (Healy designation F3 or S3) or balance ready (Healy designation S4).
3. Healy Vapor Recovery Hoses are available in various lengths to satisfy local ordinances and still provide “far side” fueling capability. Install Healy Vapor Recovery Hoses according to the instructions contained with the product in the shipping box.
4. Breakaways are required; install either a model 8701VV Breakaway or a model 807 Swivel Breakaway. Install the breakaway using the instructions supplied with the unit.
5. The Healy Systems nozzle Model 900 (EVR) series is the only nozzle necessary to complete the upgrade. Check to be sure that the nozzle hanger is mounted in the highest position. Check for proper fit in the nozzle holster and that the nozzle can be locked in the off position. Also be sure that when the nozzle is locked, the dispenser cannot be activated from the locked position.

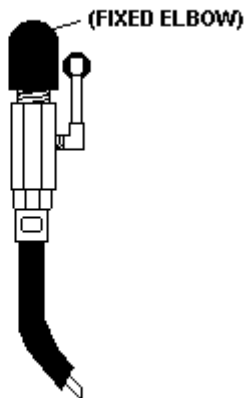
## Hose Adapters<sup>1</sup>

- Used for “Non-Vapor Ready” Commercial Dispensers Only (Universal)
- Dispensers containing existing “VacAssist” or “Balance” Stage II piping DO NOT use these adapters.

## CX6-A

Non-Vapor Ready, Standard Low Hose Dispensers

**CX6-A  
HOSE ADAPTER  
NON-VAPOR  
STANDARD UNITS**



The Vapor Kits listed below are for use with CX6-A hose adapters

Model	Description
Vapor Kit Z008	Standard low hose / Single hose dispenser
Vapor Kit Z009	Standard low hose / Dual hose dispenser

<sup>1</sup> A complete list of dispenser conversion adaptors manufactured by Franklin Fueling Systems is listed in Exhibit 1. The use of dispenser conversion adaptors not listed in Exhibit 1 may be used to facilitate installation provided that all applicable performance standards are met.

## Testing the System

1. Carefully review all work completed, making sure that all mechanical joints are thoroughly tightened and that all electrical connections are sealed.
2. Open the product crash valves and restore power to the dispenser.
3. With the power on, but no nozzles authorized, the VP1000 should not be running (unless the ambient temperature is below 40°F), but the power LED (yellow) should be energized on the interface module.
4. Authorize one handle and the vacuum system should activate when the gasoline flow control valve is engaged. Repeat for all other nozzles, individually testing each nozzle on each side of dispenser. With each authorization, one of the green LED's on the interface module should illuminate and the VP1000 activate.

**Note:** For unihose dispensers, conduct individual tests for each product grade on each side of the dispenser to ensure that the same LED activates for all grades on the same side. If the other LED activates, wiring needs to be corrected.

5. Authorize one nozzle and listen to the speed of the VP1000. With only one nozzle activated, the speed will be slower than if a nozzle on each side is activated. Activate a nozzle on the other side of the dispenser and listen for the speed to change.
6. To test the tightness of the vapor plumbing installed on the suction side of the system requires a 0-100" water column gauge. Connect the gauge into the 1/4" test port of the adaptor tee installed earlier (see Figures 6 and 7 for reference on test port installation and location) . Continue by following and completing the START-UP / NEW INSTALLATION / WARRANTY / ANNUAL TESTING FORM.

# Troubleshooting the VP1000

**Important: Use extreme care and caution when performing the tests listed below. If 120 VAC is accidentally applied to the fault or DC terminals, the module will be destroyed.**

- With power applied to the dispenser, but no products authorized, there should be 120 VAC between neutral and 120 VAC on the module terminal strip.
- As above, with any product authorized, there should be single speed power applied to the VP1000.
  - Verify this by checking for 2-3 VDC from OUTPUT 1 (RED WIRE) to FAULT COMMON (ORANGE WIRE), (or from OUTPUT 2 TO FAULT COMMON) also; one GREEN LED should be illuminated. With a second product authorized on the opposite side of the dispenser i.e. one product on each side, the motor should operate at higher speed and there should be 2-3 VDC on both output 1 and 2 (to fault common) and both GREEN LED's should be illuminated.
- With the pump running, a fault can be simulated by shorting, with a jumper wire, the "FAULT INPUT" (purple wire) to FAULT COMMON (orange). This should cause the motor to shut off, the solenoid valves to lose power and the dispenser to shut down. As long as the short is maintained, the red LED will be illuminated. Removing the short will not automatically reset the module. To reset the module, remove the short, remove power to the dispenser for fifteen seconds and restore power. The switch (some models) or jumper plug on the module will also disconnect the power as long as it is held over or removed for 15 seconds, the module should be reset and the LED extinguished. If removing the jumper plug, be sure that there are no hazardous vapors present.
- If diagnosing a problem where the LED is already illuminated, a steady light indicates a low current condition, therefore expect a vane or rotor problem. If the LED is blinking, that indicates a high current condition and would expect to find a jammed rotor or vapor line flooded with product.
- The electronics of the motor will make three attempts to have a successful start of the motor. If it detects a problem, on the fourth unsuccessful start, it will short the fault line to signal minus (DC-) and shut down the electronics.

# VP1000 Vane & Rotor Service & Replacement Guide

**Caution**  **Disconnect power before beginning service.**

1. The work area **must** be clean and have sufficient lighting.
2. Disconnect the vapor piping connected to the **IN** and **OUT** ports of the VP1000 cover assembly.
3. Remove the four Allen head screws and lock washers that secure the pump cover assembly to the pump housing and remove the cover carefully.

**Caution**  **Use a spill cloth when removing the cover, as there may be some gasoline inside the pump cavity.**

4. Carefully turn the rotor assembly by hand until the shaft key notch is at the 12 o'clock position. (See Figures)
5. Remove the rotor, vanes and shaft key from the pump housing.

**Note:** Place your hand or a container under the rotor while removing. Do not use any sharp objects that would scratch the surfaces of the pump cavity, pump shaft, rotor, or vanes.

6. Rotate the shaft by hand. If the shaft does not rotate freely, the entire vacuum pump needs replacement (p/n VP1000-5 or RVP1000-5).
7. If the rotor and vanes are cracked, chipped, excessively worn or excessively dirty, the rotor and vanes should be replaced because cleaning will not remedy these conditions (p/n VP1000VRC-G, VP1000VRC-P or VP1000VRC).
8. If there is no visible damage, use a lint-free cloth with isopropyl alcohol to clean the rotor and vanes.
9. Using a lint-free cloth with isopropyl alcohol, thoroughly clean: the inside of the pump ring and rear of the pump cavity, the rotor shaft, and the inside of the pump cover.
10. Reposition the shaft (if necessary) so that the shaft key notch is in the 12 o'clock position. Install the cleaned original or new shaft key onto the shaft.
11. Carefully install the cleaned original or new rotor onto the shaft followed by the cleaned original or new vanes into the rotor.

**Note:** The rotor assembly should slide on to the shaft easily, without excessive force. (Rotors and vanes are reversible)

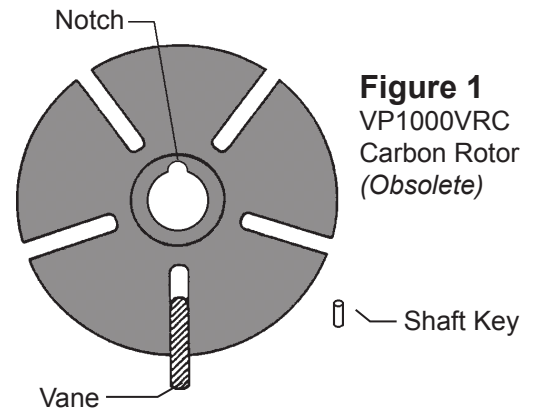
12. Lightly lubricate and install the new O-Ring for the pump housing.

**Note:** Do not allow any lubricant to get inside the pump housing.

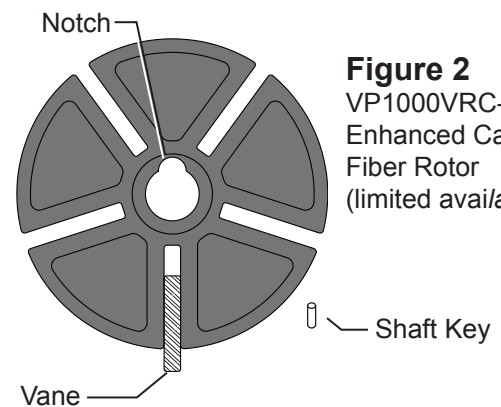
13. Install the pump cover using the four Allen head screws and lock washers removed in step 3 and cross tighten.

**Note:** Use caution when sliding the pump cover over the O-Ring seal to prevent cutting or tearing.

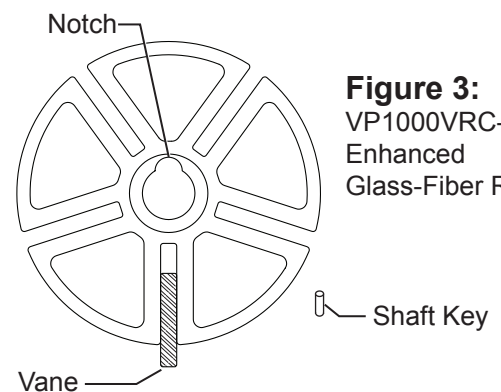
14. Re-connect the vapor piping to the **IN** and **OUT** ports of the pump cover assembly that was removed in Step 2.
15. Re-apply power. Test for normal operation. (See VP1000 Vacuum Performance Test Procedure)



**Figure 1**  
VP1000VRC  
Carbon Rotor  
(Obsolete)



**Figure 2**  
VP1000VRC-P  
Enhanced Carbon  
Fiber Rotor  
(limited availability)



**Figure 3:**  
VP1000VRC-G  
Enhanced  
Glass-Fiber Rotor

START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections 3, 4, 5 and 6 of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

SERVICE COMPANY NAME	TELEPHONE	
SERVICE TECHNICIAN	HEALY TECH CERT #	
STATION ADDRESS	CITY	STATE
DISPENSER MAKE	VACUUM PUMP SERIAL #	

## SIDE A

DISPENSER EQUIPMENT CHECKLIST - Parts A-1 and A-2	YES	NO*
<b>A-1</b> Is all the installed dispenser hanging hardware listed in Exhibit 1 of Executive Order VR-201 or VR-202?	<input type="checkbox"/>	<input type="checkbox"/>
<b>A-2</b> Proper installation of the VP1000 requires the test port and ball valve on the inlet side of the vacuum pump. Are the test port and ball valve installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
<b>*If the answer to either A-1 or A-2 is NO, the Healy Warranty is Void.</b>		

### A-3

- THE FOLLOWING TEST WILL PERFORM A POSITIVE PRESSURE LEAK CHECK OF THE VACUUM PUMP, DISPENSER VAPOR PIPING, HANGING HARDWARE AND ALL NOZZLES ON BOTH SIDES OF THE DISPENSER.
- THE VP1000 OUTLET IS NOT CONNECTED TO UNDERGROUND PIPING DURING THIS TEST.

**CAUTION: REGULATE GASEOUS NITROGEN TO 2.5 PSI (~70" WC) MAXIMUM BEFORE TESTING**

1. Install a 0-100 inch water column (" wc) mechanical gauge at the VP1000 test port.
2. Use the water column gage positive (high) pressure port.
3. Gaseous nitrogen gas can now be connected to the outlet (exhaust) port of the VP1000.
4. Test pressure **cannot** exceed 70" wc.
5. **Slowly** introduce the gaseous nitrogen to a pressure between 60 – 70" wc.
6. After reaching the pressure range, close the valve supplying the gaseous nitrogen.
7. Record the initial pressure reading on the gauge - observe and record the final pressure reading after 60 seconds.
8. Leaks must be repaired when the pressure falls more than 4" wc in 60 seconds.
9. Retest until all leaks have been repaired.
10. Record test results in Section A-4.

<p><b>A-4</b></p> <p style="text-align: center;"><b>PRESSURE TEST</b></p> <p style="text-align: center;"><b>2.5 PSI (~70"wc) Maximum</b></p>	<p><b>Initial Pressure test reading ("wc)</b></p>	<p><b>Pressure test reading after 60 seconds ("wc)</b></p>
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START-UP/NEW INSTALLATION/ WARRANTY/ ANNUAL TESTING FORM (Rev. 10/07)  
HEALY VP1000 VACUUM PUMP

Date \_\_\_\_\_

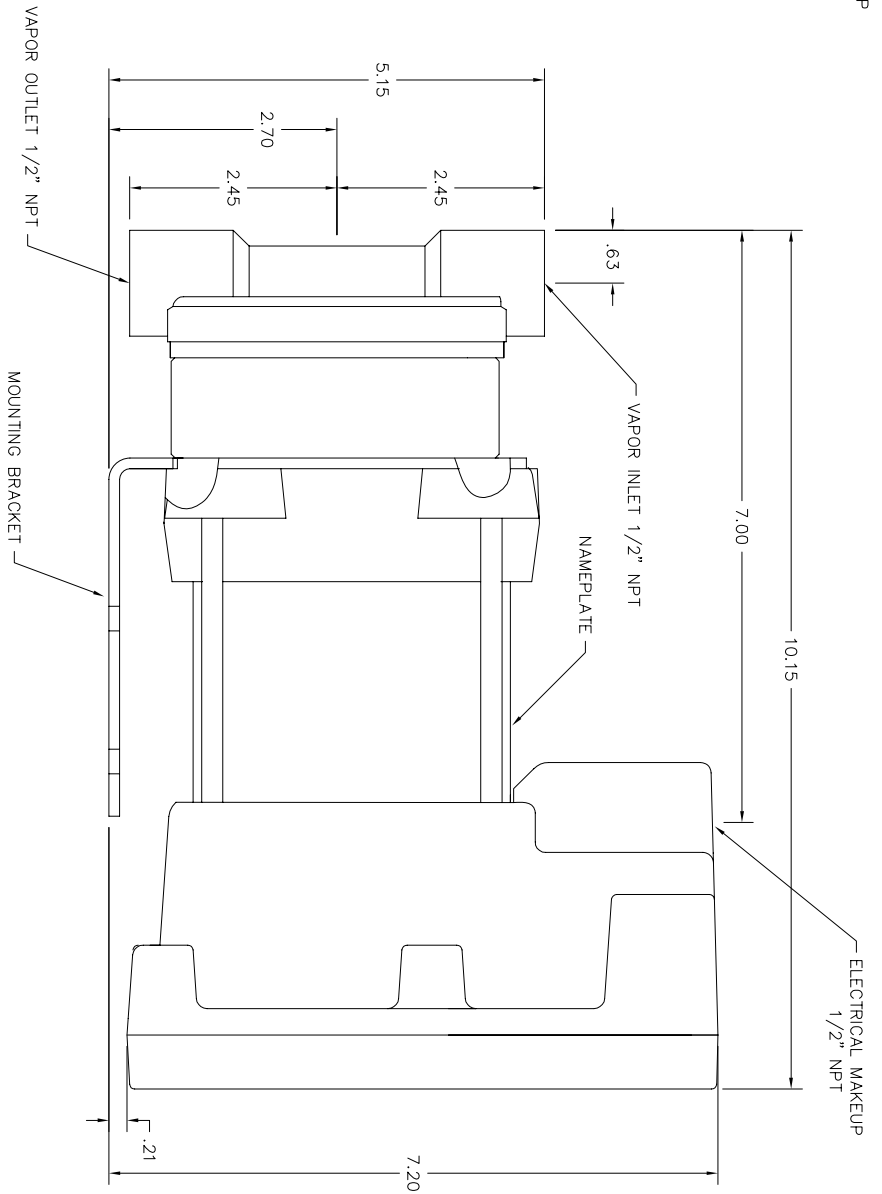
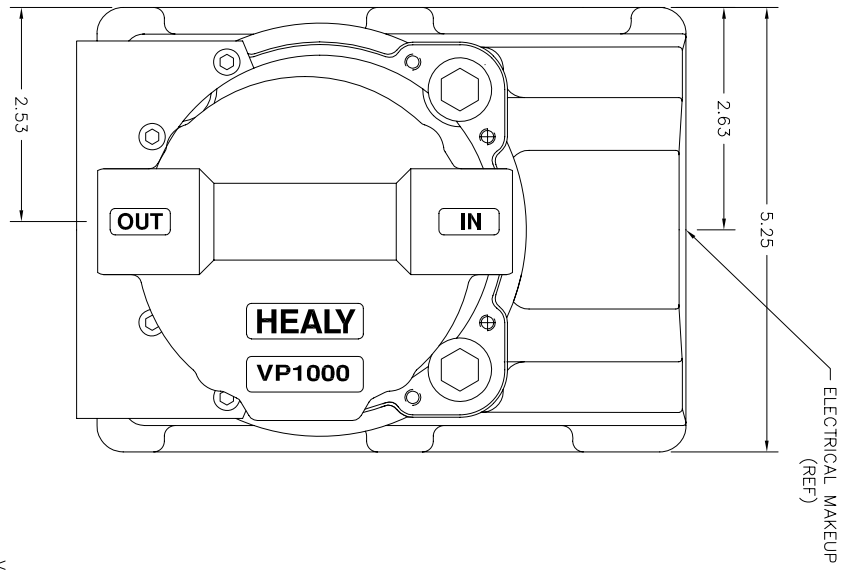
**BOTH SIDES OF THIS TEST FORM MUST BE COMPLETED FOR NEW INSTALLATIONS**

- **Start-up / New installations** – complete **SIDE A** and sections 3, 4, 5 and 6 of **SIDE B**. Submit forms to Healy Systems.
- **Warranty Service or Annual Testing** – complete contact information, dispenser make, vacuum pump serial # and the tests in sections 1 and 2 on **SIDE A** and conduct the appropriate tests specified on **SIDE B**. Submit Forms to Healy Systems.

<b>SIDE B</b>			
<i>Warranty Service</i> Complete Troubleshooting Sections <b>B-1 and B-2</b>		<i>Start-up/ New Installations/ Annual Testing</i> Complete Sections <b>B-3 through B-6</b>	
<b>B-1</b>	<b>Control Module Fault Light</b> (Circle one)	<div style="display: flex; justify-content: space-around;"> <span><b>Flashing (LED)</b></span> <span><b>Steady (LED)</b></span> </div> <ol style="list-style-type: none"> <li>1. All fault conditions require removal and cleaning or replacement of the rotor and vanes located inside the vacuum pumps round front cover assembly. Use the <b>VP1000 ROTOR &amp; VANE SERVICE AND REPLACEMENT GUIDE</b> in the applicable dispenser retrofit manual of the ARB Approved Installation, Operation and Maintenance Manual for Executive Orders VR-201-O and VR-202-O.</li> <li>2. Clean all surfaces including vanes, rotor, rotor housing and cover assembly.</li> <li>3. Manually spin and inspect the motor shaft for bearing wear before re-installing the rotor kit.</li> <li>4. Replace motor when bearings or shaft are damaged or worn.</li> <li>5. Check O-ring seal before replacing rotor cover assembly.</li> </ol>	
<b>B-2</b>	Re-Assemble / Reset Vacuum Pump and Module. (Power must be removed from both the vacuum pump and the <b>module for 20 seconds to reset the system</b> ) using the power reset switch on the MC100 module.		
<b>B-3</b>	Dispenser Vapor Line Integrity Test	<ol style="list-style-type: none"> <li>1. Install 0-100 inch water column (" wc) vacuum mechanical gauge at the VP1000 test port.</li> <li>2. Authorize the dispenser for fueling. The VP1000 will begin to run.</li> <li>3. Close the ball valve at the pump inlet.</li> <li>4. Record the initial vacuum reading on the gauge – observe and record the final vacuum reading after 60 seconds.</li> <li>5. Open the ball valve at the pump inlet.</li> <li>6. Leaks must be repaired when the vacuum reading falls more than 4" wc in 60 seconds.</li> <li>7. Retest until all leaks have been repaired.</li> <li>8. Record data in Section B-4.</li> </ol> <p><b>Note: If the initial vacuum reading is less than 60" wc, it could indicate a problem with the VP1000. Remove the dispenser from service. Use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>	
<b>B-4</b>	VACUUM TEST Using VP1000 as vacuum source	Initial Vacuum test reading (" wc)	Vacuum test reading after 60 sec. (" wc)
<b>B-5</b>	Dispenser Vacuum Test	<p>With one side of the dispenser authorized (VP1000 running) and the ball valve at the pump inlet open, dispense in handheld position a minimum of 0.5 gallons of fuel into a vehicle or test tank. Record the vacuum level while dispensing. Repeat test for the other side of the dispenser.</p> <ol style="list-style-type: none"> <li>1. Side "A" Dispensing Vacuum _____" wc</li> <li>2. Side "B" Dispensing Vacuum _____" wc</li> </ol> <p><b>Note: If the dispensing vacuum is less than 60" wc, remove the dispenser from service. See the troubleshooting section of the manual or contact FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>	
<b>B-6</b>	Audible Increase Test	<p>Test the VP1000 Vacuum Pump for normal operation. Use the 6 step procedure titled, "Testing the VP1000 Vacuum Pump for normal operation using the following test procedure:" in Section 1.1 (Weekly Inspection and Testing) of the Healy Systems Scheduled Maintenance document in the ARB Approved Installation, Operation and Maintenance Manual for the Healy Phase II EVR System not including ISD. This is to verify that the pump recognizes when both sides of the dispenser are activated for fueling.</p> <p>Does the VP1000 Vacuum Pump change speeds (audible increase) when both sides are activated for fueling?</p> <p style="text-align: center;">Yes No</p> <p>If the answer is no, <b>use the troubleshooting section of the manual to investigate problem or contact the FFS Technical Help Desk at 800-984-6266 for assistance.</b></p>	

Repairs - Comments	To Obtain Returned Materials Authorization number (RMA#) Call 800-984-6266 Forms can be faxed to Franklin Fueling Systems Customer Service at 800-225-9787
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NOTE: ALL DIMENSIONS ARE APPROXIMATE AND REFERENCE ONLY.



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# Liquid Condensate Trap (LCT)

## Installation, Operations, and Maintenance Manual

### 1. PRE INSTALLATION NOTES:

**State Water Resources Control Board (SWRCB) Requirements** are listed in California Health and Safety Code, Chapter 6.7 and California Code of Regulations Title 23 Div. 3 Chapter 16. SWRCB Local Guidance Letters LG 113 and LG-169 address in detail these regulatory requirements that apply to Liquid Condensate Traps. Installers should familiarize themselves with these requirements to ensure compliance.

Some of the highlights of the SWRCB requirements are: Vapor condensate traps are permitted as part of the Underground Storage Tank (UST) System and are regulated like any other UST System. Requirements will vary depending on the date of installation, but secondary containment, interstitial monitoring, periodic secondary containment testing, cathodic protection, periodic integrity testing, and overfill prevention may be required. Automatic evacuation of vapor condensate traps are equipped with a suction line (typically connected to a siphon port on the turbine) that can automatically evacuate liquid and return it to the UST. Because the suction line contains liquid product, it is subject to the same regulatory requirements as any other product suction piping on the UST system. Depending on the installation date of the UST and the presence or absence of check valves, secondary containment, interstitial monitoring, or periodic integrity testing of the suction line may be required.

**CAUTION:** Always obtain approval from the local authorities having jurisdiction before beginning any work. Installation of the Liquid Condensate Trap must comply with (if applicable):

- Air Resources Board Certification Procedure CP 201;
- Healy Phase II EVR Executive Orders (EO) VR 201 and 202;
- Certified Unified Program Agency (CUPA) – List of CUPAs can be found at ([www.calepa.ca.gov/CUPA/Directory/default.aspx](http://www.calepa.ca.gov/CUPA/Directory/default.aspx));
- Fire Marshal;
- SWRCB;
- Local Air Pollution District;
- International Code Council (ICC) Note: Anyone working on an LCT system must have an ICC certification for UST Service Technician, or UST Installation and Retrofitter;
- NEC;
- NFPA 30 and 30A;
- UL;
- Any other applicable Federal, State and local codes.

## 2. LIQUID CONDENSATE TRAP PHASE II EVR COMPONENTS

Exhibit 1 of VR 201 and VR 202 lists components required for a Phase II EVR System with a Liquid Condensate Trap. Existing Liquid Condensate Traps may already have some of these components installed. Some of these required components are (reference all Figures):

<b>Riser Adaptor -</b> INCON Model TSP-K2A	This riser adaptor is to be installed on all risers that are connected to the Liquid Condensate Trap, except for the Liquid Condensate Trap suction tube riser.
<b>In-Line Filter -</b> Swagelok B-4F2-140 or SS-4F2-140 (or equivalent)	The purpose of the in-line filter is to trap debris and rust particles that are traveling inside the suction line to prevent them from blocking the syphon jet valve at the turbine pump. This in-line filter is installed at the syphon inlet of the turbine pump.
<b>Stainless Steel Wired Braided Hose or ¼" Copper Tubing</b> (rated for use with gasoline)	Connects the suction tube to the turbine pump.
<b>Aluminum or Stainless Steel Insect Screen</b> with Stainless Steel Hose Clamp	This screen can be purchased from almost any hardware store. The specifications are: 18 X 14 mesh for aluminum insect screen and 18 X 18 mesh for stainless steel insect screen. A small section of this screen material is installed over the end of the suction tube inside the Liquid Condensate Trap and secured with a SS hose clamp.
<b>Liquid Sensor Connection</b> to the UST Monitoring System	<p>Many sites already have existing liquid sensors installed inside the Liquid Condensate Trap. If a liquid sensor does not exist inside the Liquid Condensate Trap then one must be installed.</p> <p>Any Liquid sensor installed inside the Liquid Condensate Trap must meet the following minimal requirements:</p> <ul style="list-style-type: none"> <li>• Provides a visual and audible alarm in case of failure of the evacuation system;</li> <li>• The audible and visual alarm monitoring system must be installed at a location that is most likely to be heard by the station attendant during normal station operation;</li> <li>• Set the liquid sensor to the height shown in Figure 5.</li> </ul>
<b>Various Pipe Fittings</b> in ¼" and 2" Sizes	For adapting the suction line, as required, and to add a fuel entry point with a plug or cap to the Liquid Condensate Trap riser.

### Optional Equipment:

<b>Secondary Syphon Kit --</b> Franklin Fueling Systems Part Number 402507930	For use when two syphon primers are required for one Submersible Turbine Pump (STP). One to syphon the Liquid Condensate Trap and one for siphoning two or more tanks of like product grade.
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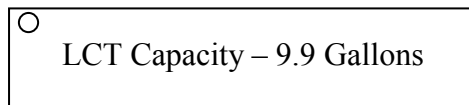
### 3. PRIOR TO INSTALLING THE EQUIPMENT LISTED IN EXHIBIT 1 OF THE EO

**WARNING:** Highly flammable vapors or liquids may be present in the environment in which this equipment is installed or serviced. Installing or working on this equipment means working in an environment that presents risks of severe injury or death if instructions and standard industry practices are not followed. Follow all applicable codes governing the installation and servicing of this product and the entire system. Always lock out and tag electrical circuit breakers while installing or servicing this equipment and related equipment. Refer to the Installation and Owner's Manual of this equipment and any related equipment for complete installation and safety information.

Prior to installing the Liquid Condensate Trap Equipment listed in Exhibit 1 of the EO VR 210 or VR 202, you must flush out the Liquid Condensate Trap to remove any dirt or debris that may have accumulated inside the Liquid Condensate Trap.

Installer will need to document the capacity, in gallons, of the Liquid Condensate Trap on an aluminum 'tag' and attach this tag to the suction riser above the Fuel Entry Port. The capacity could be documented using a metal stamp or metal engraving pen, or a waterproof ink marker on the aluminum tag. A vinyl covered steel cable or a 'zip tie' could be used to attach to the riser. Strips of aluminum can be purchased at most hardware stores.

#### Example LCT Capacity Tag



#### **Flushing the Liquid Condensate Trap and attached Piping:**

Flushing out the Liquid Condensate Trap of any debris is very important to avoid blocking the suction tube, suction line, the in-line filter, and the syphon jet at the turbine pump during liquid evacuation. This process must be performed before installing the required Liquid Condensate Trap Equipment listed in Exhibit 1 of the EO VR-201 or VR-202.

- Use appropriate equipment to flush out the Liquid Condensate Trap of any debris. One method used is:
  - a) Disconnect the suction line from the suction tube at the suction riser to prevent the turbine pump syphon from sucking any debris into the suction line and syphon jet during the flushing process.
  - b) Using a hand pump, pump approximately 5 gallons of fresh gasoline into the Liquid Condensate Trap Using the same hand pump, reverse the hoses and pump out the gasoline you just added. Repeat this procedure using fresh clean gasoline each time until the gasoline you are removing is clean and clear. This process may require a number of flushes (may be as many as 20 or more) before the gasoline being removed is clean and clear.

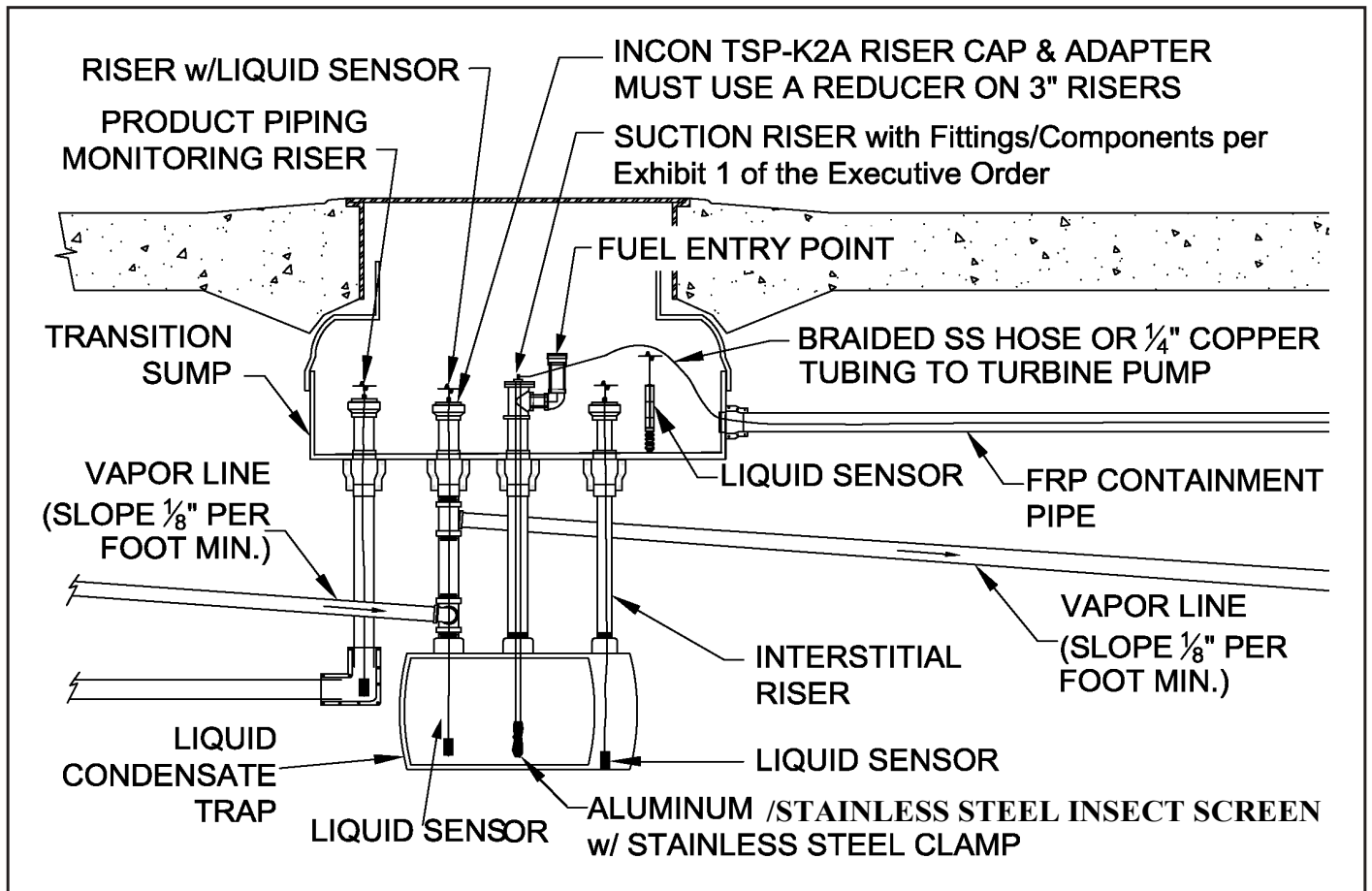
**Note:** Handle gasoline in a safe manner, following industry safety practices and all applicable State regulations and local codes.

- c) With the suction line disconnected from the Liquid Condensate Trap and disconnected at the turbine syphon port, blow compressed air through the suction line to remove any debris and check for any blockages.

**4. INSTALLATION OF THE PHASE II EVR EQUIPMENT LISTED IN EXHIBIT 1 OF EO VR 201 AND 202**

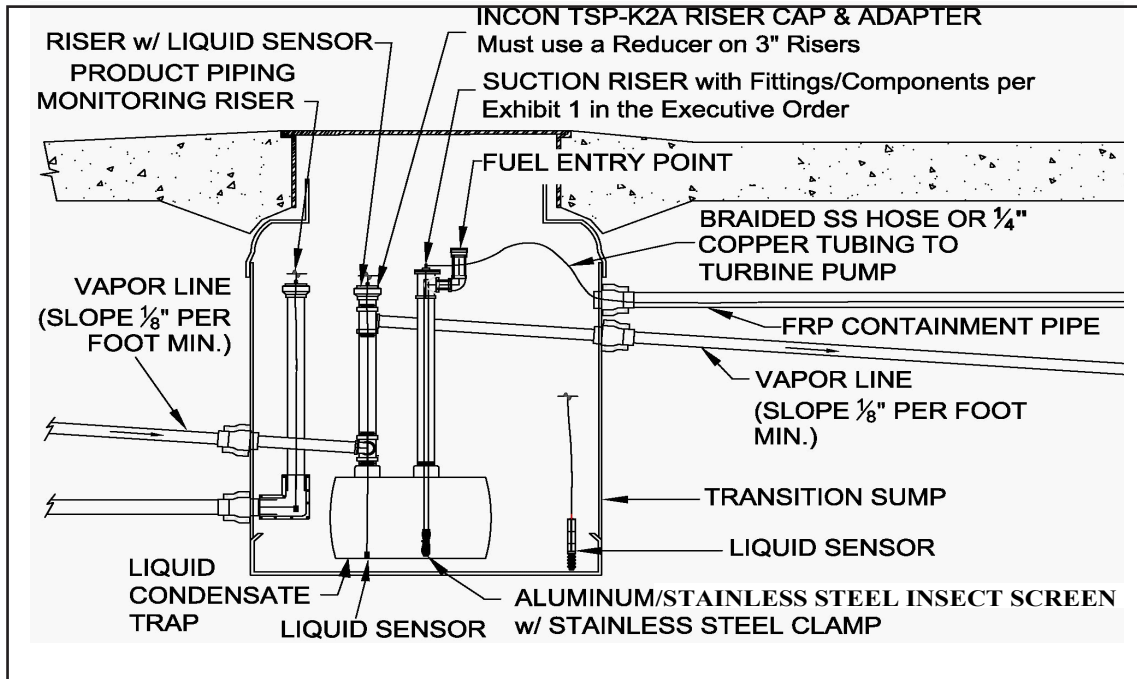
Figures 1 through 3 show a typical layout of a Phase II EVR Liquid Condensate Trap after completion of installing the equipment listed in Exhibit 1 of EO VR 201 and VR-202.

**Figure 1**  
Typical Liquid Condensate Trap Installed Below the Transition Sump



**Figure 2**

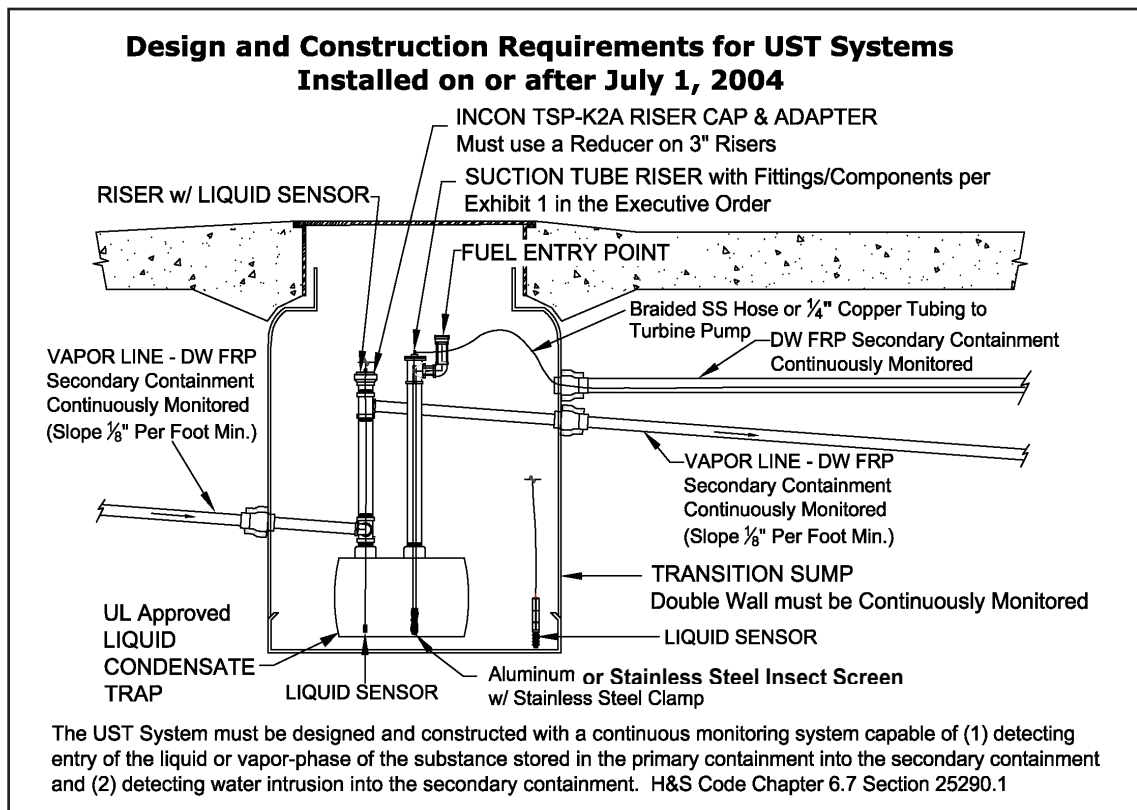
Typical Liquid Condensate Trap Installed Inside the Transition Sump



**Note:** A Liquid Condensate Trap installed inside a liquid AND vapor tight transition sump that is monitored with a liquid sensor can be single walled (if installed before July 1, 2004).

**Figure 3**

Typical Layout of a Liquid Condensate Trap Installed in a UST System Installed On or after July 1, 2004 and after the Installation of the Equipment Listed in Exhibit 1 of Executive Orders VR 201 and VR 202



#### 4.1 Installation of Swagelok 140 Micron In-Line Filter (or equivalent).

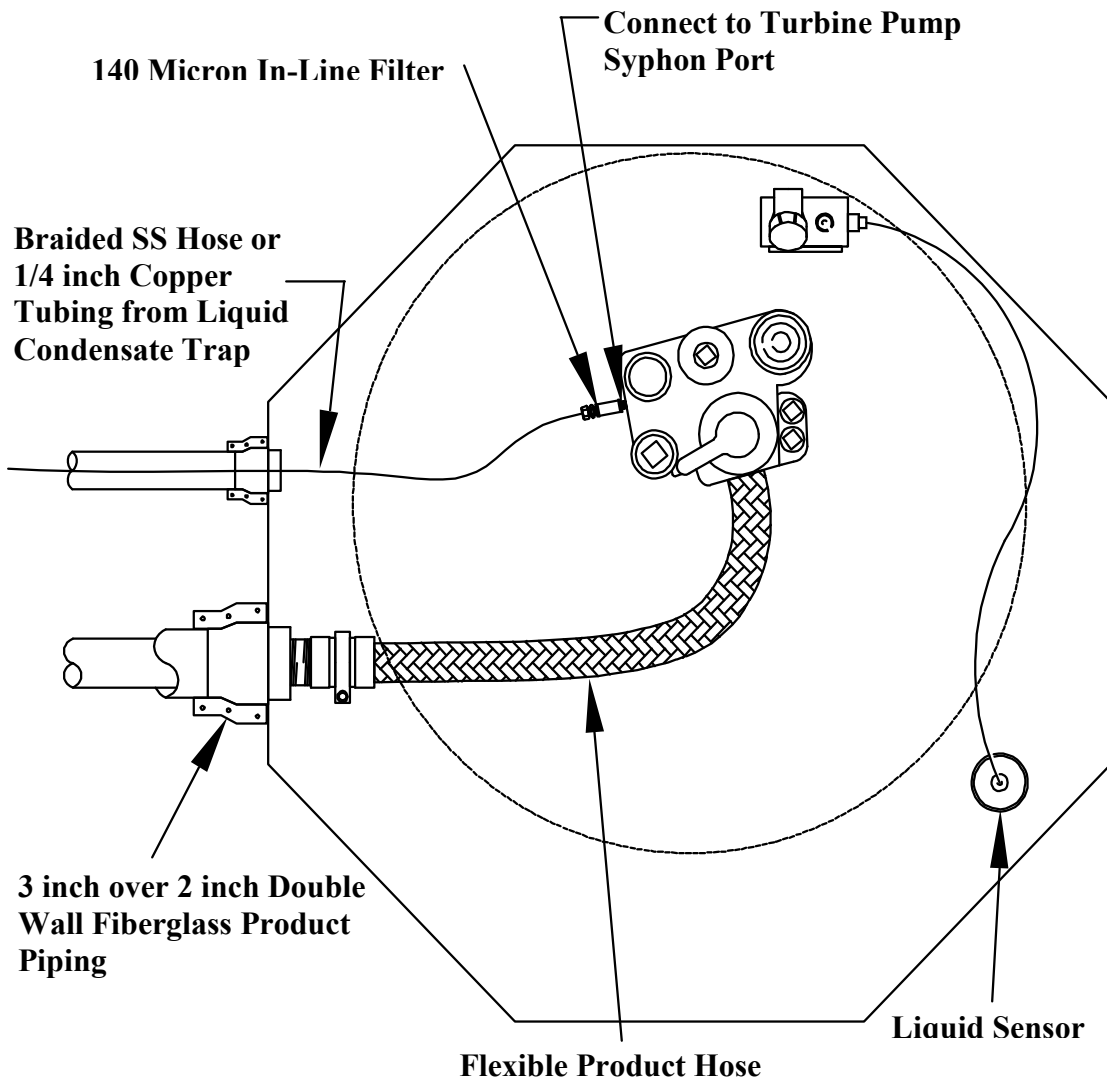
Swagelok instructions are used for guidance purposes. Individual manufacturer's installation instructions must be followed.

##### Swagelok In-Line filter B-4F2-140 Specifications

Body: Brass  
Connection: ¼" Male NPT  
Pore Size: 140 Micron

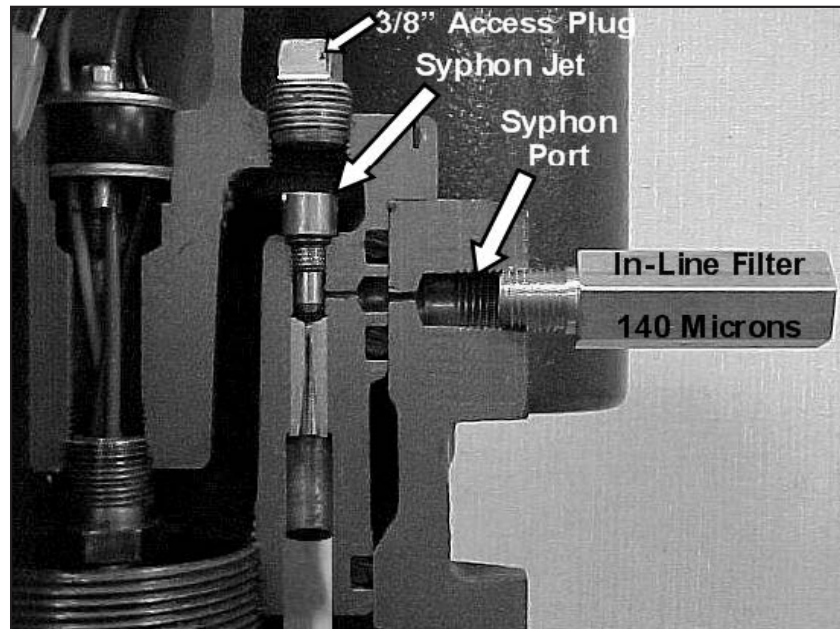
Apply Oil and gasoline compatible PTFE tape to the male NPT threads on both ends of the in-line filter. Install the in-line filter with the direction of the arrow pointing towards the syphon jet port on the Submersible Turbine Pump (STP).

**Figure 4**  
Top View of STP Sump

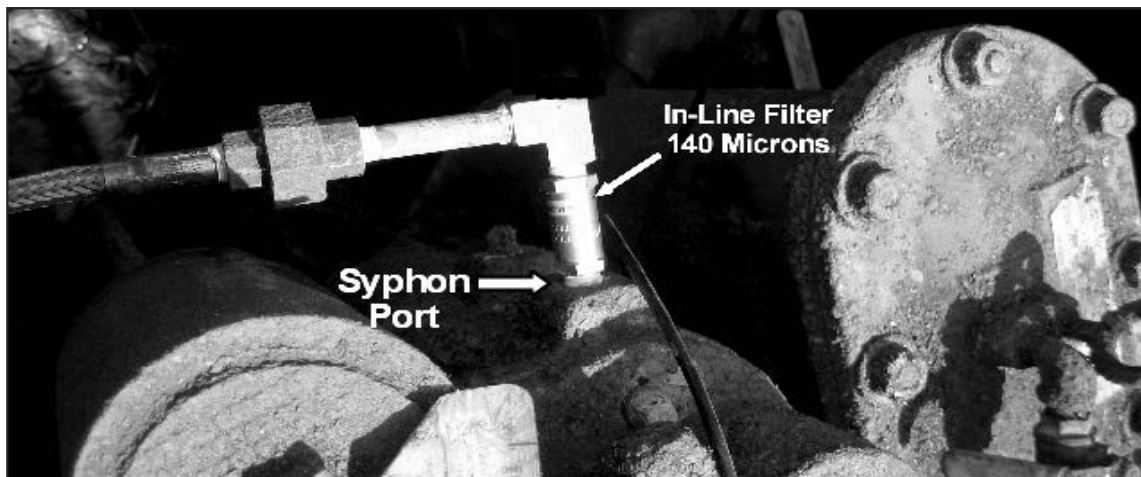




**Figure 4a**  
Cut Away side view of an STP



**Figure 4b**  
In-Line Filter connection to syphon port



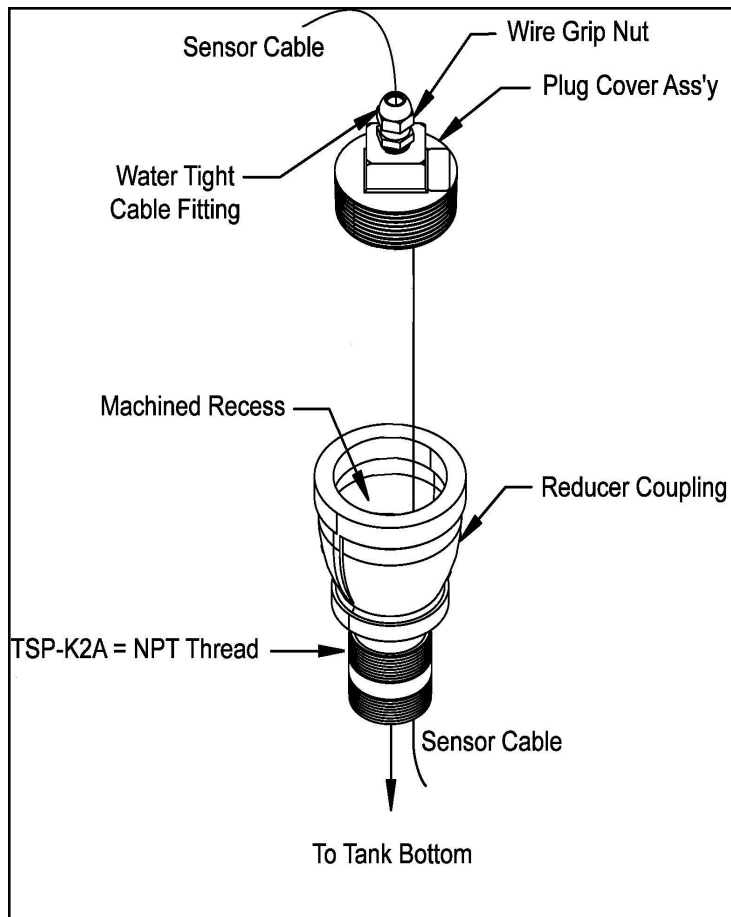
**4.1.1 Replacing Micron Filter Element Inside the In-Line Filter Swagelok** (or equivalent) instructions are used for guidance purposes. Individual manufacturer's installation instructions must be followed.

If the filter element becomes blocked from debris clean or replace the filter element – Swagelok P/N SS-4F-K4-140. See replacement instructions in Appendix B.

## 4.2 Installation of INCON TSP-K2A Riser Adaptor

**WARNING** Follow all federal, state and local laws governing the installation of this product and its associated systems. When no other regulations apply, follow NFPA codes 30, 30A and 70 from the National Fire Protection Association. Failure to follow these codes could result in severe injury, death, serious property damage and/or environmental contamination.

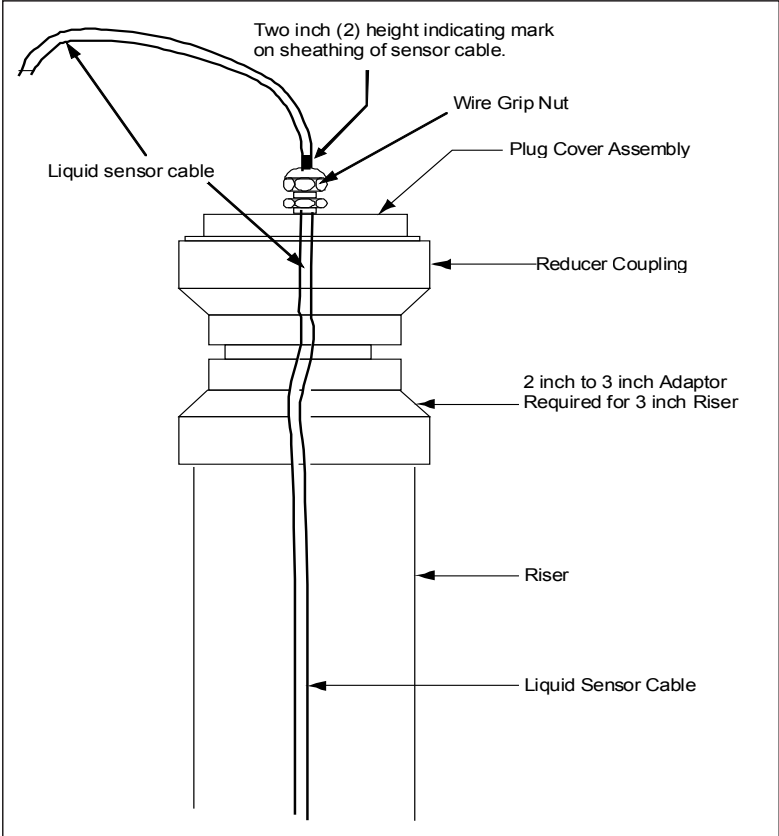
**WARNING** Always secure the work area from moving vehicles. The equipment in this guide is usually mounted underground, so reduced visibility puts service personnel working on this equipment in danger from moving vehicles entering the work area. To help eliminate these unsafe conditions, secure the area by using a service truck to block access to the work environment, or by using any other reasonable means available to ensure the safety of service personnel.



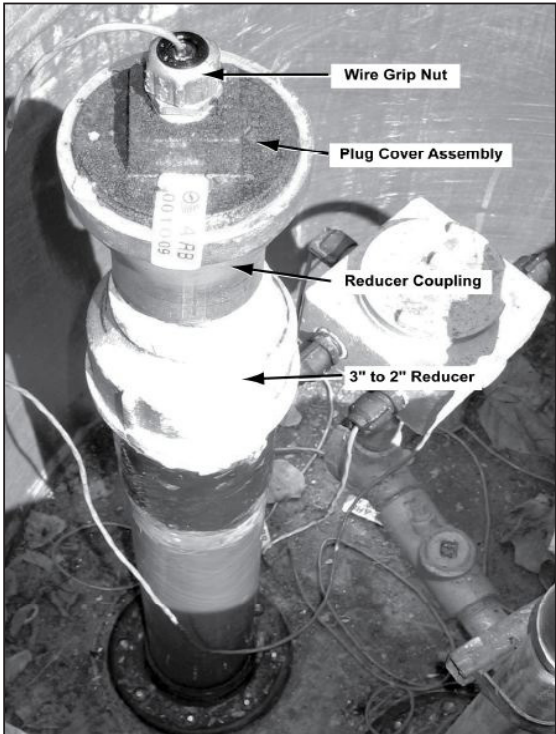
### Procedure

1. Install a close fit 2" threaded nipple (field supplied) into the existing pipe.
2. Install the Reducer Coupling onto the threaded nipple.  
**NOTE:** Use BOTH Oil and gasoline compatible PTFE® Tape and a brushed-on thread sealant on all threaded connections to form a vapor-tight seal.
3. Insert the Sensor Cable through the wire grip nut so that the end of the sensor is on the inside of the Reducer Coupling.
4. Make all of the connections and test the sensor.
5. Tape and seal the Plug Cover Assembly into the Reducer Coupling. Make sure that the wire leads through the Wire Grip are loose and do not rotate when tightening the Plug Cover Assembly.
6. Tighten the Wire Grip Nut to 75 100 in. lbs. of torque to secure the cable. Use a torque wrench with McMaster Carr # 5347A148, 1-1/16 inch Open End Head, for Interchangeable-Head Torque Wrench or equivalent.
7. Retest the sensor functionality.

**Figure 5**  
INCON TSP-K2A Riser Adaptor



**Figure 5a**  
INCON TSP-K2A Riser Adaptor



### 4.3 Installation of the Liquid Sensor

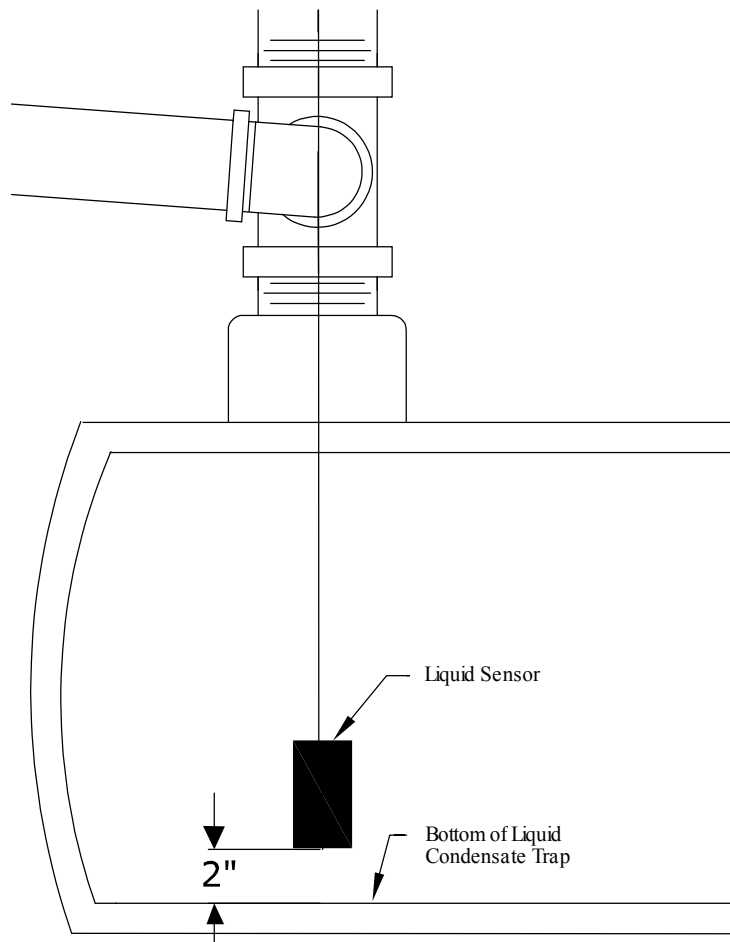
Installation of a liquid sensor requires technician to meet applicable requirements as specified in the SWRCB Local Guidance Letter 167 (LG 167).

If not already present, install a liquid sensor following the manufacture's installation instructions. Set the liquid sensor two (2) inches from the bottom of the Liquid Condensate Trap. See Figure 6. Then tighten the wire grip nut (of the TSP K2A) around sensor cable.

At the point where the cable exits the top of the wire grip, place a permanent indicating mark on the sheathing of the cable (e.g. using a waterproof marker such as a Sharpie™) which indicates the sensor is placed two (2) inches above the bottom of the Liquid Condensate Trap (see Figure 5).

When programming the LCT liquid sensor at the UST tank monitoring console, label the sensor with "LCT" in the title, e.g. L10 would be labeled "LCT High Liquid".

**Figure 6**  
Liquid Sensor Height Setting



#### 4.4 Installation of Suction Tube Riser, Suction Tube and Screen

**For all installations you must use fuel rated pipe sealant on all threaded connections.**

**For new installations** cut to size and thread a 2 inch galvanized steel riser for the suction tube and install it into a 2 inch bung at the top of the Liquid Condensate Trap.

**For all installations** install a 2 inch Tee fitting for the Fuel Entry Point on top of the 2 inch galvanized steel riser.

Measure the length of the suction tube to ensure it can meet the distance requirement in Figure 7. Cut the suction tube to length. When installing the suction tube, ensure the bottom of the suction tube is no more than 1 inch to 1 ½ inches from the bottom of the Liquid Condensate Trap.

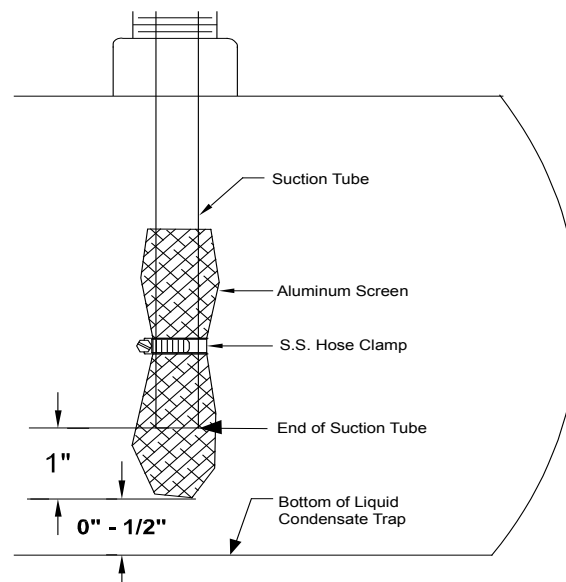
Cut a piece of 4 inch by 4 inch piece of screen material, either 18 x 14 aluminum mesh or 18 x 18 stainless steel mesh. Wrap it around the end of the suction tube as shown in Figure 7, leaving approximately 1 inch of screen below the end of the suction tube. Tighten the stainless steel hose clamp around the screen securing it approximately 3/8 inch or more from the bottom of the suction tube.

Once the aluminum screen is installed, the suction tube is ready to screw into the bottom of a double-tap bushing.

This double tap bushing, with the suction tube, is then installed into the top of the tee fitting.

Connect the suction line to the top of the double tap bushing using appropriate fittings (Figures 8 thru 8c) and the other end of the suction line connects to the 140 micron in line filter installed at the turbine syphon port per section 4.1 (Figures 4a and 4b).

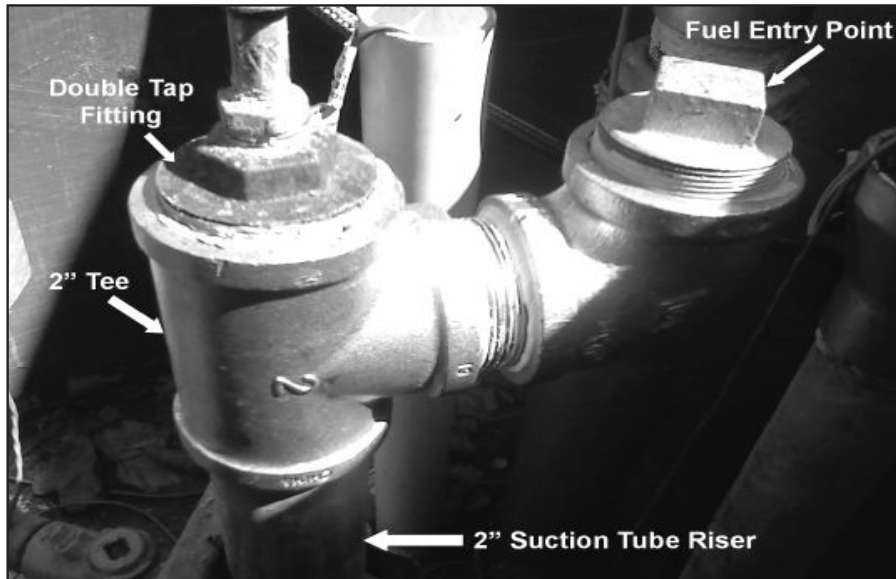
**Figure 7**  
Aluminum Screen and Suction Tube Installation



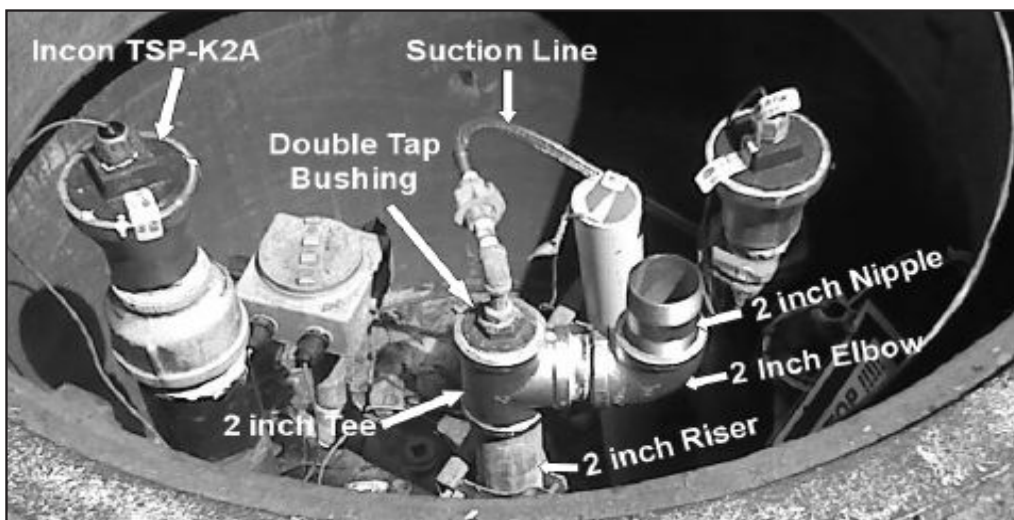
#### 4.5 Fuel Entry Point

On top of the 2 inch galvanized steel pipe install a 2 inch tee, 2 inch nipple, 2 inch elbow, additional 2 to 4 inch nipple (if using cap). Prior to installing cap or plug, conduct Exhibit 9 (VR 201) or Exhibit 11 (VR 202). Install 2 inch cap or plug using pipe thread sealant (all pipe fittings must be galvanized steel.) See figures 8 & 8a, 8b, 8c and 8d.

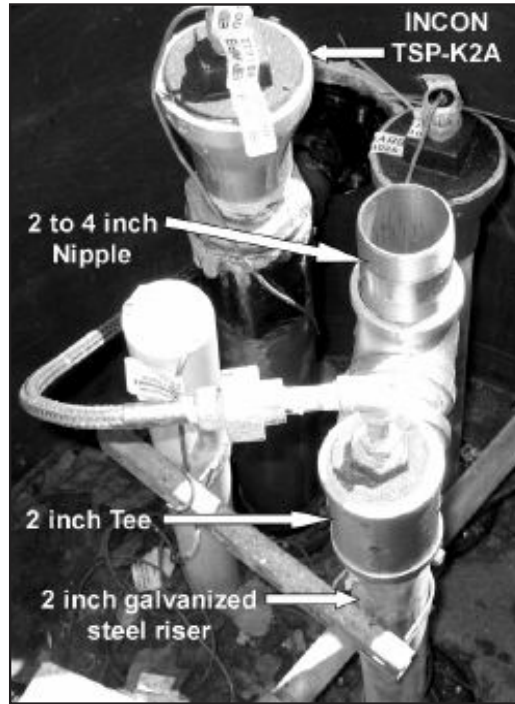
**Figure 8**  
Assembly of Fuel Entry Point



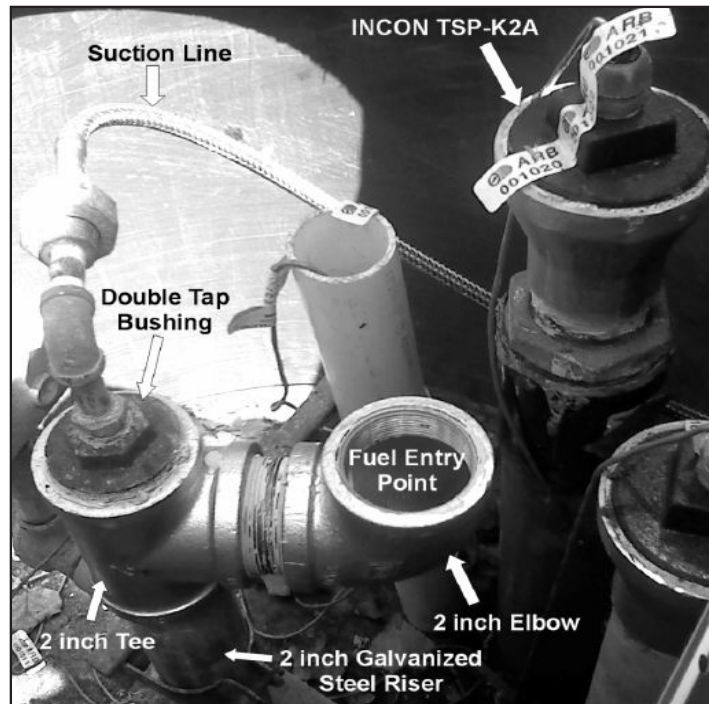
**Figure 8a**  
Assembly of Fuel Entry Point



**Figure 8b**  
Assembly of Fuel Entry Point



**Figure 8c**  
Additional View Assembly of Fuel Entry Point



**Figure 8d**  
Various Pipe fittings



#### 4.6 Conduct TP 201.3

Conduct TP 201.3, Determination of 2 Inch WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities, and Exhibit 8.

#### 5. REPLACEMENT OF TURBINE

In the event that the turbine connected to the Liquid Condensate Trap is replaced, Exhibit 9 of Executive Order VR 201 or Exhibit 11 of Executive Order VR 202 shall be conducted following replacement of the turbine. Oluptaere nobis earum rem sitatem connimos asperoreped esequam entiis que nis dolupit volorero elessus.

Iberum venet laut ex et facero con poriore hendign ihiliciae. Et ommostitiam, voliorerum sum, quas is nonseque ne nectur sunt, ute remolor emoluptaspic to conse vit pliae. Ellitat ex esendae. Is evelectempor aut volor aliquid elent venditas aut minctotatur sunt laceatem que at aut quodis eicilit quam ende seque as dolenda ntotas venis dolut qui ulles nem que volorep



# TROUBLESHOOTING PROCEDURES FOR LIQUID CONDENSATE TRAP

**WARNING:** Installing or working on this equipment means working in an environment that presents risks of severe injury or death if instructions and standard industry practices are not followed. Obey all applicable codes governing the installation and servicing of this product and the entire system. Always lock out and tag electrical circuit breakers while installing or servicing this equipment and related equipment.

## 1. Test The Turbine Pump For Normal Vacuum Readings:

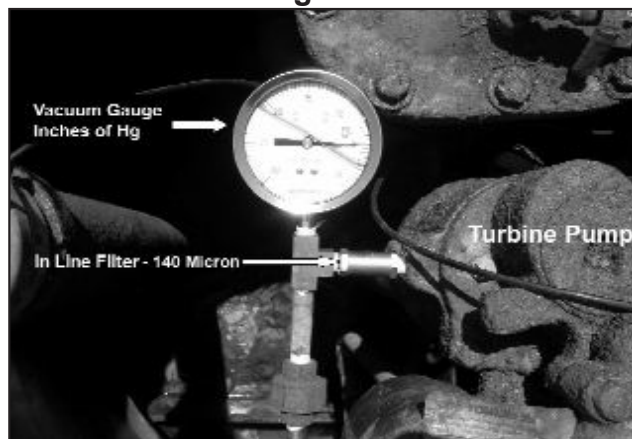
- Follow FE Petro syphon jet test procedures. See Appendix A, FFS FE Petro Service Bulletin SB005 “Syphon System Testing” (SB005). When using this test procedure for testing the turbine pump connected to the Liquid Condensate Trap only, perform Steps 1– 4. Do not use a syphon check valve and skip the syphon check valve test (for other turbine pump manufacturers, refer to their test procedure.)
- This will ensure the turbine pump is operating correctly and producing the correct amount of vacuum at the syphon port (minimum vacuum is 16 to 28 inches Hg). Make any necessary repairs to the turbine pump to meet the syphon port minimum vacuum levels.
- If the turbine pump is creating the appropriate amount of vacuum (16 to 28 inches Hg) at the syphon port, remove the test fixture called out in SB005 and install the 140 micron in line filter.
- Check the vacuum level again with the in-line filter installed using the vacuum gauge in Figure 9. The amount of vacuum should be between 16 to 28 inches Hg.

## 2. Required Troubleshooting Test Equipment

Install the following Liquid Condensate Trap evacuation troubleshooting equipment:

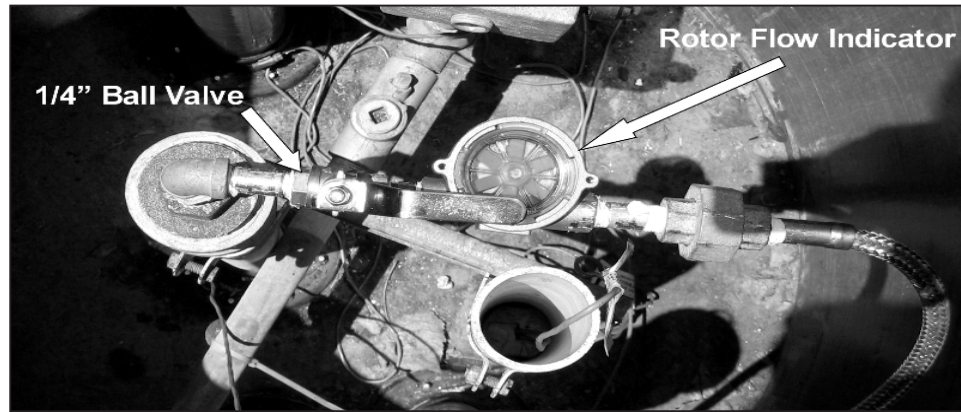
- 2.1 Ashcroft liquid-filled stainless steel, inches of Hg vacuum gauge, Grainger #2C879, 2C927 or equivalent. Install this gauge before the 140 micron in-line filter so that it is visible from outside the sump. See Figure 9.

**Figure 9**



- 2.2 Install a ¼ inch full port ball valve (ball valve) and rotor flow indicator Grainger Model 1AMD7 (or equivalent). The rotor flow indicator provides a visual indication of fuel flow when evacuating the Liquid Condensate Trap. Install this equipment so that it can be viewed from outside the sump. See Figure 10.

**Figure 10**



3. **With the troubleshooting equipment installed perform the following procedures:**
- With the ball valve in the CLOSED position fill the Liquid Condensate Trap with gasoline using the same method used in the Liquid Condensate Trap Compliance Test Procedure. The liquid sensor should be approximately 2 inches from the bottom of the Liquid Condensate Trap. Start the turbine pump connected to the Liquid Condensate Trap if it is not already running.
  - With the ball valve CLOSED, check the vacuum gauge and verify it is reading between 16 to 28 inches Hg of vacuum. If you do not have the correct amount of vacuum then look for a vacuum leak in the system. Check for a blocked in-line filter or syphon jet. See the table titled "If You Experience the Following Conditions".
  - OPEN the ball valve and watch for rotation of the rotor flow indicator. Rotation of the rotor flow indicator will indicate the flow of gasoline. The rotor flow indicator will not rotate at a high speed and will not rotate at all if no liquid is flowing through the indicator. The rotor flow indicator provides a visual indication that liquid is being evacuated from the Liquid Condensate Trap. If any air is getting into the syphon system during evacuation the liquid flow rate will change or stop.
  - When first opening the ball valve, the vacuum pressure may drop to zero inches of Hg (0" Hg) during priming of the suction line; however the vacuum should rise up to approximately 4 to 5 inches Hg during evacuation. Monitor the rotor flow indicator for steady rotation.

- e. When the Liquid Condensate Trap is almost empty and/or the liquid is below the end of the suction tube the rotor flow indicator will stop then start a few times and then completely stop. This is an indication that air is getting into the system. If the liquid sensor is out of alarm and the Liquid Condensate Trap is empty or almost empty (liquid level is at or below the bottom of the suction tube) you have successfully evacuated the Liquid Condensate Trap.

**Note:** At this time the vacuum gauge will read near zero inches of Hg (0" Hg) because the suction tube is sucking in air and not liquid.

#### **4. Passed this Troubleshooting Section**

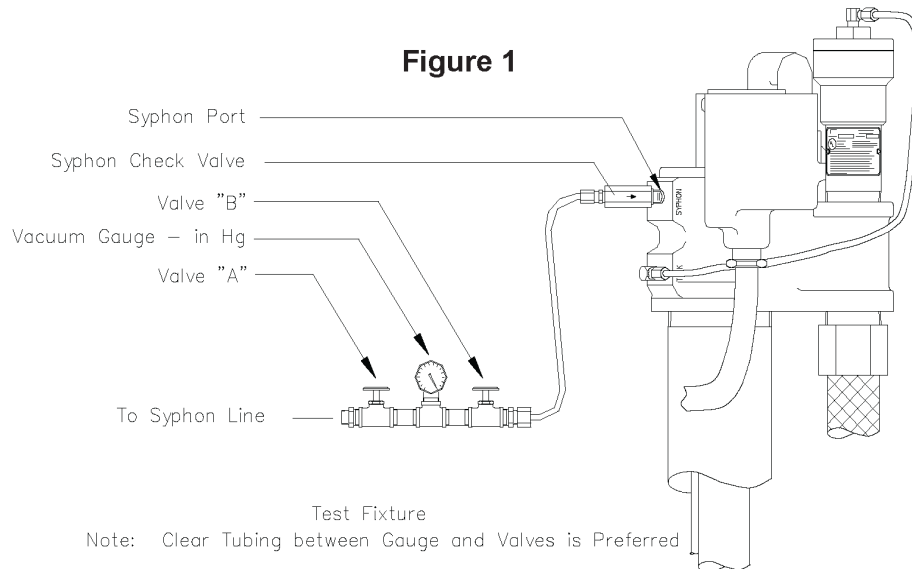
When you have successfully passed this Troubleshooting section, remove the troubleshooting equipment and retest the system again using the "Liquid Condensate Trap Compliance Test Procedure" (VR 201 Exhibit 9, VR 202 Exhibit 11).

**IF YOU EXPERIENCE THE FOLLOWING CONDITIONS:**


<b>Symptom:</b>	<b>Troubleshooting steps:</b>
The ball valve is open, no rotation of the rotor flow indicator, and high vacuum (16" Hg to 28" Hg)	<ul style="list-style-type: none"> <li>o There is a blockage in the piping before the vacuum gauge.</li> <li>o Check the suction tube and suction line from the bottom of the suction tube to the vacuum gauge.</li> <li>o Check for kinks or pinches in the suction line.</li> </ul>
The ball valve is open and the rotor flow indicator stops and starts intermittently. This indicates a small vacuum leak or an intermitting blockage	<ul style="list-style-type: none"> <li>o Check the screen at the bottom of the suction tube for debris, dirt, rocks, etc.</li> <li>o Check the in-line filter and/or syphon jet for debris and blockage.</li> <li>o Check the fittings and connections from the suction tube to the syphon jet for any vacuum leaks.</li> </ul>
With the ball valve open, no rotation of the rotor flow indicator, zero vacuum (0" Hg), and the liquid condensate trap still has liquid above the bottom of the suction tube.	<ul style="list-style-type: none"> <li>o Check the in-line filter and/or syphon jet for debris and blockage. Small particle of debris (rust particles) can block the in-line filter and/or syphon jet causing the vacuum level to drop to zero.</li> <li>o Check the in-line filter and/or syphon jet for debris and clean or replace the filter element and/or syphon jet as necessary.</li> <li>o There may be a vacuum leak somewhere in the system. If you had the correct amount of vacuum before you opened the ball valve, then the vacuum leak is between the ball valve and the end of the suction tube; or the liquid level inside the Liquid Condensate Trap is below the bottom of the suction tube and you are sucking in air.</li> </ul>
The ball valve is closed and there is zero inches (0" Hg) of vacuum on the gauge	<ul style="list-style-type: none"> <li>o Check the in-line filter and/or syphon jet for debris and blockage. Small particles of debris (rust particles) can block the in-line filter and/or the syphon jet causing the vacuum level to drop to zero.</li> <li>o Check the in-line filter and/or syphon jet for debris and clean or replace the filter element and/or syphon jet as necessary.</li> <li>o Check for a vacuum leak between the vacuum gauge and the ball valve.</li> </ul>

## Syphon System Testing

The following procedure illustrates syphon system testing techniques on 4" pumps.



When manifolded tanks are not maintaining equal product levels (i.e., loss of syphon prime) there are several possible causes: the Submersible Turbine Pump (STP) is not generating a vacuum, the syphon check valve is not holding prime when the STP is off, there is a leak in the syphon loop (i.e., tube, fittings, or pipe), there is foreign material blocking the syphon pipe, and/or the syphon system was not properly installed (i.e., the syphon bar is not sloped, the syphon pipes are too short, the tanks are different diameters, the tanks are on different planes, etc.).

**Warning**  **Highly flammable vapors or liquids may be present in the environment in which this equipment is installed or serviced. Installing or working on this equipment means working in an environment that presents risks of severe injury or death if instructions and standard industry practices are not followed. Follow all applicable codes governing the installation and servicing of this product and the entire system. Always lock out and tag electrical circuit breakers while installing or servicing this equipment and related equipment. Refer to the *Installation and Owner's Manual* of this equipment and any related equipment for complete installation and safety information.**

### Vacuum Testing Procedure

1. Turn off the power at the load center, then lock out and tag the circuit breaker.
2. Install a test fixture into the syphon line as shown in Figure 1.
3. Run the STP with the dispenser nozzles and valve "A" closed, and with valve "B" open. The normal vacuum reading should be 20-28" Hg. If the vacuum is normal, continue with Step 4. If there isn't any vacuum or it is somewhat less than 20" Hg, there is the possibility of blockage in the STP syphon passages.

**Note:** Vacuum readings should be taken without any product delivery. Also, check if the Pump Motor Assembly is producing correct pressures.

4. To remedy abnormal vacuum conditions, remove the 3/8" plug from the manifold discharge head (see Figure 3) and unscrew the brass Syphon Jet using a large standard screwdriver. Pull the Syphon Jet out and clean it, making sure that the Syphon Jet only allows for downward flow when installed. Before reinstalling the Syphon Jet, ensure that the Syphon Port and the Vapor Return Tube have open passages by using a stiff wire or other similar device to check. Replace or reinstall the Syphon Jet and 3/8" plug. Check for normal vacuum. If the passages are clear and the vacuum is still abnormal, check the STP Extractable O-rings for damage and make sure that the Vapor Return Tube is not pinched. To check the Vapor Return Tube, remove the STP Extractable and repair as necessary (see Figure 2). If the condition has been corrected, continue with the next step to test the remaining syphon system. If abnormal vacuum conditions continue, contact FFS Petro Technical Support.

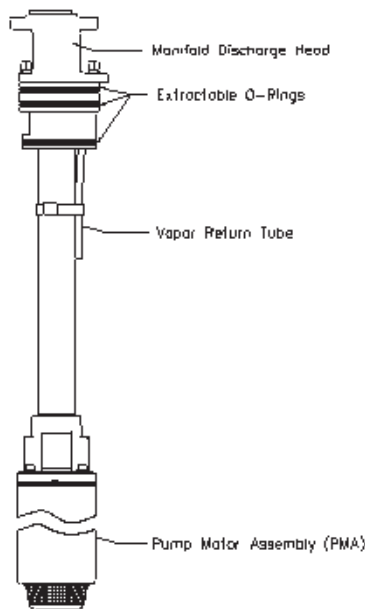
- Run the submersible with dispenser nozzles and valve "A" closed, but leave valve "B" open. When the vacuum reading reaches 20-28" Hg, shut the submersible off. The vacuum should hold for at least 15 minutes. If this worked, continue with the next step. If the vacuum does not hold, the Syphon Check Valve is not holding or the Test Fixture fittings may be loose. Providing the Test Fixture fittings are tight, remove the Syphon Check Valve and clean or replace it. Repeat this step until the problem has been corrected, then continue with the next step.

**Note:** Syphon Check Valves may hold at high vacuum, but may fail under low vacuum. Test the Syphon Check Valve at a lower vacuum by bleeding off the vacuum and re-testing at 5" Hg.

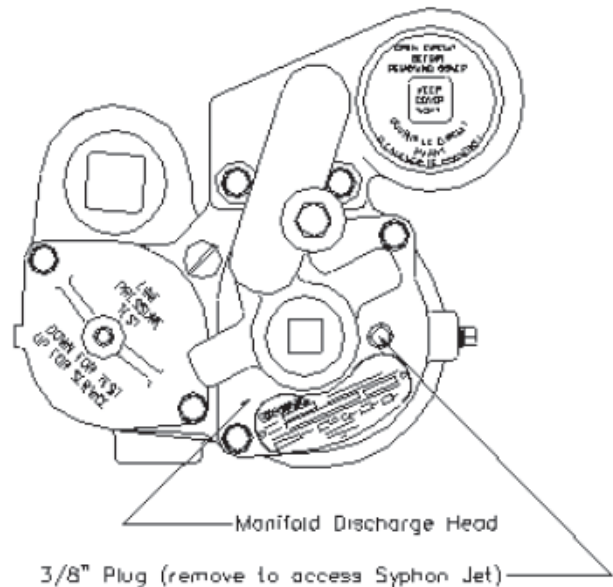
- Run the STP with valves "A" and "B" both open and the dispenser nozzles closed. Normal priming should take approximately 5-10 minutes. When first priming with both valves open, the vacuum gage will indicate 0" Hg. After awhile, vacuum will begin to show. For every inch of mercury vacuum shown, the product level in the syphon pipes is about 1-½ feet above the tank fluid level. When air is being removed from the syphon system, the vacuum gauge needle will bounce. This bouncing should stabilize as more air is removed. If not, this would be a good indication that there is a leak in the syphon system. This air may also be visible if using a Test Fixture with clear tubing. The air would indicate that there is a leak in the syphon line between the tanks or the possibility of foreign material blocking the syphon pipe. Repair any leaks or blockage and repeat this step. If there is no evidence of air, then continue with the next step.

- Close valve "B" and then shut off the STP. The gauge should hold constant for 30-40 minutes after the submersible is turned off. The vacuum may increase if the syphon system wasn't fully primed before closing the valve. If the vacuum drops, there is a leak in the syphon line between the tanks or the possibility of foreign material blocking the syphon pipe. Repair any leaks or blockages and then repeat this step.

**Note:** If there is a leak in the syphon line, product will drain out of the horizontal pipes before vacuum gauge readings indicate a leak.



**Figure 2**  
(STP Extractable)



**Figure 3**  
(Top View of STP)

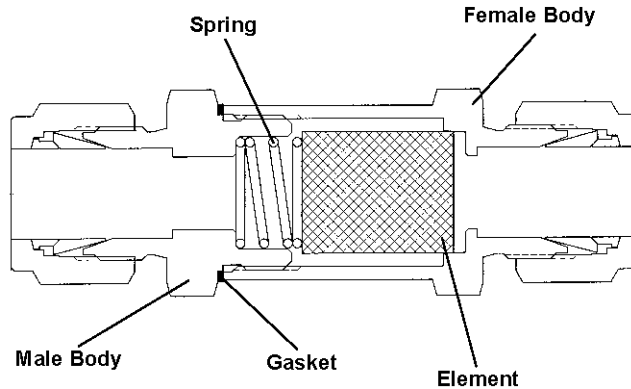
Contact FFS Technical Support for any assistance

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## Appendix B

### Swagelok F-Series In-Line Filter Service Instructions



#### Disassembly

1. Loosen male and female bodies and disassemble.
2. If replacing the filter element, remove and discard used element.

#### Reassembly

3. Before reassembling the filter, be certain that all components are clean.
4. Align the new filter element parallel to the filter bore of the female body. Position the open end of the element towards the body and press in place.
5. Lubricate the gasket with a thin film of system-compatible lubricant. Place gasket on male body seal surface.
6. Place the spring in to the male body.
7. Thread the male and female bodies together, and tighten finger-tight.
8. Tighten the bodies to the proper torque as shown in the table below.
9. Test the filter for proper operation and leak-tight sealing.

Size and Series	Torque, in.-lb. (N-O)		
	Standard Assembly		Unplated Gasket
	Stainless Steel	Brass	Stainless Steel
1F, 2F, 3F-OM	135 (15)	125 (14)	—
4F, 6F-OM	350 (40)	325 (36)	500 (56)
6F, 8F, 10F-OM, 12F-OM	500 (56)	450 (50)	800 (90)



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## In-Station Diagnostics (ISD)

# Install, Setup, & Operation Manual

*For Healy Assist EVR*



# Notice

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## **DAMAGE CLAIMS / LOST EQUIPMENT**

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

## **VEEDER-ROOT'S PREFERRED CARRIER**

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

## **CUSTOMER'S PREFERRED CARRIER**

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

## **RETURN SHIPPING**

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

## **FCC INFORMATION**

This equipment complies with the requirements in Part 15 of the FCC rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference.

**WARRANTY - Please see next page, iii.**

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# Warranty

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This warranty applies only when the product is installed in accordance with Veeder-Root's specifications by Veeder-Root certified installers. This warranty will not apply to any product which has been subjected to misuse, negligence, accidents, systems that are misapplied or are not installed per Veeder-Root specifications, modified or repaired by unauthorized persons, or damage related to acts of God. Veeder-Root is not liable for incidental, consequential, or indirect damages or loss, including, without limitation, personal injury, death, property damage, environmental damages, cost of labor, clean-up, downtime, installation and removal, product damages, loss of product, or loss of revenue or profits. This warranty applies to the initial purchaser and any subsequent purchaser for the duration of the warranty period. **THE WARRANTY CONTAINED HEREIN IS EXCLUSIVE AND THERE ARE NO OTHER EXPRESS, IMPLIED, OR STATUTORY WARRANTIES. WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.**

## **TLS-350R, TLS-350 PLUS, TLS-350J AND TLS-300I/C, AND TLS2 MONITORING SYSTEMS**

We warrant that this product shall be free from defects in material and workmanship and is compliant with all applicable performance standards and specifications for which it has been certified, for a period of one (1) year from the date of installation when proof of date of installation is provided or twenty-four (24) months from the date of manufacture when proof of date of installation is not provided. 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, FUSES, AND LITHIUM BATTERIES ARE NOT COVERED UNDER THIS WARRANTY.**

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.

## **MODULES, KITS, OTHER COMPONENTS (PARTS PURCHASED SEPARATE OF A COMPLETE CONSOLE)**

We warrant that this product shall be free from defects in material and workmanship and is compliant with all applicable performance standards and specifications for which it has been certified, for a period of one (1) year from the date of installation when proof of the date of installation is provided or fifteen (15) months from the date of manufacture when proof of date of installation is not provided. We warrant that the lithium batteries (excluding EVR BATTERY PACK) shall be free from defects in material and workmanship for a period of three (3) months from date of invoice. 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. **LAMPS AND FUSES ARE NOT COVERED UNDER THIS WARRANTY.**

## **IN STATION DIAGNOSTICS (ISD)**

For components used in ISD systems (Vapor Flow Sensor, Vapor Pressure Sensor, Software, TLS RF, Wireless Repeater, Wireless Transmitter & Wireless Receiver), excluding **LAMPS, FUSES, AND LITHIUM BATTERIES**, the following warranty applies:

We warrant that this product shall be free from defects in material and workmanship and is compliant with all applicable performance standards and specifications for which it has been certified,, for a period of one (1) year from the date of ISD start-up when proof of the date of install is provided or twenty-four (24) months from the date of manufacture when proof of date of installation is not provided. During the warranty period, we and or our representative will repair or replace the product, if determined by us to be defective, at the location where the product is in use, at no charge to the purchaser.

---

For ISD components installed after the initial ISD start-up, we warrant that these products shall be free from defects in material and workmanship and is compliant with all applicable performance standards and specifications for which it has been certified, for a period of one (1) year from the date of installation when proof of the date of install is provided or fifteen (15) months from date of manufacture when proof of date of installation is not provided. 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.

## **EVR BATTERY PACK**

We warrant that this product shall be free from defects in material and workmanship and is compliant with all applicable performance standards and specifications for which it has been certified, for a period of one (1) year from the date of installation when proof of the date of install is provided or fifteen (15) months from the date of manufacture when proof of date of installation is not provided. **The replacement EVR Battery Pack warranty period will be the REMAINING warranty period of the original EVR Battery Pack. LAMPS, FUSES, AND LITHIUM BATTERIES OTHER THAN THE EVR BATTERY PACK, ARE NOT COVERED UNDER THIS WARRANTY.**

<b>Introduction</b>	
Site Requirements .....	1
Supported Vapor Recovery Systems .....	2
Contractor Certification Requirements .....	2
Related Manuals .....	2
Safety Precautions .....	3
Example Site Diagrams .....	4
<b>Installation</b>	
Vapor Flow Meter .....	6
Vapor Pressure Sensor .....	6
Installing TLS Console Modules - General Notes .....	6
Circuit Directory .....	7
Smart Sensor Interface Module .....	8
NVMEM Board .....	8
Site Shut Down Requirements .....	8
Dispenser Interface Module (DIM) .....	8
Probe Interface Module .....	8
<b>Setup</b>	
Introduction .....	9
System Setups .....	9
Alarm Setups .....	9
Smart Sensor Setup .....	10
Hose label/Fueling Point/Air Flow Meter Serial Number Chart .....	11
EVR/ISD Setup .....	11
Alarm Setup .....	16
Introduction .....	16
Programming ISD Shut Down Alarms .....	18
Alarm Setup for Sites with Dispenser Relays .....	22
<b>ISD Operability Test Procedure</b>	
Vapor Pressure Sensor Verification Test .....	24
Vapor Flow Meter Operability Test .....	24
<b>Operation</b>	
Alarms .....	25
Overview of TLS console Interface .....	25
Warning Posting .....	25
Alarm Posting .....	26
Site Reenable .....	26
Alarm Logs .....	27
Alarm Sequence .....	27
ISD Alarm Summary .....	28
Reports .....	30
Viewing ISD Reports via RS-232 Connection .....	35
Connecting Laptop to Console .....	35
Connecting Laptop to Console .....	36
Sending Console Commands .....	39
<b>Maintenance</b>	
TLS Console .....	43
Vapor Flow Meter .....	43
Vapor Pressure Sensor .....	43

**Diagnostic Menus** ..... 44

**Appendix A: Site EVR/ISD Equipment Location Worksheet**

**Figures**

Figure 1. Example Site Diagram ..... 5  
 Figure 2. TLS Console Interface Module Bays ..... 7  
 Figure 3. Smart Sensor Setup ..... 10  
 Figure 4. Smart Sensor Setup Printout Example ..... 11  
 Figure 5. EVR/ISD Setup 1 ..... 12  
 Figure 6. EVR/ISD Setup 2 ..... 13  
 Figure 7. EVR/ISD Setup 3 ..... 14  
 Figure 8. Example Healy Setup Printout ..... 15  
 Figure 9. Site Tank Control Examples ..... 16  
 Figure 10. Dispenser Control Examples ..... 17  
 Figure 11. Assigning ISD Shut Down Alarms in Line Leak Disable Setup ..... 18  
 Figure 12. Example Line leak Disable Setup Printout ..... 19  
 Figure 13. Assigning ISD Shut Down Alarms in Output Relay Setup ..... 20  
 Figure 14. Example Printout - ISD Alarms Assignments - Output Relay Setup ..... 21  
 Figure 15. Assigning ISD Shut Down Alarms in Dispenser Relay Setup ..... 22  
 Figure 16. Example Printout - ISD Hose Alarm Assignments - Dispenser Relay Setup ..... 23  
 Figure 17. TLS Console Alarm Interface ..... 25  
 Figure 18. Example Warning Posting ..... 26  
 Figure 19. Example Alarm Posting ..... 26  
 Figure 20. ISD Alarm Override Procedure ..... 27  
 Figure 21. Printing ISD Reports on Console Printer ..... 31  
 Figure 22. ISD Status Report Example - TLS Console Printout ..... 32  
 Figure 23. ISD Daily Report Example - TLS Console Printout ..... 33  
 Figure 24. ISD Monthly Report Example - TLS Console Printout ..... 34  
 Figure 25. Connecting Laptop to TLS Console for Serial Communication ..... 35  
 Figure 26. Connection Description Window ..... 36  
 Figure 27. Connect to Window ..... 37  
 Figure 28. Console Comm Port Settings Printout Example ..... 38  
 Figure 29. HyperTerminal Main Window ..... 39  
 Figure 30. ISD Daily Report Details - Serial to PC Format ..... 41  
 Figure 31. ISD Monthly Status Report - Serial to PC Format ..... 42  
 Figure 32. ISD Alarm Status Report - Serial to PC Format ..... 43

**Tables**

Table 1. V-R Supported Vapor Recovery Systems ..... 2  
 Table 2. Related Manuals ..... 2  
 Table 3. SD Alarm Summary ..... 28  
 Table 4. Other Alarms ..... 29  
 Table 5. Wireless Related Sensor Alarms ..... 29  
 Table 6. Serial Commands for ISD Alarm, Monthly, and Daily Reports ..... 40  
 Table 7. Clear Test Repair Menu ..... 47

## Introduction

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

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

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

## Site Requirements

---

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

- V-R TLS-350R/EMC w/BIR, TLS-350 Plus/EMC Enhanced, TLS-350/EMC and Red Jacket ProMax consoles with ECPUII - install as per TLS-3XX Site Prep manual, setup following instructions in TLS-3XX System Setup Manual.
- A flash memory board (NVMEM2) for ISD software storage - installed on the ECPUII board in place of the console's 1/2 Meg RAM board - install as per TLS-350 Series Board and Software Replacement Manual, no setup required.
- A RS-232 module is required for RS-232 access to ISD reports - install as per instructions shipped with module, setup following instructions in this manual.
- An output relay or dispenser relay board is required (either 4-Output Relay module, I/O Combination module) to shut down each Submersible Turbine Pump (STP) or dispenser upon activation of certain ISD alarms (these alarms can also be assigned in Line Leak Disable setup to shut down the STP or dispenser if Line Leak detection feature is installed) - install as per instructions shipped with module or line leak system, setup ISD shut down alarms either using output relays or line leak system following instructions in this manual.
- Dispenser Interface module (DIM) for the type of dispensers installed - install as per installation manual shipped with device, setup following instructions in DIM manual and TLS-3XX Setup Manual. Note: the DIM supplies flow meter event inputs needed for ISD analysis.
- One V-R Mag probe in each of the gasoline tanks being monitored - install as per installation manual shipped with device, setup following instructions in TLS-3XX Setup Manual.
- Smart Sensor module is required to monitor Vapor Flow Meters and Vapor Pressure Sensor (up to 8 devices per module, or 7 if customer is using Smart Sensor module / embedded pressure). Install and connect following instructions in the Vapor Flow Meter and Vapor Pressure Sensor installation Guides.
- Vapor Flow Meters (one for each dispenser) - install as per ISD Flow Meter installation manual shipped with meter, setup following instructions in this manual.
- Vapor Pressure Sensor (one per site) - install as per ISD Pressure Sensor installation manual shipped with sensor, setup following instructions in this manual.
- To achieve CP-201 false alarm performance standards for ISD reporting, the vapor recovery system leak rate should be at or below 2.88 CFH at 2 inches water column.

## Supported Vapor Recovery Systems

Table 1 lists V-R supported vapor recovery systems.

**Table 1. V-R Supported Vapor Recovery Systems**

Name	CARB Executive Order
Healy Assist EVR	VR-202

## Contractor Certification Requirements

Veeder-Root Contractor Certification Requirements	Installer Certification <sup>6</sup>	ATG Technician Certification <sup>7</sup>	VR Vapor Products Certification <sup>8</sup>
Install <sup>1</sup> ISD	X	X	X
Install PMC	X	X	X
Install CCVP	X	X	X
Install Wireless ISD/PMC	X	X	X
Installation Checkout <sup>2</sup>		X	X
ATG Startup <sup>3</sup> / Training <sup>4</sup> / Service <sup>5</sup>		X	X
ISD Startup / Training / Service			X
PMC Startup / Training / Service			X
CCVP Startup / Training / Service			X
Wireless ISD/PMC Startup / Training / Service			X
Install Pressure Sensor (ATG)	X	X	X
Maintain Pressure Sensor (ATG)		X	X
Calibrate Pressure Sensor (ATG)		X	X
Clear ATG Pressure Sensor Alarm (ATG)		X	X
Clear ISD/PMC Alarms (ISD/PMC)			X
<sup>1</sup> Perform wiring and conduit routing; equipment mounting		<sup>6</sup> UST Monitoring Systems – Installer (Level 1)	
<sup>2</sup> Inspect wiring and conduit routing; equipment mounting		<sup>7</sup> Certified UST Monitoring Technician	
<sup>3</sup> Turn power on, program and test the systems		<sup>8</sup> VR Vapor Products	
<sup>4</sup> Provide supervised field experience in service techniques and operations			
<sup>5</sup> Troubleshoot and provide routing maintenance			

**Warranty Registrations** may only be submitted by selected Distributors. Certified installers are required to provide the GDF operator with the completed Equipment Warranty Notice, form 577013-868, for their records.

## Related Manuals

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

**Table 2. Related Manuals**

V-R Manual	Part Number
TLS-3XX Site Prep Manual	VR202 IOM 21
ISD Flow Meter Installation Guide	VR202 IOM 22
ISD Vapor Pressure Sensor Installation Guide	577013-797
TLS-3XX Series Consoles System Setup Manual	576013-623








Table 2. Related Manuals



V-R Manual	Part Number
TLS-3XX Series Consoles Operator's Manual	576013-610
Serial Comm Modules Installation Guide	577013-528
ISD Troubleshooting Manual	577013-819
TLS-350 Series Board and Software Replacement Manual	576013-637
TLS-350R Point-of-Sale (POS) Application Guide	577013-401
Input/Output Modules Installation	576013-614
TLS RF Wireless 2 System (W2) Installation and Maintenance Guide	577013-964

## Safety Precautions

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

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

 **WARNING**

 	<p><b>The console contains high voltages which can be lethal. It is also connected to low power devices that must be kept intrinsically safe.</b></p> <p><b>Turn power Off at the circuit breaker. Do not connect the console AC power supply until all devices are installed.</b></p> <p><b>FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.</b></p>
---	--

## Example Site Diagrams

---

Figure 1 shows an example site diagram. The diagram show setups unique to ISD which are discussed in this manual (marked with a star), and those setups performed following instructions in the appropriate sections of the TLS-3XX System Setup manual, such as In-Tank setup (marked with a hexagon).

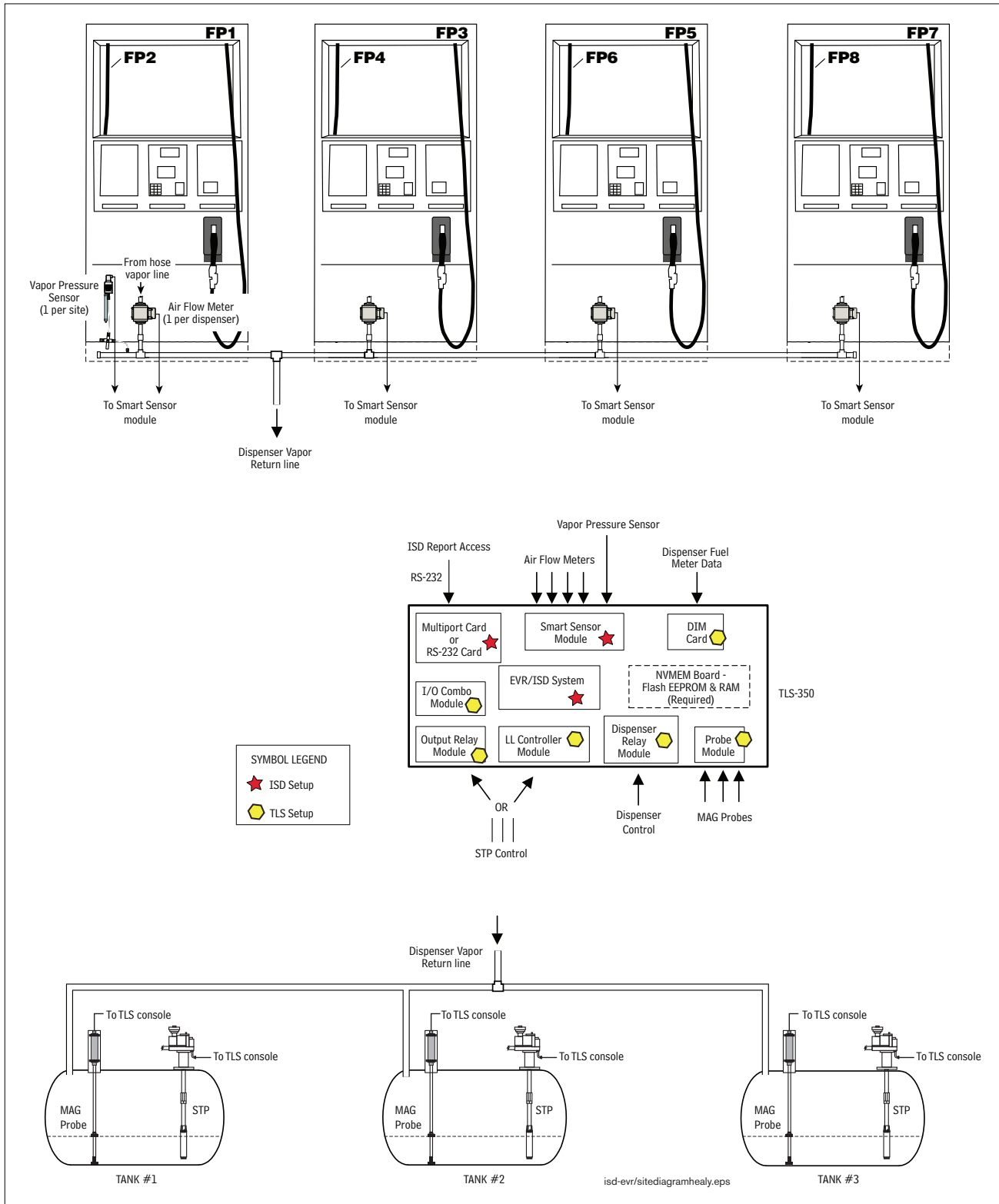


Figure 1. Example Site Diagram

## Installation

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

- Vapor Flow Meter
- Vapor Pressure Sensor
- Smart Sensor Interface Module (8 input and 7 input w/embedded pressure versions)
- NVMEM board - required
- 4-Relay Output Module or Dispenser Relay Module
- Line Leak Detection
- Dispenser Interface Module
- Probe Interface Module



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

### Vapor Flow Meter

---

Install one Vapor Flow Meter in the vapor return piping of each gasoline dispenser following the instructions in the ISD Flow Meter Installation guide (P/N 577013-796). Program the meter following instructions in this manual.

### Vapor Pressure Sensor

---

Install one Vapor Pressure Sensor in the vapor return piping of the gasoline dispenser closest to the tanks following the instructions in the ISD Pressure Sensor Installation guide (P/N 577013-797). Program the meter following instructions in this manual.

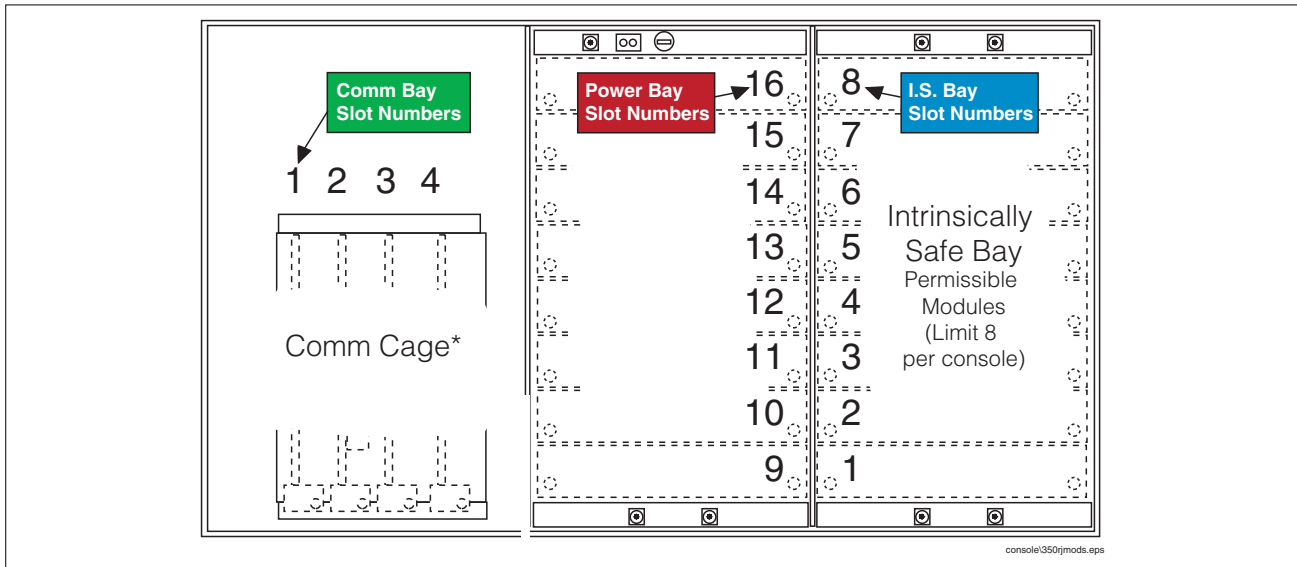
### Installing TLS Console Modules - General Notes

---

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

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

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



**Figure 2. TLS console Interface Module Bays**

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

### Module Position

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

### Connector Position

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

### Grounding Probe and Sensor Shields

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

### CIRCUIT DIRECTORY

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

The following information should be recorded for each slot:

- **Module Type:** record what type of module has been installed in the slot, e.g., Smart Sensor Module.
- **Position Record:** record the physical location and/or type of device wired to each terminal of the module connector in the slot, e.g., VFM1.

## Smart Sensor Interface Module

---

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



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

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

## NVMEM Board

---

Verify that a NVMEM board is installed in the TLS console (ref. Figure 2-14 in the V-R TLS-3XX Series Consoles Troubleshooting Manual P/N 576013-818, Rev J or later). This board contains flash EEPROM and RAM needed to run ISD software and store ISD reports. No setup is required.

## Site Shut Down Requirements

---

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

## Dispenser Interface Module (DIM)

---

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

## Probe Interface Module

---

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

# Setup

## Introduction

---

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

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

## SYSTEM SETUPS

- Smart Sensor Setup - All ISD sites - Figure 3  
This setup mode function programs the Smart Sensor Interface module to monitor the Air Flow Meters and the Vapor Pressure Sensor.
- EVR/ISD Setup - All ISD sites - Figure 5, Figure 6, Figure 7  
This setup mode function programs the TLS console for EVR/ISD vapor recovery monitoring and reporting.
- Verify Console Date/Time - Check the console front panel to confirm display of current date and time. Reset if necessary (refer to current date/current time setups in TLS-3XX System Setup manual).

## ALARM SETUPS

One or more TLS setup functions must be programmed to shut down the tank or the dispenser if certain ISD alarms occur:

- XLLD Line Disable Setup - For ISD sites with line leak detection - Figure 11  
This setup mode function lets you assign ISD alarms to a line leak detector that will shut down the tank's STP.
- Output Relay Setup - For ISD sites without line leak detection - Figure 13  
This setup mode function lets you assign ISD alarms to a relay on the 4-Relay output module or I/O Combination module that will shut down the tank's STP.
- For ISD sites with dispenser shutdown - Dispenser Relay Setup (go to Figure 15)  
This setup assigns ISD alarms to a relay that will shut down the dispenser.

## Smart Sensor Setup

The Smart Sensor Interface Module is installed in the Intrinsically-Safe bay of the TLS console. This module monitors Air Flow Meters and the Vapor Pressure Sensor. Figure 3 diagrams the Smart Sensor setup procedure. Figure 4 shows a printout of the Smart Sensor setup.

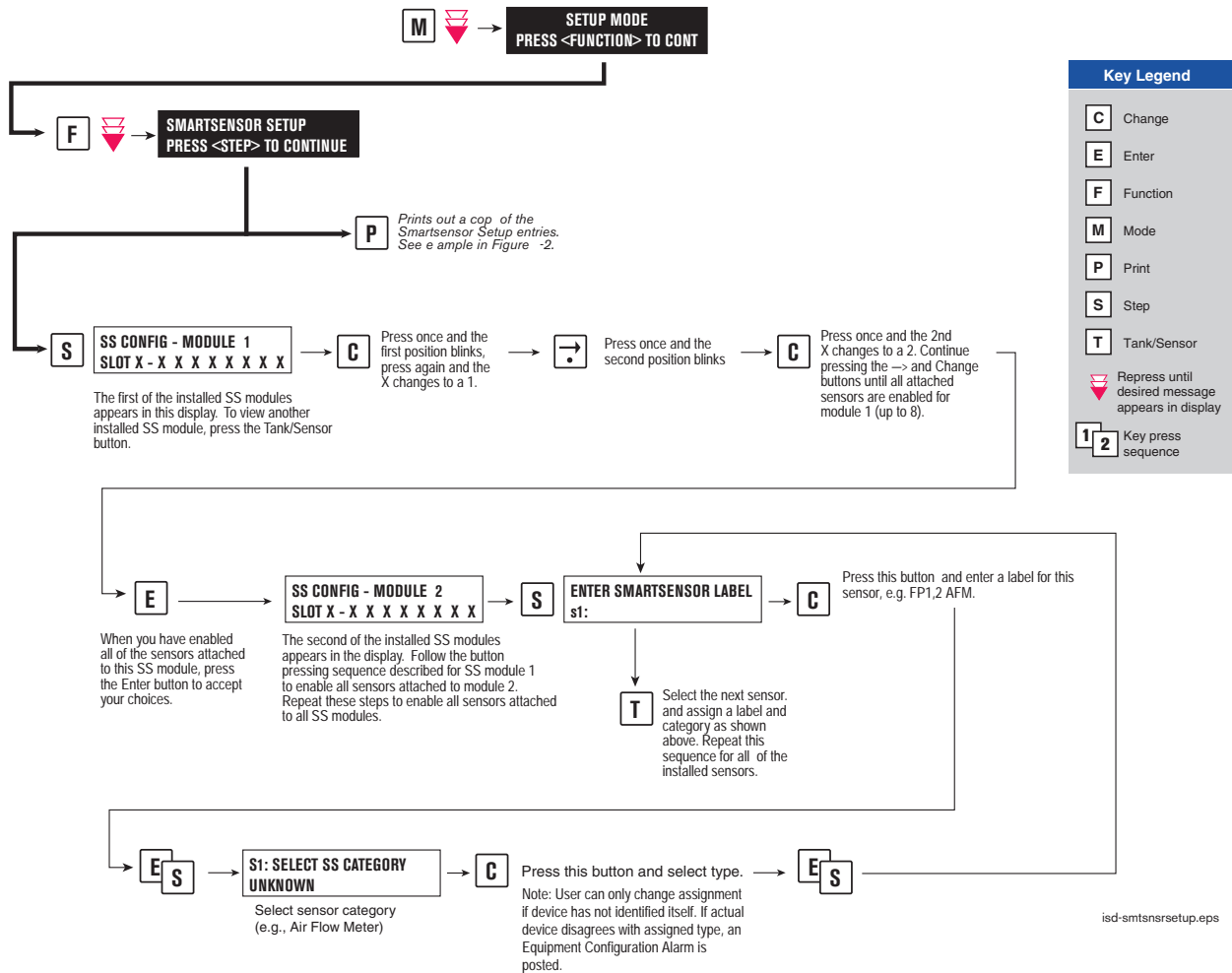
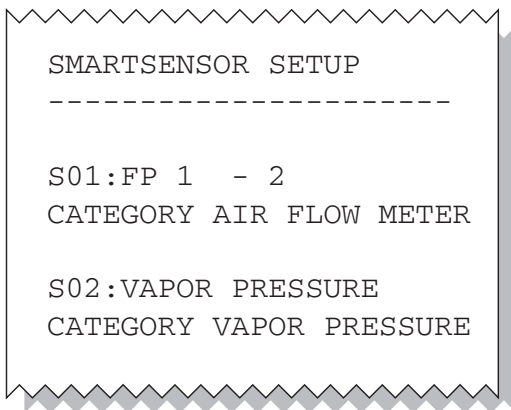


Figure 3. Smart Sensor Setup





```
SMARTSENSOR SETUP
-----

S01:FP 1 - 2
CATEGORY AIR FLOW METER

S02:VAPOR PRESSURE
CATEGORY VAPOR PRESSURE
```

isd-evr/sssetprt.eps

Figure 4. Smart Sensor Setup Printout Example

## Hose label/Fueling Point/Air Flow Meter Serial Number Chart

---

The next step in programming your system requires documentation of information from the ISD equipment installed at the facility. Choose the appropriate data sheet from Appendix A for the vapor recovery system installed at your facility. Record the unique information from the sensors prior to attempting the TLS EVR/ISD set up described in Figure 6. After you complete the TLS EVR/ISD you must perform the Product Meter ID set up procedure to complete the set up

## EVR/ISD Setup

---

Figure 5, Figure 6, and Figure 7 diagram the EVR/ISD setup programming. Start with the first figure, continue to the second, and finish in the third. Figure 8 shows an example printout of the EVR/ISD setup.

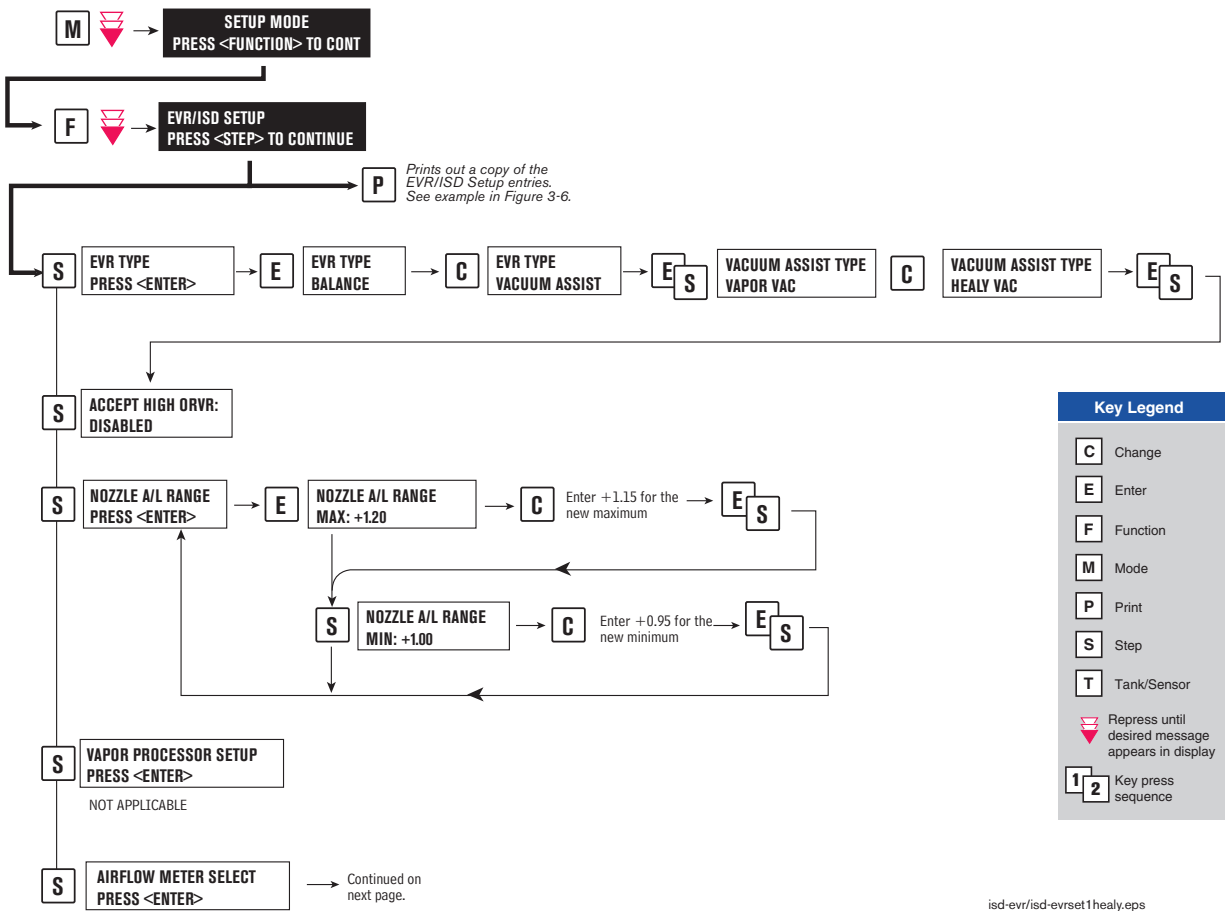
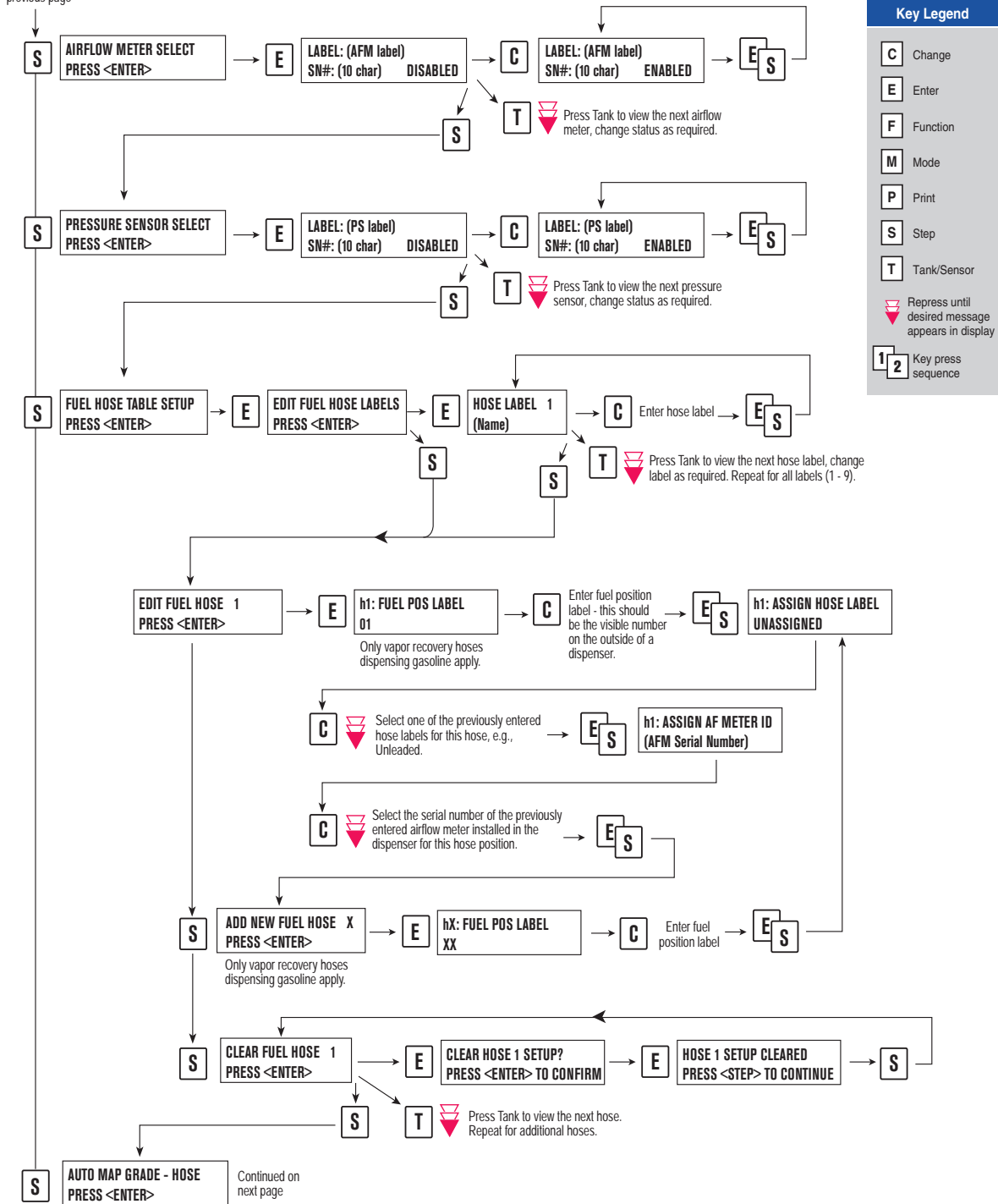


Figure 5. EVR/ISD Setup 1

Continued from previous page



isd-evr/isd-evrset1a.eps

Figure 6. EVR/ISD Setup 2

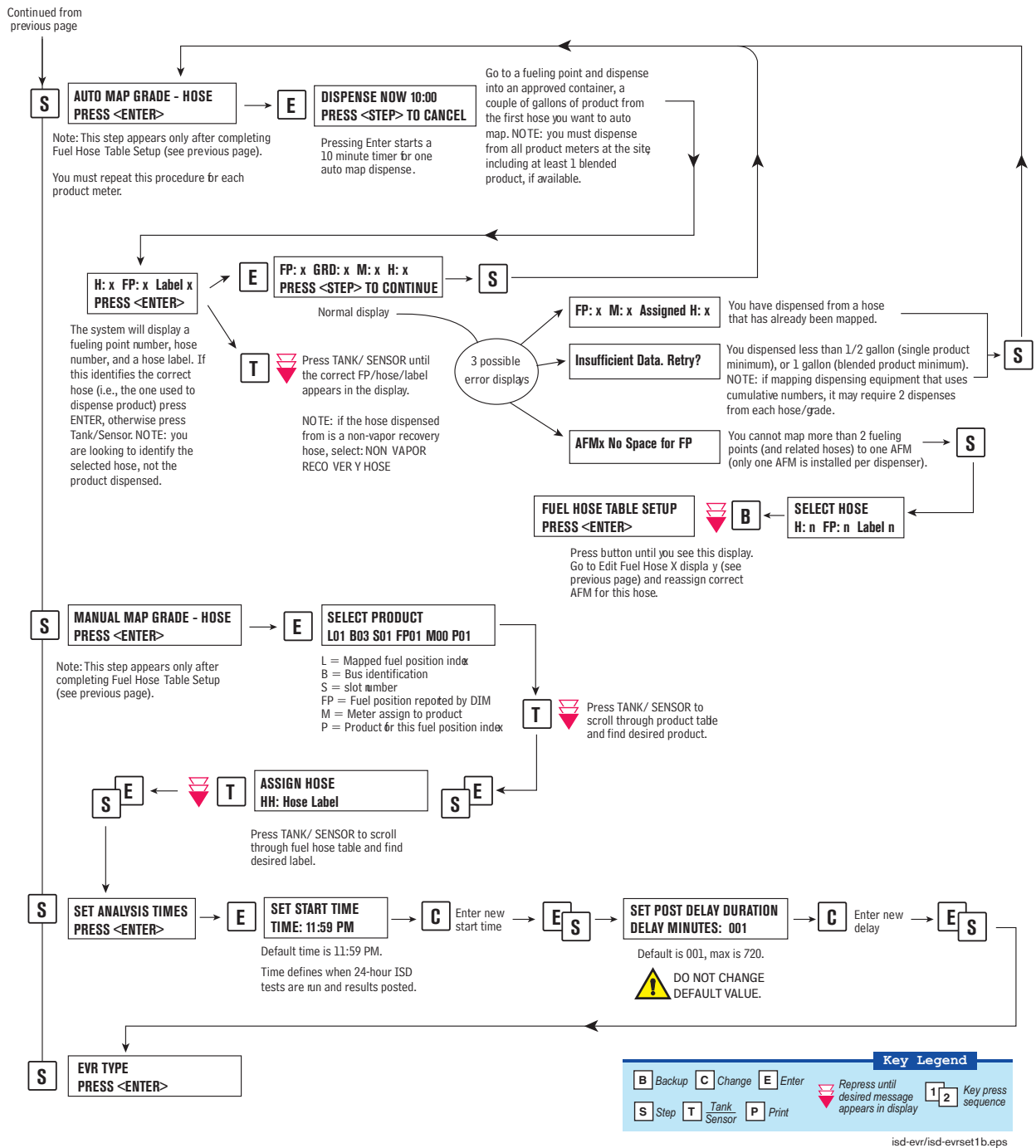


Figure 7. EVR/ISD Setup 3

```

EVR/ISD SETUP

EVR TYPE: VACUUM ASSIST
VACUUM ASSIST TYPE
HEALY VAC

NOZZLE A/L RANGE
MAX: 1.15 MIN: 0.95

VAPOR PROCESSOR TYPE
NO VAPOR PROCESSOR

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

ACCEPT HIGH ORVR:
DISABLED

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

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

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

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

```

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

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

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

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

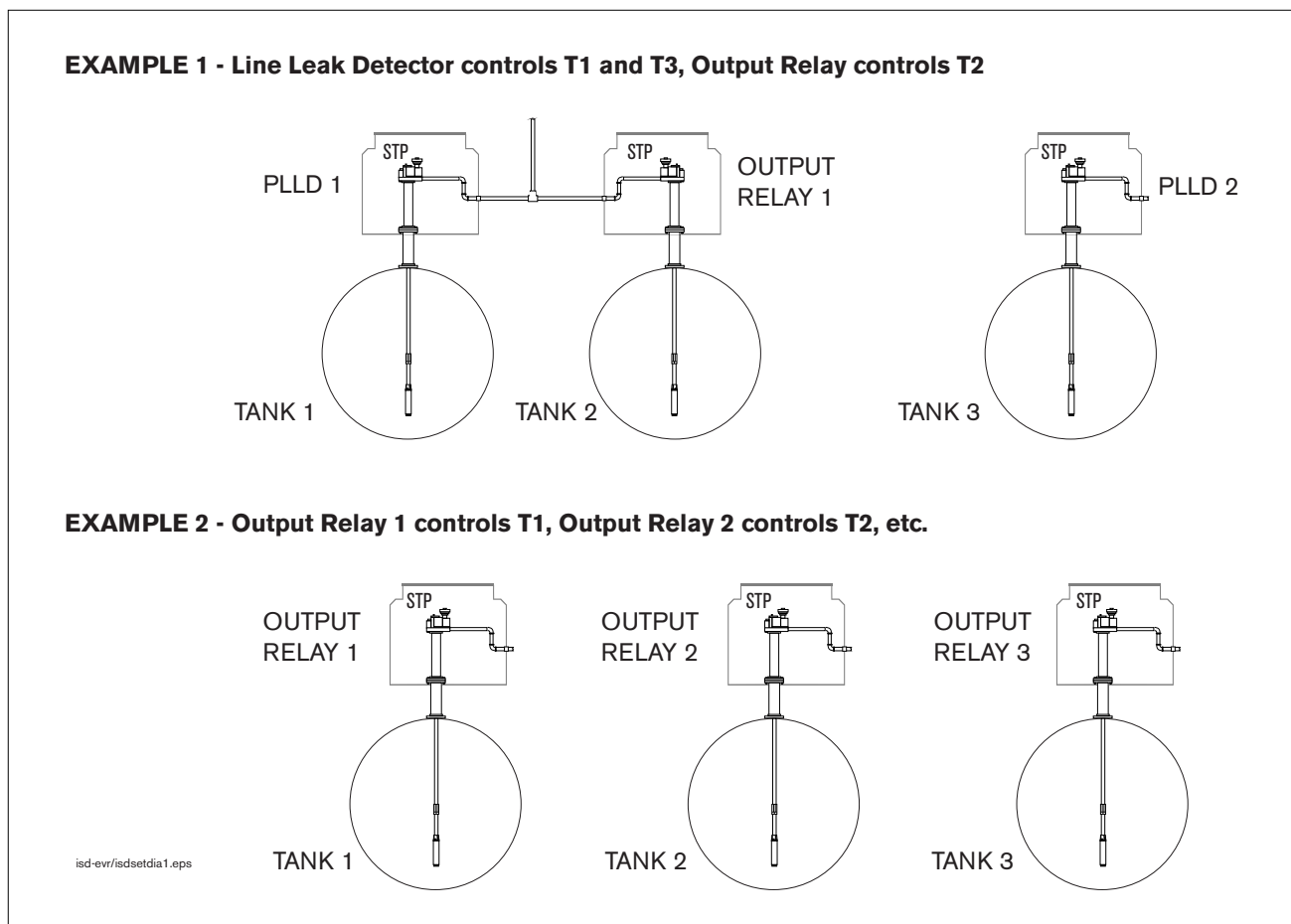
isdhealysetprtout.eps

**Figure 8. Example Healy Setup Printout**

## Alarm Setup

### INTRODUCTION

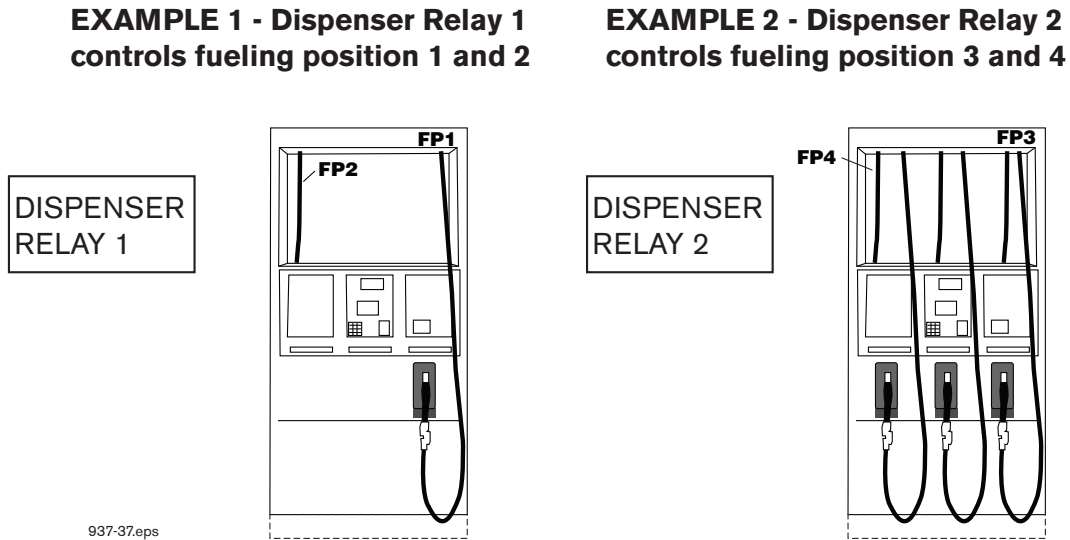
California regulations (VAPOR RECOVERY CERTIFICATION PROCEDURE, CP-201, CERTIFICATION PROCEDURE FOR VAPOR RECOVERY SYSTEMS AT GASOLINE DISPENSING FACILITIES, Section 10.1.2) require shut down of dispensing systems that generate specific alarm conditions. To accomplish this, the TLS must be configured to control the gasoline tank's pump (diesel tanks are not monitored) or the gasoline dispensers in order to disable them when ISD shutdown alarm conditions occur. Prior to setting up ISD shut down alarms, you will need to determine how the site's tank pumps or dispensers are controlled. If the site has line leak detection, you can shut down the line (tank) by assigning the ISD alarms in Line Leak Disable setup. In the absence of line leak detection, you can assign the ISD alarms to Output Relays which in turn can be wired to shut down the tank or assign ISD alarms to Dispenser Relays which can be used to shut down the dispenser. Figure 9 illustrates two examples of tank pump control, one using a line leak/output relay combination and one using output relays.



**Figure 9. Site Tank Control Examples**

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

Figure 10 illustrates two examples of dispenser control using Dispenser Relay modules.

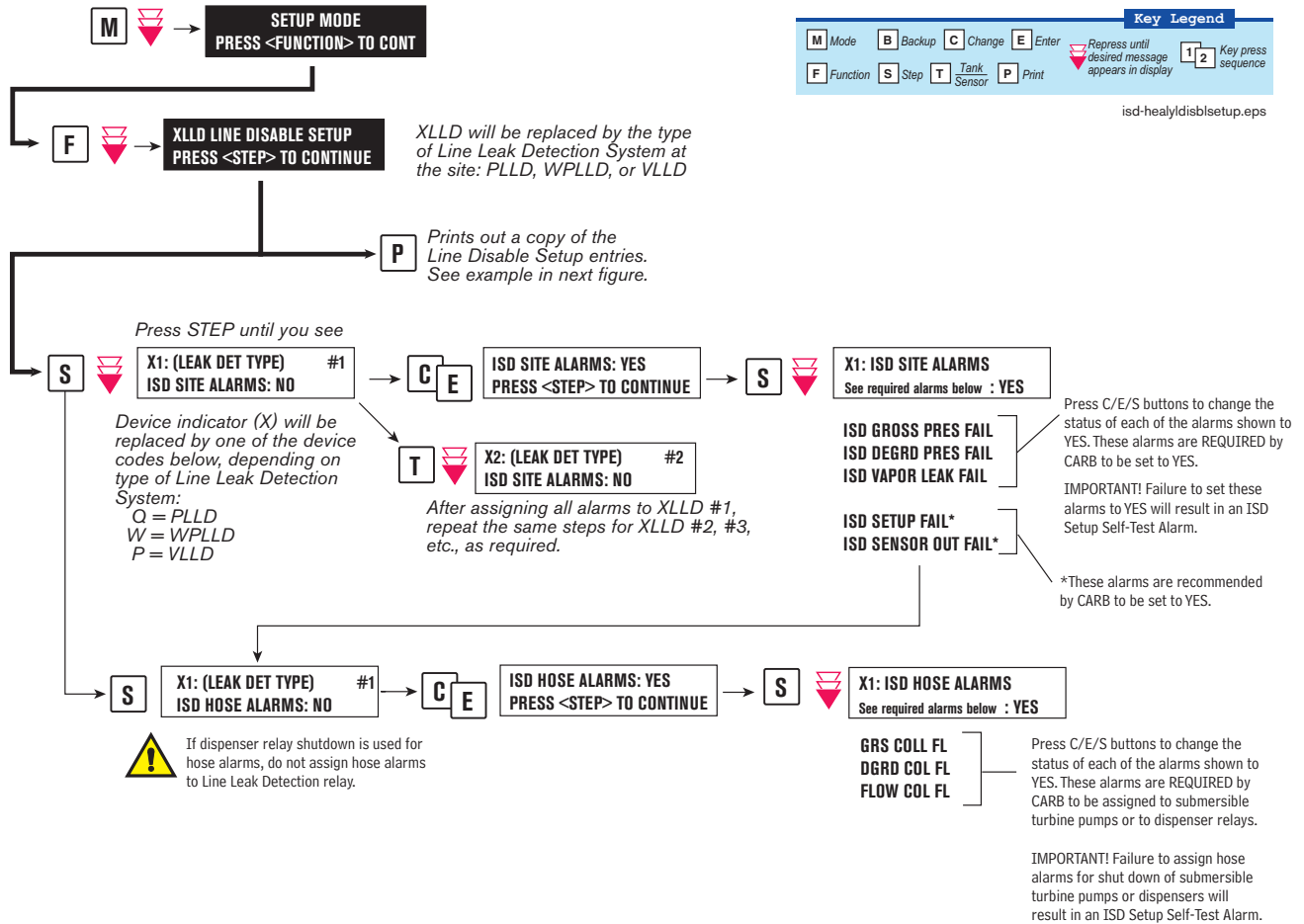


**Figure 10. Dispenser Control Examples**

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

### PROGRAMMING ISD SHUT DOWN ALARMS

Figure 11 illustrates the setup steps required to assign ISD Shut Down Alarms to a tank having a line leak detection system installed.



**Figure 11. Assigning ISD Shut Down Alarms in Line Leak Disable Setup**



Figure 12 shows a resulting printout of the Line Leak Disable setup with ISD alarms assigned when Dispenser Relay modules are not used.

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

Q 1:UNLEADED

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

ISD HOSE ALARMS
  h1: GROSS COLLECT FAIL
  h1: DEGRD COLLECT FAIL
  h1: FLOW COLLECT FAIL
```

isd-evr\healy\ldsetprt.eps

**Figure 12. Example Line leak Disable Setup Printout**

Figure 13 illustrates the setup steps required to assign ISD Shut Down Alarms to a tank using either a Four Relay Output Module or an I/O Combination Module.

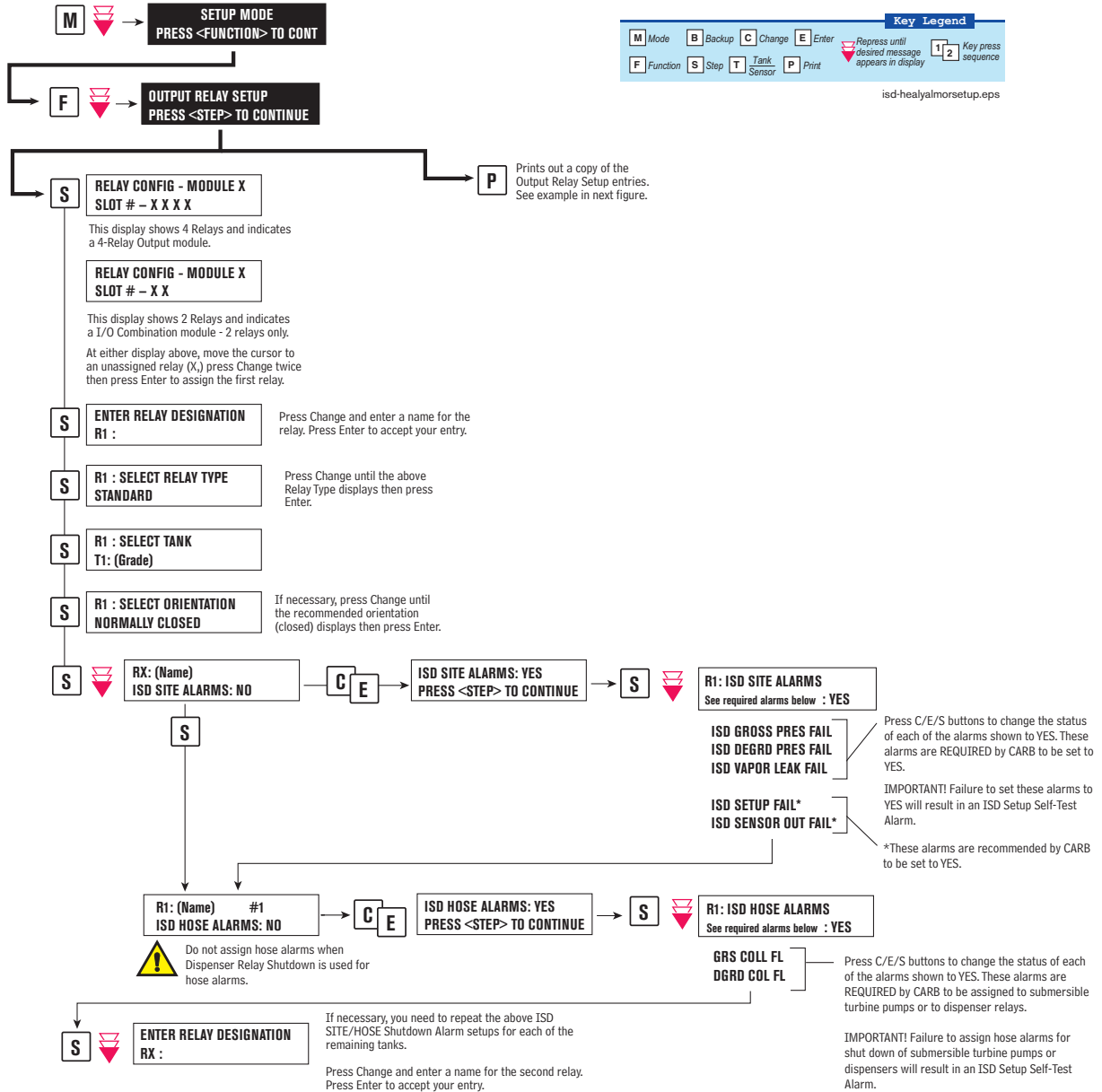


Figure 13. Assigning ISD Shut Down Alarms in Output Relay Setup

Figure 14 shows a resulting printout of the Output Relay setup with ISD alarms assigned when Dispenser Relay modules are not used.

```
OUTPUT RELAY SETUP
-----

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

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

ISD HOSE ALARMS
  h1: GROSS COLLECT FAIL
  h1: DEGRD COLLECT FAIL
```

isd-evrthealysorsetprt.eps

**Figure 14. Example Printout - ISD Alarms Assignments - Output Relay Setup**

### ALARM SETUP FOR SITES WITH DISPENSER RELAYS

Figure 15 illustrates the setup steps required to assign ISD Shut Down Alarms to a tank using Dispenser Relay Module.

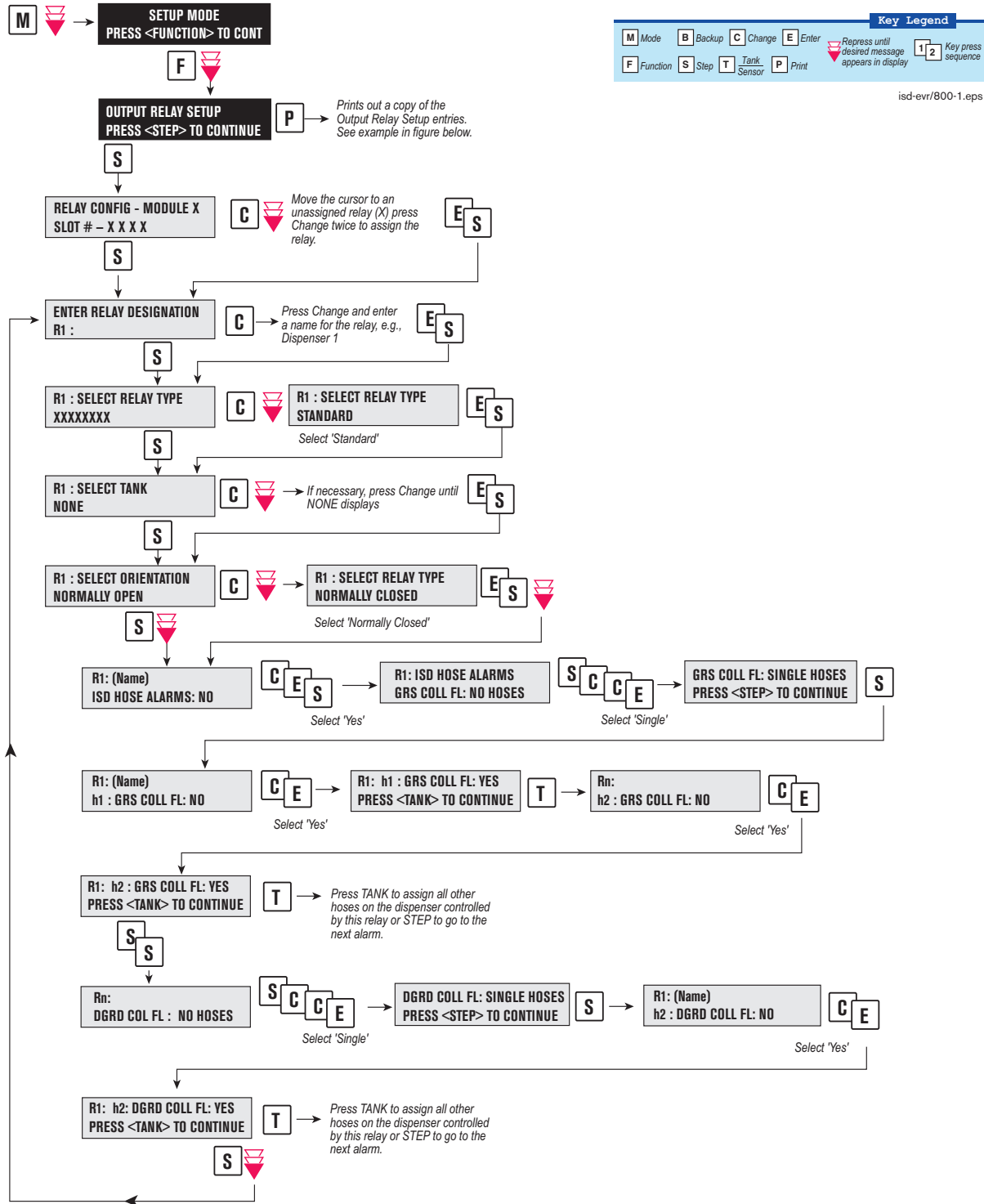


Figure 15. Assigning ISD Shut Down Alarms in Dispenser Relay Setup

Figure 16 shows a resulting printout of the Dispenser Relay setup with ISD hose alarms assigned..

```
OUTPUT RELAY SETUP
-----

R 1:DISPENSER 1
TYPE:
  STANDARD
NORMALLY CLOSED

TANK #:  NONE

ISD HOSE ALARMS
h 1:GROSS COLLECT FAIL
h 2:GROSS COLLECT FAIL
h 1:DEGRD COLLECT FAIL
h 2:DEGRD COLLECT FAIL
```

isd-evr\800-2.eps

**Figure 16. Example Printout - ISD Hose Alarm Assignments - Dispenser Relay Setup**

## ISD Operability Test Procedure

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

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

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

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

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

### Vapor Pressure Sensor Verification Test

---

See EO VR 202 Exhibit 9 for the Pressure Sensor Verification Test.

### Vapor Flow Meter Operability Test

---

See EO VR 202 Exhibit 9 for the ISD Vapor Flow Meter Operability Test Procedure.

# Operation

## Alarms

### OVERVIEW OF TLS CONSOLE INTERFACE

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

During normal operation when the TLS console and monitored EVR/ISD System is functioning properly and no alarm conditions exist, the "ALL FUNCTIONS NORMAL" message will appear in the system status (bottom) line of the console display, and the green Power light will be On (see Figure 17).

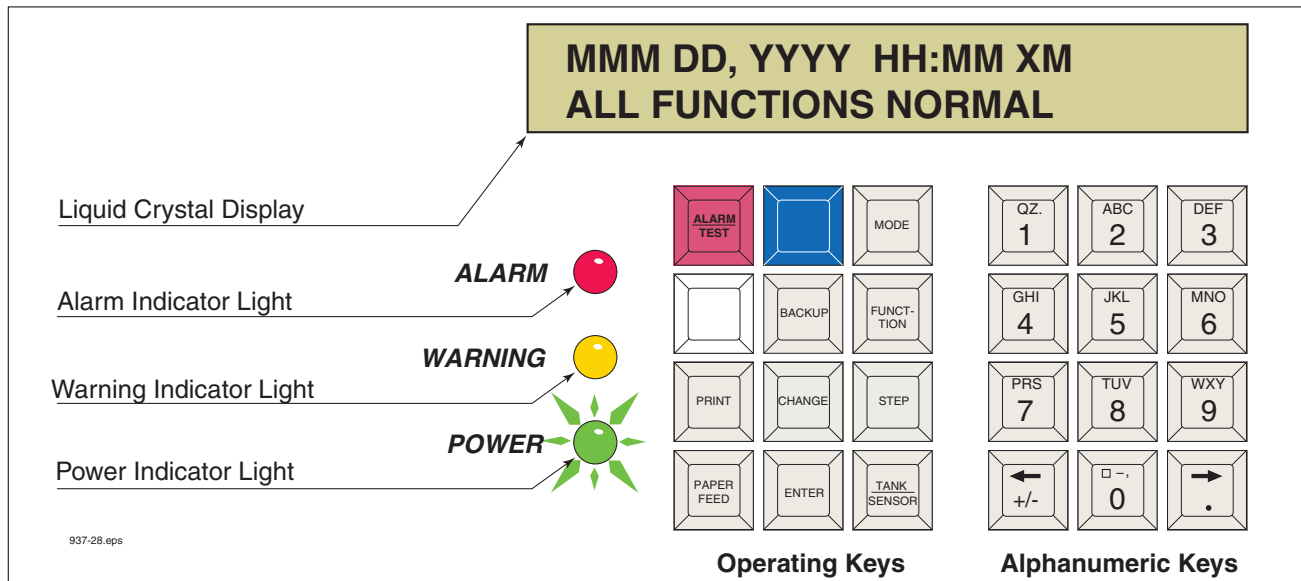


Figure 17. TLS Console Alarm Interface

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

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

### WARNING POSTING

Displayed messages alert you to the source and type of alarm. Printed messages show the type and location of the alarm. In the Warning example in Figure 18, the display's second line and printed message indicates that the containment system's vapor leak rate has increased above the allowed standard generating a warning.

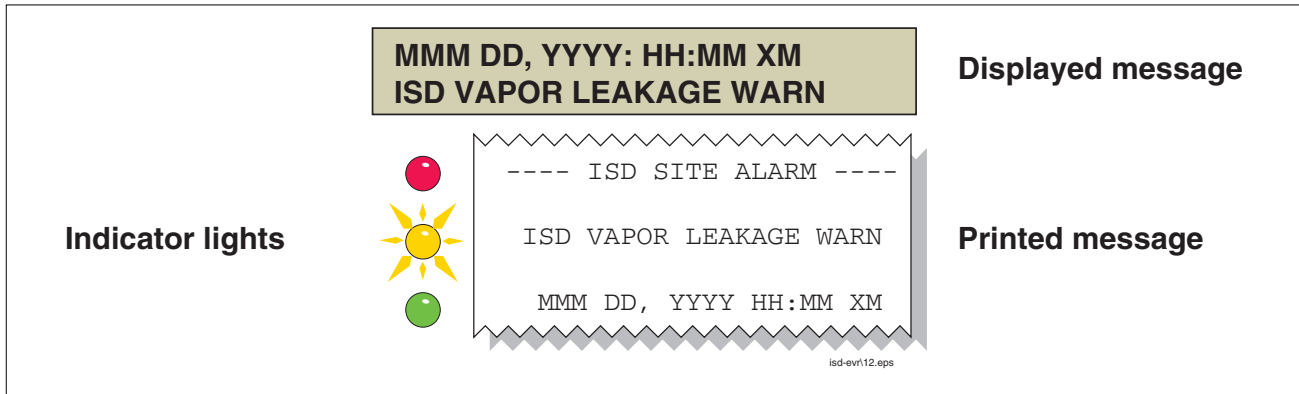


Figure 18. Example Warning Posting

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

### ALARM POSTING

Displayed messages alert you to the source/number and type of alarm. Printed messages show the type and location of the alarm. In the alarm example in Figure 19 the display's second line and printed message indicates that vapor collection on hose 1, FP1 Super has dropped below the allowed standard resulting in a failure alarm. (By default, for unihose dispensers, FP1 BLEND3 will be displayed rather than FP1SUPER as shown below.)

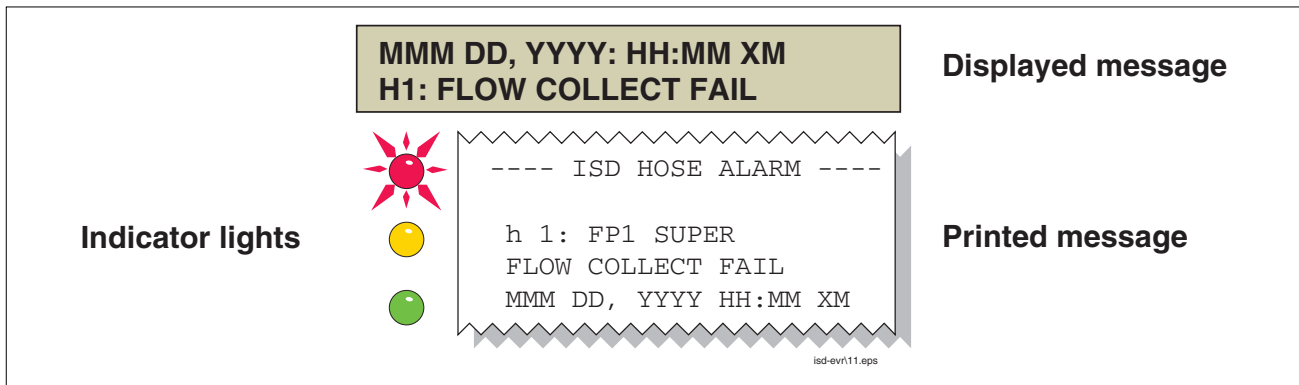


Figure 19. Example Alarm Posting

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

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

### SITE REENABLE

The TLS console ALARM/TEST button allows you to perform a logged shutdown override and resume dispensing. Figure 20 illustrates the ISD alarm override procedure.



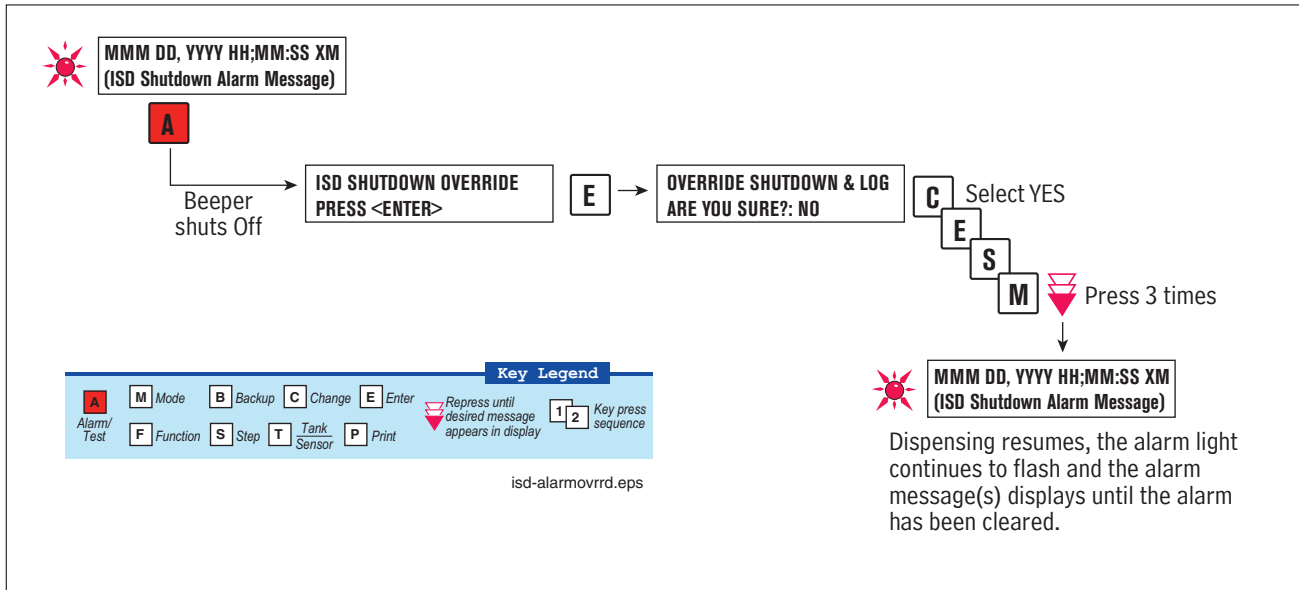


Figure 20. ISD Alarm Override Procedure

**ALARM LOGS**

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

**Monthly Report Warning & Failure Log Examples:**

Warning Alarms

Date	Time	Description	Reading	Value
2003/01/01	23:59	VAPOR VAPOR CONTAINMENT LEAKAGE	CFH@2"WC	14
2003/01/01	23:59	A/L RATIO DEGRADATION	FP2 MID	0.69
2002/12/31	23:59	VAPOR VAPOR CONTAINMENT LEAKAGE	CFH@2"WC	13
2002/12/31	23:59	A/L RATIO DEGRADATION	FP2 MID	0.67

Failure Alarms

Date	Time	Description	Reading	Value
2003/01/01	23:59	A/L RATIO GROSS BLOCKAGE	FP1 REG	0.06
2003/01/01	23:59	A/L RATIO DEGRADATION	FP1 REG	0.14
2003/01/01	23:59	A/L RATIO GROSS BLOCKAGE	FP1 MID	0.13
2003/01/01	23:59	A/L RATIO DEGRADATION	FP1 MID	0.15

**ALARM SEQUENCE**

Each ISD monitoring test operates once each day on sensor data gathered over a fixed time interval and with a minimum required number of monitored events. The interval is a fixed number of calendar days depending on the test being run. As an example, the A/L degradation Vapor Collection Monitoring test requires seven calendar days of data and at least 30 fueling events. In this example, each daily test result represents a test based on the prior

seven days' time period. When a test first fails, a warning is posted and a warning event is logged. If this condition persists for seven more consecutive days, an alarm is posted, a failure alarm event is logged and the site is shutdown. If the condition continues, additional failure events are logged and the site will continue to be shutdown each day.

**ISD ALARM SUMMARY**

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

**Table 3. SD Alarm Summary**

Displayed Message	ISD Monitoring Category	Light Indicator	Cause	Suggested Troubleshooting <sup>1</sup>
ISD VAPOR LEAKAGE WARN	Containment	Yellow	Vapor Leakage Detection test warning	<ul style="list-style-type: none"> <li>•Exhibit 7 Nozzle Bag Test</li> <li>•Exhibit 9/10 Operability Test</li> <li>•T.P. 201.1E-PVV Test</li> <li>•Exhibit 4 Clean Air Separator Test</li> <li>•TP-201.3</li> </ul>
ISD VAPOR LEAKAGE FAIL <sup>2</sup>	Containment	Red	Vapor Leakage Detection test - 8th consecutive failure	
ISD GROSS PRESSURE WARN	Containment	Yellow	Gross Over Pressure test warning	<ul style="list-style-type: none"> <li>•Are ball valves for the clean air separator in the correct position?</li> <li>•Is the ball valve near the pressure sensor in the correct position?</li> <li>•Exhibit 7 Bag Test</li> <li>•T.P. 201.1E-PVV Test</li> <li>•T.P. 201.3</li> <li>•Look for problems using one or more of the following VR-202 procedures/tests: Dispenser Integrity Test B-3 (i.e. 'Pumping Tightness' test), Exhibit 4, Exhibit 5, Exhibit 9 (pressure sensor only) or Flow Rate Verification per section 1.2.3.</li> </ul>
ISD GROSS PRESSURE FAIL <sup>2</sup>	Containment	Red	Gross Over Pressure test - 8th consecutive failure	
ISD DEGRD PRESSURE WARN	Containment	Yellow	Degradation Over-Pressure test warning	
ISD DEGRD PRESSURE FAIL <sup>2</sup>	Containment	Red	Degradation Over-Pressure test - 30th consecutive failure	
Hnn: GROSS COLLECT WARN	Collection	Yellow	1-Day Gross A/L Test warning	<ul style="list-style-type: none"> <li>•Visually inspect hanging hardware at the affected fueling point</li> <li>•Exhibit 7 Nozzle Bag Test</li> <li>•VR-202 Exhibit 5</li> </ul>
Hnn: GROSS COLLECT FAIL <sup>2</sup>	Collection	Red	1-Day Gross A/L Test failure - 2nd consecutive failure	
Hnn: DEGRD COLLECT WARN	Collection	Yellow	7-Day Degradation A/L Test warning	
Hnn: DEGRD COLLECT FAIL <sup>2</sup>	Collection	Red	7-Day Degradation A/L Test - consecutive failure	
ISD SENSOR OUT WARN	Self-Test	Yellow	ISD Sensor Out Self-Test warning	Confirm ISD sensor & module installation / communication per section 2.
ISD SENSOR OUT FAIL <sup>2</sup>	Self-Test	Red	ISD Sensor Out Self-Test - 8th consecutive failure	
ISD SETUP WARN	Self-Test	Yellow	System Setup Self-Test warning	Confirm EVR / ISD programming per section 3.
ISD SETUP FAIL <sup>2</sup>	Self-Test	Red	System Setup Self-Test failure - 8th consecutive failure	

<sup>1</sup> See ISD Troubleshooting Manual P/N 577013-819 for a complete list of suggestions.

<sup>2</sup> ISD Shutdown Alarms - see "Site Reenable" on page 26.

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

**Table 4. Other Alarms**

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

**Table 5. Wireless Related Sensor Alarms**

Fault Message	Device	Light Indicator	Cause	Suggested Troubleshooting
BATTERY WARNING	Vapor Flow Meter, Pressure Sensor	Yellow	Device transmitter reports battery status as 'Replace' for 24 hours	Remove and replace battery.

## Reports

There are two main reports (CP-201 required) that are stored by the ISD system: the Monthly Status Report, stored for 12-months, and the Daily Status Report, stored for 365 days. A third report discussed in this section is the ISD Status Report. You can print out ISD reports from the TLS console front panel as shown in Figure 21.

- The monthly report includes:
  - The Warning Log
  - The Failure Log

- The Misc. Event Log
- The daily report includes:
  - Maximum and minimum ullage pressures
  - Results of the Vapor Containment Monitoring Gross (75th percentile), Degradation (95th percentile) ullage pressure test and Vapor Leakage Detection (CVLD) tests
  - Vapor Collection Monitoring test results for each fueling position
- ISD Status Report
  - Last test report results

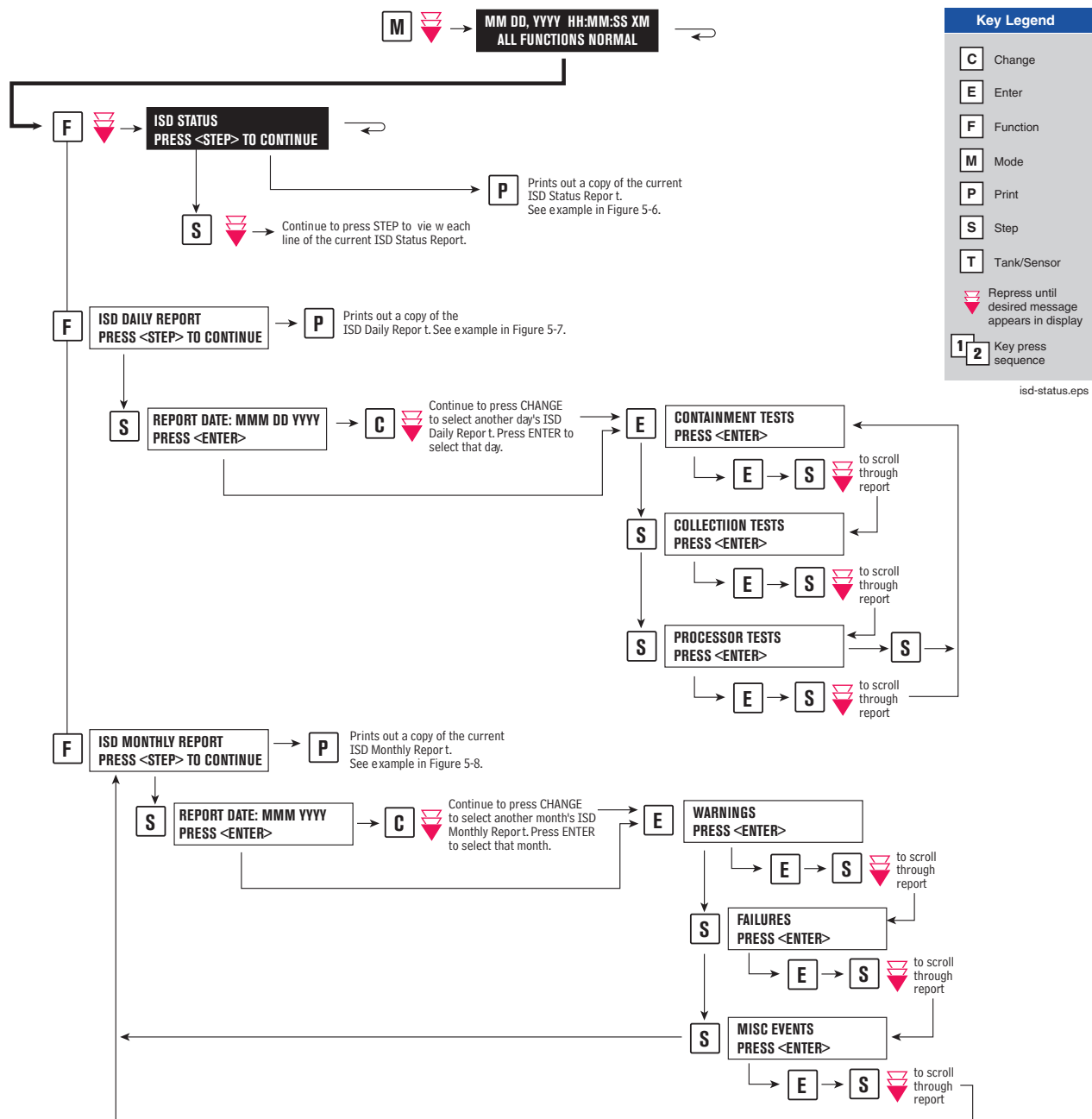


Figure 21. Printing ISD Reports on Console Printer

```
ISD STATUS

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

(MMM DD, YYYY HH:MM XM)

EVR TYPE: VACUUM ASSIST
ISD VERSION XX.XX

REPORT DATE:SEP 22, 2004

CONTAINMENT TEST GROSS
STATUS: 0.1"WC PASS

CONTAINMENT TEST DEGRADE
STATUS: -1.1"WC PASS

CONTAINMENT TEST CVLD
STATUS: 3.26CFH PASS

COLLECTION GROSS TEST
STATUS: PASS

COLLECTION DEGRADE TEST
STATUS: PASS

ISD SENSOR SELF TEST
STATUS: PASS

ISD SETUP SELF TEST
STATUS: PASS

STAGE 1 TRANSFER TEST
STATUS: 4 of 4 PASS
```

*NOTE: values are for last tests performed*

isd-evr\healy5-6.eps

**Figure 22. ISD Status Report Example - TLS Console Printout**

```

ISD DAILY REPORT

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

EVR TYPE: VACUUM ASSIST
ISD VERSION XX.XX

REPORT DATE: JAN 20
ISD VERSION XX.XX

OVERALL STATUS PASS
EVR CONTAINMENT PASS
EVR COLLECTION PASS
STAGE1 1 of 1 PASS
SELF TEST PASS
ISD MONITOR UP-TIME 100%

-----

CONTAINMENT TESTS
GROSS 95% -0.0 "WC
DGRD 75% -1.0N "WC
VAPOR LEAK 2 CFH
MAX -0.8 "WC
MIN -5.0 "WC

-----

COLLECTION TESTS
GROSS DGRD
A/L(#) A/L(#)

FP 1: BLEND
1.04( 51) 1.06(297)
FP 2: BLEND
1.12( 36) 1.10(285)
FP 3: BLEND
1.05( 28) 1.07(231)
FP 4: BLEND
1.03( 45) 1.07(211)
FP 5: BLEND
1.09( 31) 1.08(249)
FP 6: BLEND
0.99( 50) 1.01(417)
FP 7: BLEND
1.04( 52) 1.04(293)
FP 8: BLEND
1.10( 75) 1.09(457)
FP 9: BLEND
1.13( 31) 1.08(281)
FP10: BLEND
1.13( 74) 1.13(463)
FP11: BLEND
1.02( 36) 1.08(233)
FP12: BLEND
1.09( 70) 1.06(488)

-----

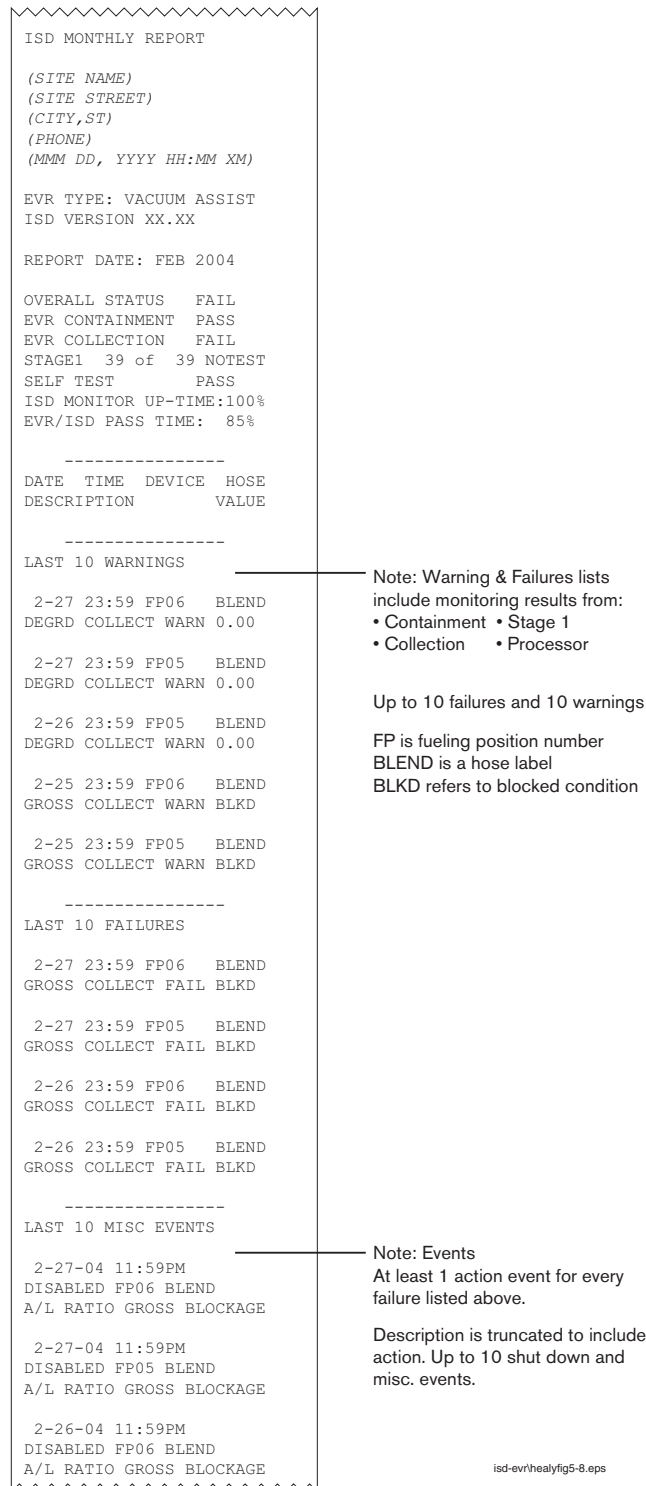
SELF TEST

SETUP TEST PASS
SENSOR OUT TEST PASS
    
```

(#) Count max number 999

isd-evr\healy\fig5-7.eps

**Figure 23. ISD Daily Report Example - TLS Console Printout**



**Figure 24. ISD Monthly Report Example - TLS Console Printout**



## Viewing ISD Reports via RS-232 Connection

### CONNECTING LAPTOP TO CONSOLE

Connect your laptop to the TLS console's RS-232 or Multiport card using one of the methods shown in the examples in Figure 25 below.

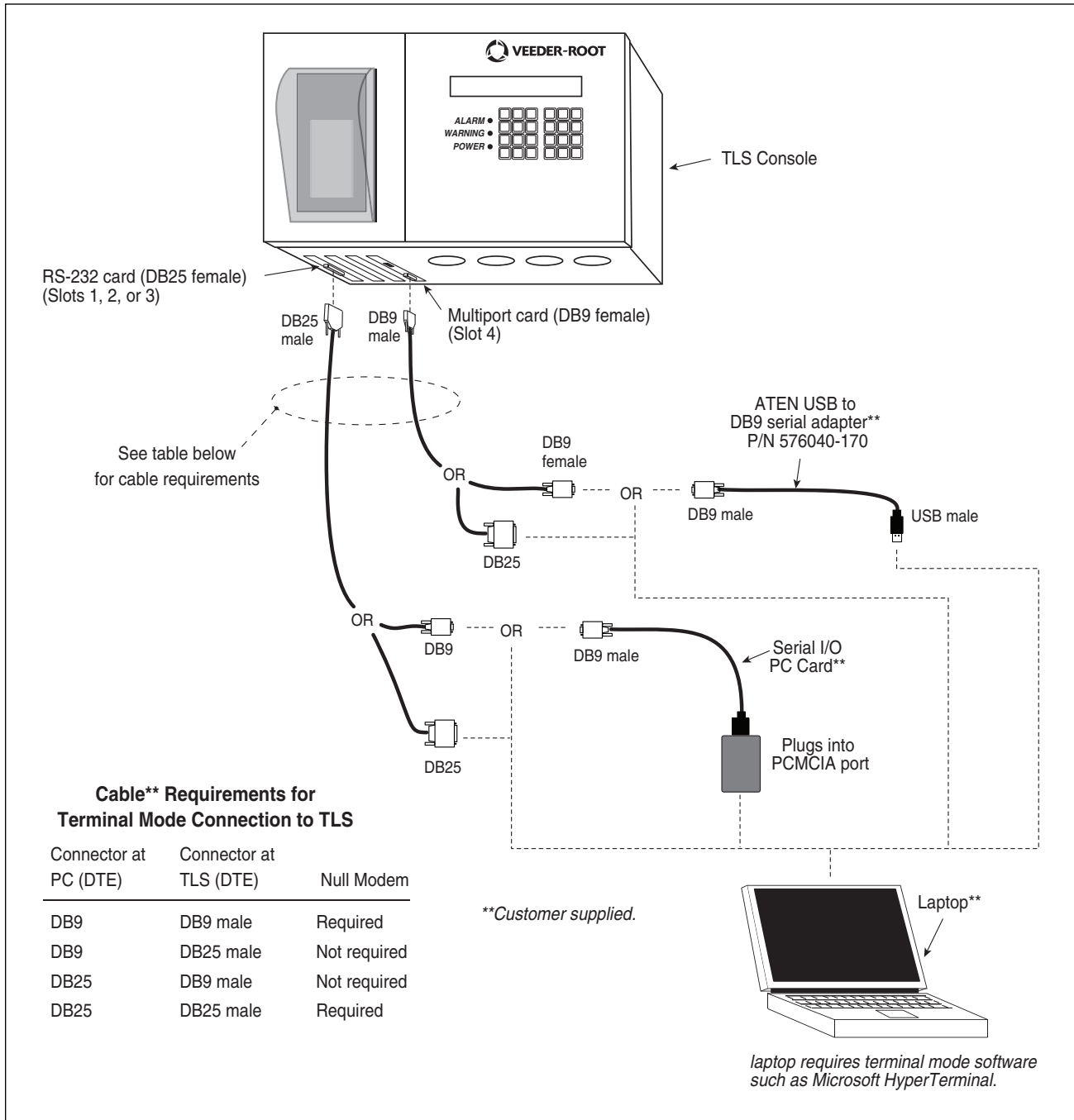


Figure 25. Connecting Laptop to TLS Console for Serial Communication

### CONNECTING LAPTOP TO CONSOLE

1. Open your laptop's serial communication program, e.g., HyperTerminal. You can typically find HyperTerminal under: Start/Programs/Accessories/Communications.
2. After opening the terminal software program, ignore (cancel) any modem/dialing related request windows since you will be directly connecting to the console via serial communications. When the Connection Description window appears (Figure 26), enter a connection name, e.g., TLSDIRECT, and click the OK button.



Figure 26. Connection Description Window

3. After clicking the OK button, you may see a repeat of the modem/dialing windows, in which case ignore (cancel) them all.
4. When the Connect To window appears (Figure 27), depending on your connection method, select either COM1 (If RS-232 port on laptop), USB-Serial Controller (if using USB port on laptop), or Serial I/O PC Card (if using PCMCIA port on laptop) in the 'Connect using' drop down box, then click OK button.



Figure 27. Connect To Window



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

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

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

```

SETUP MODE
PRESS <FUNCTION> TO CONT
    
```

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

```

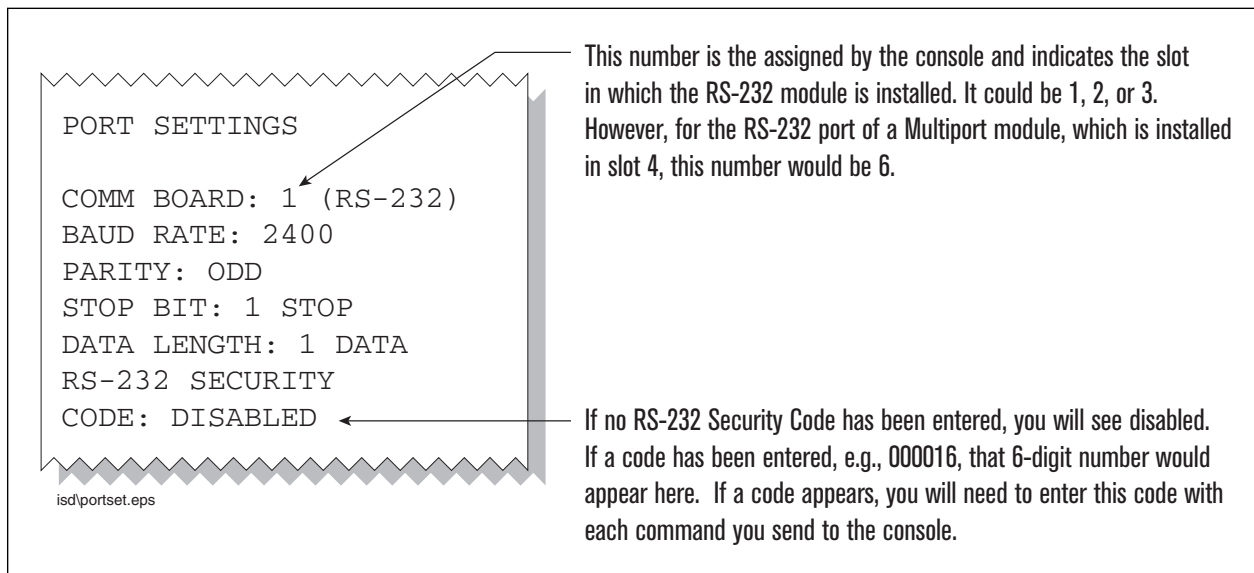
COMMUNICATIONS SETUP
PRESS <STEP> TO CONTINUE
    
```

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

```

PORT SETTINGS
PRESS <ENTER>
    
```

d. Press the PRINT key to printout the port settings for all communication modules installed in the console. Figure 28 shows an example port settings printout with the RS-232 module installed. Using the console port settings in the example below, your HyperTerminal 'Port Settings' window entries would be Bits per second - 2400, Data bits - 7, Parity - Odd, Stop Bits - 1. For the 'Flow Control' entry select None. Click OK.



**Figure 28. Console Comm Port Settings Printout Example**

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

6. After entering your port settings, the program's main window appears (Figure 29).

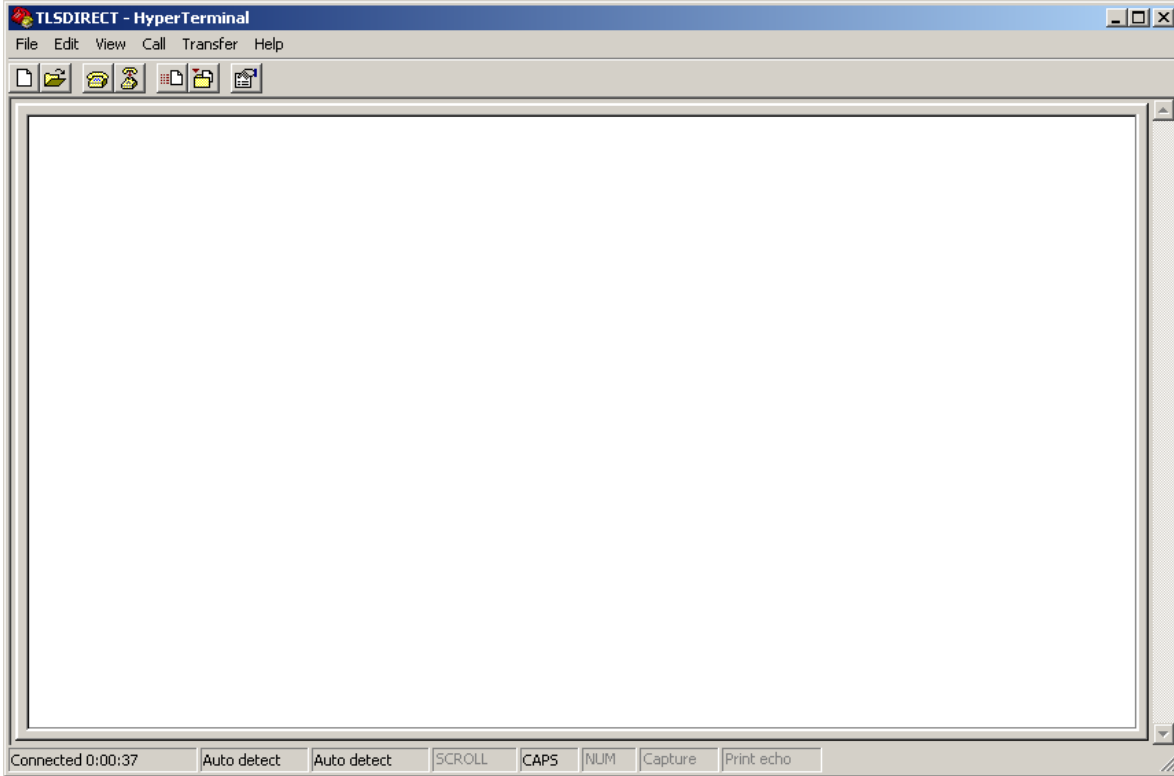


Figure 29. HyperTerminal Main Window

### SENDING CONSOLE COMMANDS

Table 2-3 shows three important ISD console commands: IV0500, IV0200, and IV0100. The <SOH> shown in the table means that you must press and hold the **Ctrl** key while you press the **A** key.

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



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

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

You will see the typed command on the screen: `␣IV0500010` followed by the response (report) from the console. The `␣` symbol indicates Ctrl+A and the `♥` symbol indicates the end of the response.

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

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

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

**Table 6.- Serial Commands for ISD Alarm, Monthly, and Daily Reports**

Report Type	Serial Command (PC to Console)*
Daily Report Details (See example Figure 32)	<SOH>IV0500ddd Where ddd = number of days, 001 = yesterday and today, 002 = two days ago, etc.
Monthly Status Report (See example Figure 31)	<SOH>IV0200yyyymm Where yyyy = year number, e.g. 2003, mm = month number, 01 = January, 02 = February, etc.
Alarm Status (See example Figure 30)	<SOH>IV0100

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

```

IV0500
MAR 1, 2004 12:20 AM

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

ISD DAILY REPORT DETAILS

EVR TYPE: VACUUM ASSIST
ISD TYPE: XX.XX
VAPOR PROCESSOR TYPE: NO VAPOR PROCESSOR

OVERALL STATUS          :FAIL          EVR VAPOR COLLECTION :FAIL
EVR VAPOR CONTAINMENT  :PASS
ISD MONITOR UP-TIME    :100%          STAGE I TRANSFERS: 39 of 39 PASS
EVR/ISD PASS TIME      : 85%

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

      ISD  ISD  ---CONTAINMENT TESTS---  STAGE  ---COLLECTION TESTS
      EVR  %UP  GROSS  DGRD  MAX  MIN  LEAK  I  VAPOR  FP1  FP2  FP3
DATE  STATUS  TIME  95%  75%  "WC  "WC  CFH  XFR  PRCR  BLEND BLEND BLEND
02/10  PASS  100%  -1.4N -3.1N -1.1 -5.0  0N  PASS  1.09  1.10  1.11
02/11  PASS  100%  -1.7N -3.5N  0.4 -5.0  0N  PASS  1.05  1.14  1.06
02/12  PASS  100%  -1.7N -3.4N -1.2 -5.0  0N  PASS  1.06  1.07  1.05
02/13  PASS  100%  -1.8N -3.4N -1.0 -5.0  2N  PASS  1.08  1.10  1.00
02/14  PASS  100%  -1.6N -3.3N -0.3 -5.0  2N  PASS  1.05  1.09  1.08
02/15  PASS  100%  -1.5N -3.3N  1.3 -5.0  2  PASS  1.07  1.11  1.05
02/16  PASS  100%  -1.2  -3.0N -0.3 -5.0  3  PASS  1.06  1.10  1.14
02/17  PASS  100%  -1.2  -2.9N  0.0 -5.0  3  PASS  1.06N 1.10N 1.14
02/18  PASS  100%  -1.0  -2.9N  1.0 -5.0  3  PASS  1.06N 1.10N 1.06
02/19  PASS  100%  -0.9  -2.9N  1.6 -5.0  4  PASS  1.06N 1.10N 1.09
02/20  PASS  100%  -0.6  -2.7N  2.9 -5.0  4  PASS  1.06N 1.10N 1.03
02/21  PASS  100%  -0.6  -2.7N  1.1 -5.0  1  PASS  1.06N 1.10N 1.13
02/22  PASS  100%  0.1  -2.5N  3.1 -5.0  0  PASS  1.06N 1.10N 1.03
02/23  PASS  100%  0.1  -2.6N  0.9 -5.0  0  PASS  1.06N 1.10N 1.04
02/24  PASS  100%  0.2  -2.6N  0.9 -5.0  0  PASS  1.08  1.09  1.07
02/25  W  100%  0.8  -2.3N  2.8 -5.0  0  PASS  1.10  1.11  1.08
02/26  F  100%  1.1  -2.2N  5.0 -5.0  0  PASS  1.10  1.12  1.11
02/27  F  100%  1.0  -2.4N -0.8 -5.0  0  PASS  1.11  1.13  1.11
02/28  PASS  100%  1.0  -2.4N  0.3 -5.0  0  PASS  1.09  1.16  1.08
02/29  PASS  100%  0.9  -2.3N  1.6 -5.0  0  PASS  1.01  1.14  1.08N

---COLLECTION TESTS-DAILY AVERAGE HOSE A/L RATIO-----
      FP4  FP5  FP6  FP7  FP8  FP9  FP10  FP11  FP12
DATE  BLEND BLEND BLEND BLEND BLEND BLEND BLEND BLEND BLEND
02/10  1.12  1.03  0.97  1.04  1.07  1.05  1.09  1.08  1.06
02/11  1.09  1.04  1.04  0.98  1.03  1.06  1.06  1.14  1.07
02/12  1.10  1.09  1.04  1.04  1.06  1.09  1.10  1.03  1.04
02/13  1.06  1.11  1.04  1.07  1.09  1.08  1.09  1.13  1.08
02/14  1.05  1.07  1.05  1.07  1.02  1.07  1.08  1.13  1.06
02/15  1.07  1.04  1.04  0.94  1.09  1.05  1.08  1.13  1.07
02/16  1.09  1.08  1.06  1.05  1.10  1.06  1.13  1.03  1.04
02/17  1.08  1.05  1.05  1.06  1.08  1.13  1.10  1.10  1.07
02/18  1.08  1.06  1.05  1.03  1.08  1.00  1.09  1.05  1.09
02/19  1.09  1.11  1.04  1.01  1.08  1.06  1.08  1.06  1.05
02/20  1.07  1.07  1.05  1.05  1.10  1.12  1.10  1.11  1.07
02/21  1.08  1.10  1.06  1.00  1.07  1.13  1.16  1.09  1.09
02/22  1.08  1.04  1.09  1.05  1.09  1.06  1.10  1.11  1.10
02/23  1.06  1.17  1.09  1.06  1.12  1.09  1.14  1.12  1.08
02/24  1.10  1.12  1.08  0.98  1.08  1.11  1.15  1.11  1.02
02/25  1.10  BLKDF BLKDF 1.07  1.06  1.09  1.16  1.03  1.05
02/26  1.11  BLKDF BLKDF 1.05  1.10  1.11  1.10  1.08  1.05
02/27  1.12  BLKDF BLKDF 1.08  1.08  1.06  1.15  1.13  1.09
02/28  1.08  1.11  1.08  1.07  1.07  1.10  1.18  1.05  1.08
02/29  1.09  1.14  1.08  1.03  1.10  1.06  1.19  1.09  1.09
    
```

isd-evr\healyfig5-9.eps

Figure 30. ISD Daily Report Details - Serial to PC Format

```

IV0200
MAR 1, 2004 12:20 AM

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

ISD MONTHLY STATUS REPORT

EVR TYPE: VACUUM ASSIST
ISD TYPE: XX.XX
VAPOR PROCESSOR TYPE: NO VAPOR PROCESSOR

OVERALL STATUS           :FAIL           EVR VAPOR COLLECTION :FAIL
EVR VAPOR CONTAINMENT   :PASS
ISD MONITOR UP-TIME     :100%          STAGE I TRANSFERS: 39 of 39 PASS
EVR/ISD PASS TIME      : 85%

CARB EVR CERTIFIED OPERATING REQUIREMENTS

VAPOR COLLECTION ASSIST SYSTEM A/L RANGE      MIN      MAX
                                                0.95     1.15

ISD MONITORING TEST PASS/FAIL THRESHOLDS

PERIOD      BELOW  ABOVE
VAPOR COLLECTION ASSIST SYSTEM A/L GROSS FAIL  1DAYS     0.33  1.90
VAPOR COLLECTION ASSIST SYSTEM A/L DEGRADATION FAIL  7DAYS     0.81  1.32

VAPOR CONTAINMENT GROSS FAIL, 95th PERCENTILE      7DAYS     ----  1.30"wcg
VAPOR CONTAINMENT DEGRADATION, 75th PERCENTILE    30DAYS     ----  0.30"wcg
VAPOR CONTAINMENT LEAK DETECTION FAIL @2"WCG      7DAYS     ----  8.50cfh
STAGE I VAPOR TRANSFER FAIL, 50th PERCENTILE      20MINS     ----  2.50"wcg

WARNING ALARMS
DATE      TIME      DESCRIPTION           READING      VALUE
04-02-27 23:59:00 A/L RATIO DEGRADATION  FP 6 BLEND   0.80
04-02-27 23:59:00 A/L RATIO DEGRADATION  FP 5 BLEND   0.76
04-02-26 23:59:00 A/L RATIO DEGRADATION  FP 5 BLEND   0.79
04-02-25 23:59:00 A/L RATIO GROSS BLOCKAGE  FP 6 BLEND   BLKD
04-02-25 23:59:00 A/L RATIO GROSS BLOCKAGE  FP 5 BLEND   BLKD

FAILURE ALARMS
DATE      TIME      DESCRIPTION           READING      VALUE
04-02-27 23:59:00 A/L RATIO GROSS BLOCKAGE  FP 6 BLEND   BLKD
04-02-27 23:59:00 A/L RATIO GROSS BLOCKAGE  FP 5 BLEND   BLKD
04-02-26 23:59:00 A/L RATIO GROSS BLOCKAGE  FP 6 BLEND   BLKD
04-02-26 23:59:00 A/L RATIO GROSS BLOCKAGE  FP 5 BLEND   BLKD

SHUTDOWN & MISCELLANEOUS EVENTS
DATE      TIME      DESCRIPTION           ACTION/NAME
04-02-27 23:59:00 A/L RATIO GROSS BLOCKAGE  DISABLED FP 06 BLEND
04-02-27 23:59:00 A/L RATIO GROSS BLOCKAGE  DISABLED FP 05 BLEND
04-02-26 23:59:00 A/L RATIO GROSS BLOCKAGE  DISABLED FP 06 BLEND
04-02-26 23:59:00 A/L RATIO GROSS BLOCKAGE  DISABLED FP 05 BLEND
04-02-15 23:59:00 READINESS ISD:PP EVR:PP      ISD & EVR READY
04-02-14 23:59:00 READINESS ISD:PP EVR:PN      EVR READINESS PENDING
04-02-13 23:59:00 READINESS ISD:PP EVR:PN      EVR READINESS PENDING
04-02-12 23:59:00 READINESS ISD:PP EVR:PN      EVR READINESS PENDING
04-02-11 23:59:00 READINESS ISD:PP EVR:PN      EVR READINESS PENDING
04-02-10 23:59:00 READINESS ISD:PP EVR:PN      EVR READINESS PENDING
    
```

isd-evr\healyfig5-10.eps

Figure 31. ISD Monthly Status Report - Serial to PC Format

```

IV0100
MAR 1, 2004 12:05 AM

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

ISD ALARM STATUS REPORT

EVR TYPE: VACUUM ASSIST
ISD TYPE: XX.XX
VAPOR PROCESSOR TYPE: NO VAPOR PROCESSOR

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

WARNING ALARMS
DATE    TIME    DESCRIPTION           READING    VALUE
04-02-27 23:59:01 A/L RATIO DEGRADATION FP 6 BLEND 0.80
04-02-27 23:59:01 A/L RATIO DEGRADATION FP 5 BLEND 0.76
04-02-26 23:59:00 A/L RATIO DEGRADATION FP 5 BLEND 0.79
04-02-25 23:59:01 A/L RATIO GROSS BLOCKAGE FP 6 BLEND BLKD
04-02-25 23:59:01 A/L RATIO GROSS BLOCKAGE FP 5 BLEND BLKD

FAILURE ALARMS
DATE    TIME    DESCRIPTION           READING    VALUE
04-02-27 23:59:01 A/L RATIO GROSS BLOCKAGE FP 6 BLEND BLKD
04-02-27 23:59:01 A/L RATIO GROSS BLOCKAGE FP 5 BLEND BLKD
04-02-26 23:59:00 A/L RATIO GROSS BLOCKAGE FP 6 BLEND BLKD
04-02-26 23:59:00 A/L RATIO GROSS BLOCKAGE FP 5 BLEND BLKD

SHUTDOWN & MISCELLANEOUS EVENTS
DATE    TIME    DESCRIPTION           ACTION/NAME
04-02-27 23:59:01 A/L RATIO GROSS BLOCKAGE DISABLED FP 06 BLEND
04-02-27 23:59:01 A/L RATIO GROSS BLOCKAGE DISABLED FP 05 BLEND
04-02-26 23:59:00 A/L RATIO GROSS BLOCKAGE DISABLED FP 06 BLEND
04-02-26 23:59:00 A/L RATIO GROSS BLOCKAGE DISABLED FP 05 BLEND
04-02-15 23:59:00 READINESS ISD:PP EVR:PP ISD & EVR READY
04-02-14 23:59:00 READINESS ISD:PP EVR:PN EVR READINESS PENDING
04-02-13 23:59:00 READINESS ISD:PP EVR:PN EVR READINESS PENDING
04-02-12 23:59:00 READINESS ISD:PP EVR:PN EVR READINESS PENDING
04-02-11 23:59:00 READINESS ISD:PP EVR:PN EVR READINESS PENDING
04-02-10 23:59:00 READINESS ISD:PP EVR:PN EVR READINESS PENDING
    
```

isd-evr\healyfig5-11.eps

Figure 32. ISD Alarm Status Report - Serial to PC Format



## Maintenance

### **TLS Console**

---

The TLS console, including interface modules, do not require scheduled maintenance, but the station operator is responsible to ensure printer paper is properly loaded and front panel indicator lights are operational. ISD System Self-Test Monitoring algorithms are designed to verify proper selection, setup and operation of the TLS console and sensors. Servicing should be performed in accordance with the In-Station Diagnostic System Troubleshooting Guide, Manual 577013-819 in response to warning or alarm conditions.

### **Vapor Flow Meter**

---

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

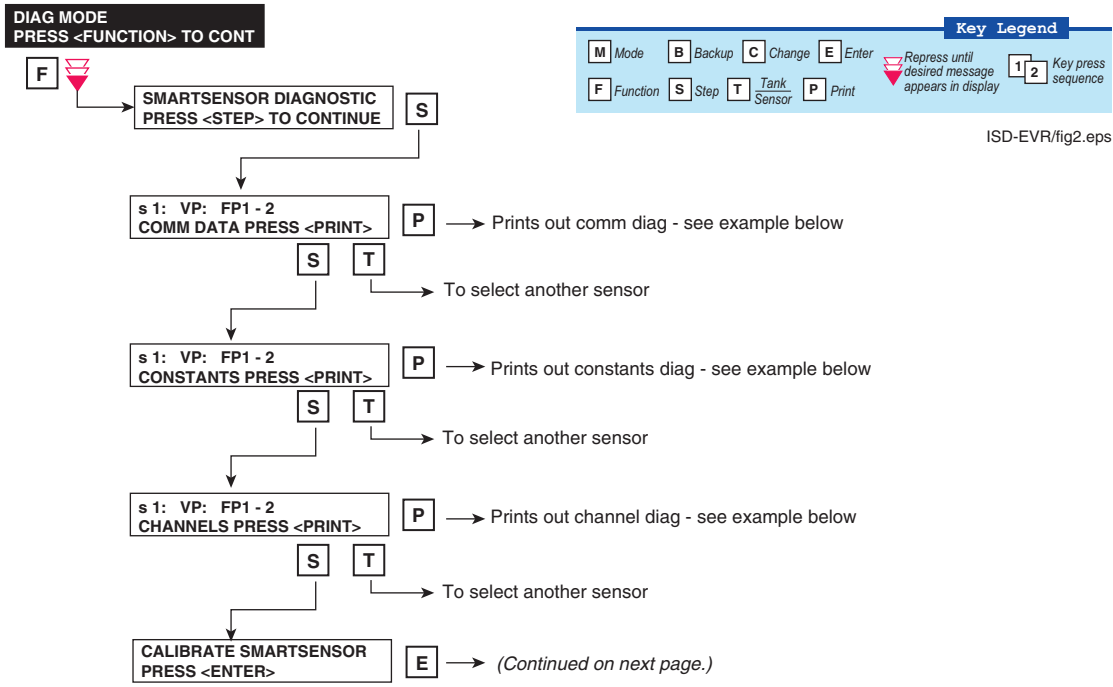
### **Vapor Pressure Sensor**

---

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

# Diagnostic Menus

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



*This menu only appears if this SmartSensor type is a pressure sensor.*

```

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

```

SS CONSTANTS DIAG
-----
s 1: AFM1  FP1-2
VAPOR PRESSURE
SERIAL NUMBER  1007
PROTOCOL VERSION  0
    
```

```

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

## Diagnostic Menus

**CALIBRATE SMARTSENSOR**  
PRESS <ENTER> **E**

*This menu only appears if this Smartsensor type is a pressure sensor.*

**S**

**CALIBRATE SMARTSENSOR**  
PRESS <STEP> TO CONTINUE **P**

→ Prints out sensor calibration history - see example at right.

**S**

s 1: VAPOR PRESSURE  
PRESSURE: -XX.XXX **S**

This is the current uncalibrated value read by the pressure sensor.

**S**

ENTER ZERO REFERENCE  
PRESSURE: +XX.XXX **S**

Enter reference pressure value from calibrated test device at pressure sensor via TLS Console front panel, e.g., ambient pressure (0.0). This is the first point of the calibration slope.

**S**

READ ZERO VALUE  
PRESSURE: -XX.XXX **S**

Wait until the read zero pressure value stabilizes and no longer changes, then press STEP.

**S**

ENTER SPAN REFERENCE  
PRESSURE: -XX.XXX **S**

Enter span reference pressure value from calibrated test device at pressure sensor via TLS Console front panel, e.g., 2 psi. This is the second point of the calibration slope.

**S**

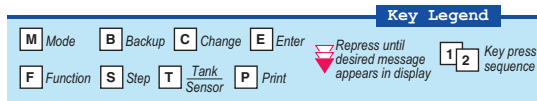
READ SPAN VALUE  
PRESSURE: -XX.XXX **S**

Wait until the read span pressure value stabilizes and no longer changes, then press STEP.

**S**

CALB STATUS: PASS  
PRESS <STEP> TO CONTINUE

This message will only appear after all 4 values have been successfully obtained and the calibrated slope and offset are within acceptable limits.

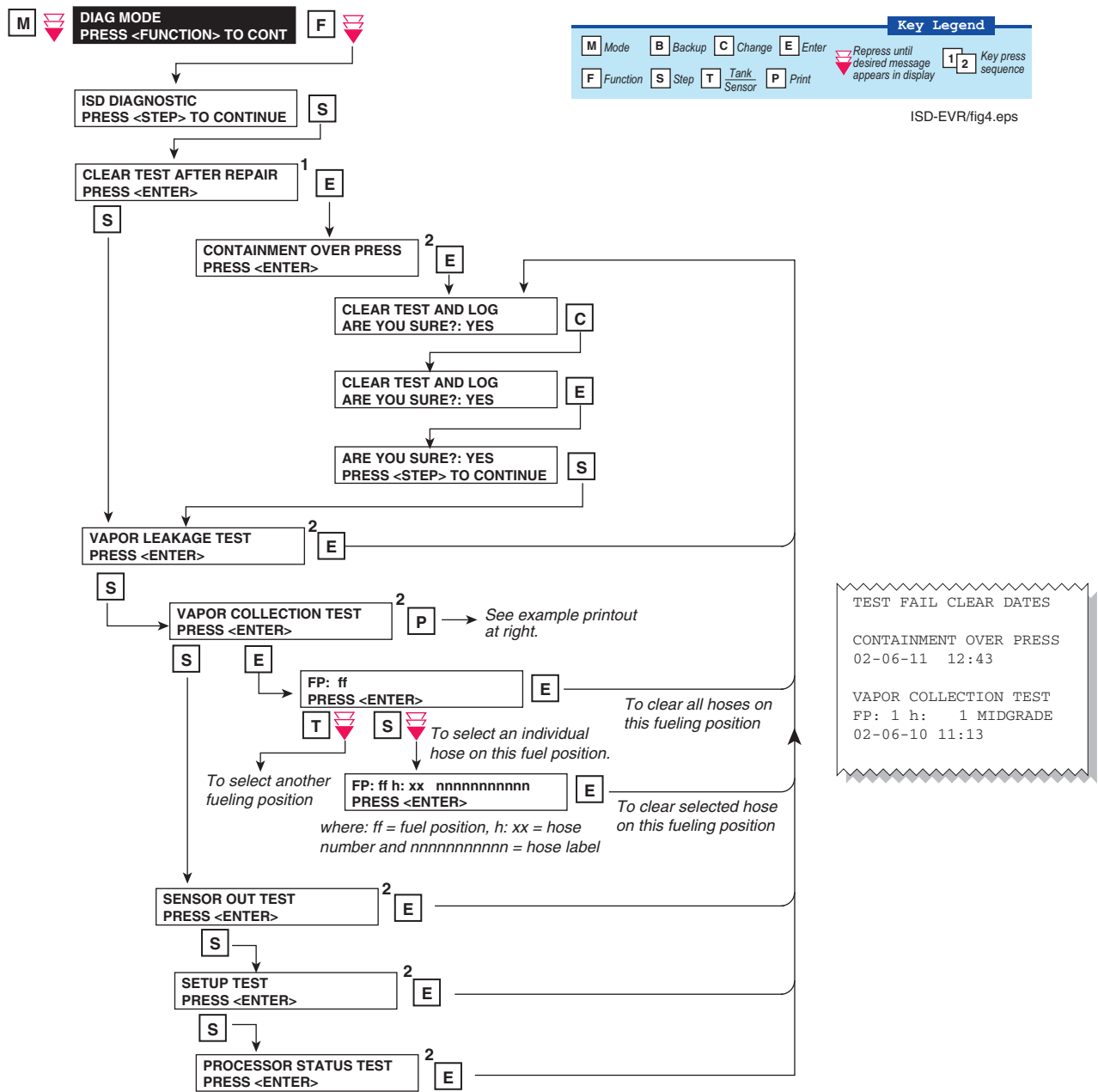


ISD-EVR/fig3.eps

VAPOR PRESSURE SENSOR  
CALIBRATION HISTORY

```
s 1: VAPOR PRESSURE
DATE: MM-DD-YY HH:MM
SERIAL #: XXXXXXXX
SLOPE: XXXX.XXX
OFFSET: XXXX.XXX
CALB STATUS: PASS
```

# Diagnostic Menus



**Notes:**

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

**Table 7. Clear Test Repair Menu**

<b>Menu Selection</b>	<b>Clears Alarms</b>	<b>Reset Dates</b>
Containment Over Press	ISD GROSS PRESSURE WARN ISD GROSS PRESSURE FAIL ISD DEGRD PRESSURE WARN ISD DEGRD PRESSURE FAIL	Containment Test Time
Vapor Leakage Test	ISD VAPOR LEAKAGE WARN ISD VAPOR LEAKAGE FAIL	Vapor Leak Test Time
Vapor Collection Test	GROSS COLLECT WARN GROSS COLLECT FAIL DEGRD COLLECT WARN DEGRD COLLECT FAIL AIRFLOW MTR SETUP	Hose Test Time
Sensor Out Test	ISD SENSOR OUT WARN ISD SENSOR OUT FAIL	Sensor Out Test Time
Setup Test	ISD SETUP WARN ISD SETUP FAIL	Setup Self Test Time

## Appendix A: Site EVR/ISD Equipment Location Worksheet

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

### Single-Hose Fueling Position Dispensers

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

<sup>①</sup>Each hose must have a unique number (1 - 99).

<sup>②</sup>This is the Fuel Position Label which is the visible number on the outside of the dispenser (1 -2 digits).

<sup>③</sup>The hose label is always Blend for single-hose dispensers.

<sup>④</sup>This is the serial number on the Air Flow Meter (1 per dispenser).

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

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

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

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



### Multi-Hose Fueling Position Dispensers

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

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

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

③The hose label is the grade.

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

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

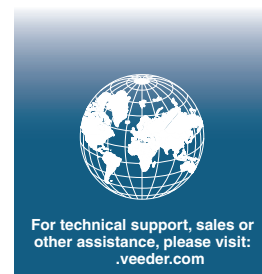
⑥After you have entered the contents of columns 1 - 5 into the TLS EVR/ISD hose table setup, you now must follow automap procedure and dispense from each hose. Enter a check in this column following a dispense from the hose.







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



# ISD Vapor Flow Meter

## Installation Guide



# Notice

---

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

## **DAMAGE CLAIMS / LOST EQUIPMENT**

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

## **VEEDER-ROOT'S PREFERRED CARRIER**

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

## **CUSTOMER'S PREFERRED CARRIER**

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

## **RETURN SHIPPING**

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

## **FOR INSTALLATIONS IN THE STATE OF CALIFORNIA**

Please refer to the California Air Resources Board Vapor Recovery Certification Phase II EVR Executive Order web site ([www.arb.ca.gov/vapor/eo-evrphaseII.htm](http://www.arb.ca.gov/vapor/eo-evrphaseII.htm)) for the latest manual revisions pertaining to Executive Order VR202 (Healy Phase II EVR System Including ISD System).

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## ISD Vapor Flow Meter Installation

Contractor Certification Requirements .....	1
Product Marking Information .....	2
Safety Warnings .....	3
Safety Precautions .....	4
Related Manuals .....	4
Before You Begin .....	4
Veeder-Root Parts .....	5
Tools Required .....	5
Installation Steps - Vacuum Assist System Above Shear Valve .....	6
Installation Steps - Vacuum Assist System Below Shear Valve .....	8
Seal and Connect Field Wiring .....	11

## Figures

Figure 1.	Example Vapor Flow Meter Installation Above Shear Valve .....	7
Figure 2.	Field wiring Vapor Flow Meter - Observe Polarity .....	8
Figure 3.	Example flow meter installations with approximate clearances .....	9
Figure 4.	Example Vapor Flow Meter Installation Below Shear Valve .....	10
Figure 5.	Epoxy sealing field wiring .....	11
Figure 6.	Connecting Vapor Flow Meter to TLS-350 Smart Sensor Interface Module .....	12
Figure 7.	Connecting Vapor Flow Meter to TLS-450 USM Module .....	12

# ISD Vapor Flow Meter Installation

This manual contains instructions to install a Veeder-Root ISD (In-Station Diagnostic) Vapor Flow Meter in a dispenser's vapor return line in vacuum assist systems.

This manual assumes all preliminary site preparation is completed, and that wiring from the console to the Vapor Flow Meter junction box is in place and meets the requirements set out in the applicable console Site Prep and/or TLS RF Wireless 2 system (W2) installation manuals.

## Contractor Certification Requirements

Veeder-Root Contractor Certification Requirements	Installer Certification <sup>6</sup>	ATG Technician Certification <sup>7</sup>	VR Vapor Products Certification <sup>8</sup>
Install <sup>1</sup> ISD	X	X	X
Install PMC	X	X	X
Install CCVP	X	X	X
Install Wireless ISD/PMC	X	X	X
Installation Checkout <sup>2</sup>		X	X
ATG Startup <sup>3</sup> / Training <sup>4</sup> / Service <sup>5</sup>		X	X
ISD Startup / Training / Service			X
PMC Startup / Training / Service			X
CCVP Startup / Training / Service			X
Wireless ISD/PMC Startup / Training / Service			X
Install Pressure Sensor (ATG)	X	X	X
Maintain Pressure Sensor (ATG)		X	X
Calibrate Pressure Sensor (ATG)		X	X
Clear ATG Pressure Sensor Alarm (ATG)		X	X
Clear ISD/PMC Alarms (ISD/PMC)			X
<sup>1</sup> Perform wiring and conduit routing; equipment mounting <sup>2</sup> Inspect wiring and conduit routing; equipment mounting <sup>3</sup> Turn power on, program and test the systems <sup>4</sup> Provide supervised field experience in service techniques and operations <sup>5</sup> Troubleshoot and provide routing maintenance		<sup>6</sup> UST Monitoring Systems – Installer (Level 1) <sup>7</sup> Certified UST Monitoring Technician <sup>8</sup> VR Vapor Products	

**Warranty Registrations** may only be submitted by selected Distributors. Certified installers are required to provide the GDF operator with the completed Equipment Warranty Notice, form 577013-868, for their records.

## Product Marking Information

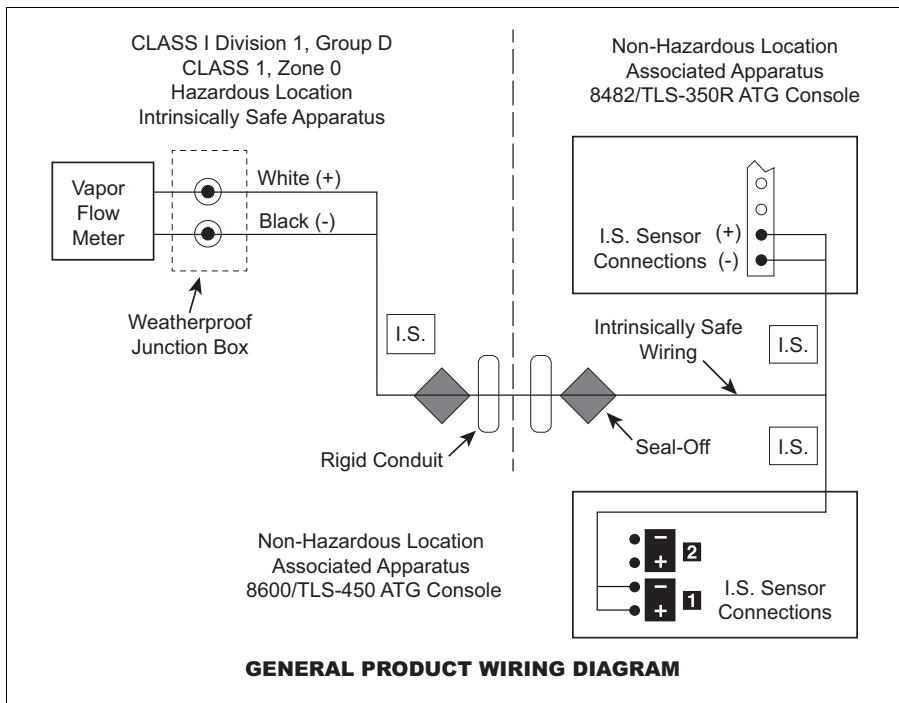
### RELATED DOCUMENTS

#### Documents Required to Install Equipment



This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
<b>Associated Apparatus</b>	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
<b>Intrinsically Safe Apparatus for Wireless Applications</b>	
Tank Gauge Accessories	331940-012

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at [veeder.com](http://veeder.com) under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.









**Product Label Contents**

	<b>VEEDER-ROOT</b> TM	I.S. CIRCUIT FOR HAZLOC SENSOR	
			F/N 331847-XXX
	CL I, DIV. 1, GP.D		S/N XXXXXX
	CL I, ZONE 0		
	AEx ia IIA	-40°C ≤ Ta ≤ +60°C	
	Ex ia IIA		
	TC=T4	MANUAL NO. 577013-796	
	SECURITE INTRINSEQUE		

**Safety Warnings**

To protect yourself and your equipment, observe the following warnings and important information:







 **WARNING**

    	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p><b>FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.</b></p> <ol style="list-style-type: none"> <li>1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock.</li> <li>2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.</li> <li>3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service.</li> <li>4. Do not alter or modify any component or substitute components in this kit.</li> <li>5. <b>Warning!</b> Substitution of components may impair intrinsic safety.</li> <li>6. Field wiring to the Flow Meter must not share a conduit with any non-intrinsically safe device's wiring</li> <li>7. <b>Warning!</b> To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.</li> <li>8. Materials used in the construction of this device contain aluminum. Care must be taken to avoid ignition hazards due to impact or friction.</li> <li>9. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required.</li> </ol>
--	---

**NOTE** Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

## Safety Precautions

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

 <p><b>EXPLOSIVE</b> Fuels and their vapors are extremely explosive if ignited.</p>	 <p><b>FLAMMABLE</b> Fuels and their vapors are extremely flammable.</p>
 <p><b>ELECTRICITY</b> High voltage exists in, and is supplied to, the device. A potential shock hazard exists.</p>	 <p><b>TURN POWER OFF</b> Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.</p>
 <p><b>READ ALL RELATED MANUALS</b> Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.</p>	 <p><b>USE SAFETY BARRICADES</b> Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.</p>

## Related Manuals

- 576013-879 TLS-3XX Series Consoles Site Prep Manual
- 577013-879 TLS-450 Series Consoles Site Prep Manual
- 577013-800 In-Station Diagnostics Install, Setup & Operation Manual
- 577013-964 TLS RF Wireless 2 System (W2) Installation and Maintenance Guide

## Before You Begin

- A level 1 or higher certified Veeder-Root Technician must be available (on site) to assist in this type of installation.
- Comply with all recommended safety practices identified by OSHA (Occupational Safety and Health Administration) and your employer.
- Follow all installation requirements as per NFPA (National Fire Protection Association) 30, 30A, and 70.
- Review and comply with all the safety warnings in the installation manuals and any other national, State or Local requirements.
- When directly wiring to a TLS console, a 2-conductor, 18 AWG shielded cable must be installed in intrinsically safe conduit from each dispenser to the intrinsically safe wiring compartment of the TLS console.
- Debris from plumbing modifications should be flushed through the piping system prior to installing the ISD Vapor Flow Meter.
- Use only UL classified Gas/TFE yellow teflon tape on all fittings. Do not use pipe dope to seal pipe threads or fittings in and out of the ISD Vapor Flow Meter.

## Veeder-Root Parts

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- Veeder-Root ISD Vapor Flow Meter (P/N 331847-001).
- Sensor Installation Kit, see Table 1.

**Table 1.- Vapor Flow Meter Installation Kit (P/N 330020-445)**

Item	Qty.	Description	P/N
1	1	ISD Vapor Flow Meter	331847-002
2	2	Flange with 1" NPT threaded hole	332091-001
3	4	5/16-18 UNC-2B x 3/4" hex head bolt	514100-426
4	2	1-11.5 NPT x 2 " male to male threaded steel nipple	576008-655
5	1	Inlet filter	332092-001
6	1	Outlet o-ring (Parker size # 2-218, Nitrile)	512700-258
7	1	Cord grip group	331028-001
8	1	Sealing pack	514100-304
9	2	Wire nut	576008-461
10	2	Tie wrap	510901-337
11	4	5/16" Lock washer	514100-436

## Tools Required

---

1. Pipe wrench suitable for tightening 1-inch NPT pipe.
2. 1/2" socket wrench to install Vapor Flow Meter flange bolts.
3. Necessary pipe fitter's equipment and a non-hazardous work space suitable to modify dispenser vapor line for Vapor Flow Meter installation, when necessary.

## Installation Steps - Vacuum Assist System Above Shear Valve



1. Before installing this device, turn Off, tag/lock out power to the system, including console and submersible pumps.
2. Remove the dispenser's lower sheet metal doors to access the vapor plumbing.
3. Loosen any factory installed mounts and/or brackets necessary to provide room to disconnect the vacuum motor outlet plumbing.
4. Disconnect the factory installed plumbing between the outlet of the vacuum motors and the field installed plumbing above the vapor shear valve, if present (see example installation in Figure 1). Retain the manufacturers installed piping for later use.
5. Remove any unneeded field installed plumbing above the vapor shear valve. The Vapor Flow Meter with flanges attached can be used for sizing the required head space of approximately 8 inches. Approximately 3 inches of clearance is required on both sides of the piping to accommodate the width of the meter body.
6. Working through the vacuum motor mounting plate, if present, connect the upper flange to factory installed plumbing. Note that this may need to be temporarily suspended across the vacuum motor mounting plate while the lower plumbing work progresses.
7. Install any plumbing and the lower flange that will connect between the outlet side of the Vapor Flow Meter and the shear valve or lower vapor return line. Note: Elbows should be kept to a minimum (straight vertical plumbing is preferable). To improve efficiency and to reduce the risk of liquid traps, all horizontal plumbing must be pitched to drain.
8. Clean all debris around the inlet and outlet plumbing prior to installing the Vapor Flow Meter. Do not blow compressed air through the Vapor Flow Meter to prevent damaging the internal screens.
9. Install the o-ring into the lower mounting flange.
10. Taking care that foreign material (chips, debris, sealant, etc.) does not enter the open piping or Vapor Flow Meter, carefully insert the inlet filter and then connect the Vapor Flow Meter to the upper flange. Note that the flow arrow on the side of the meter body must point down.
11. Connect the lower flange to the Vapor Flow Meter.
12. Tighten any loose fittings and hardware
13. Route the wiring to the TLS RF transmitter (W2) or into the junction box via the supplied cord grip assembly when direct wiring to a TLS console.
14. Connect the wires from the Vapor Flow Meter to the field wiring from the console and cap with wire nuts (see Figure 2). Not required when connecting to the TLS RF transmitter (W2).
15. After all other ISD Vapor Flow Meters and the ISD Pressure Sensor are installed, pressurize the tank ullage space and vapor piping to at least 2 inches WC and test for leaks using leak detection solution.

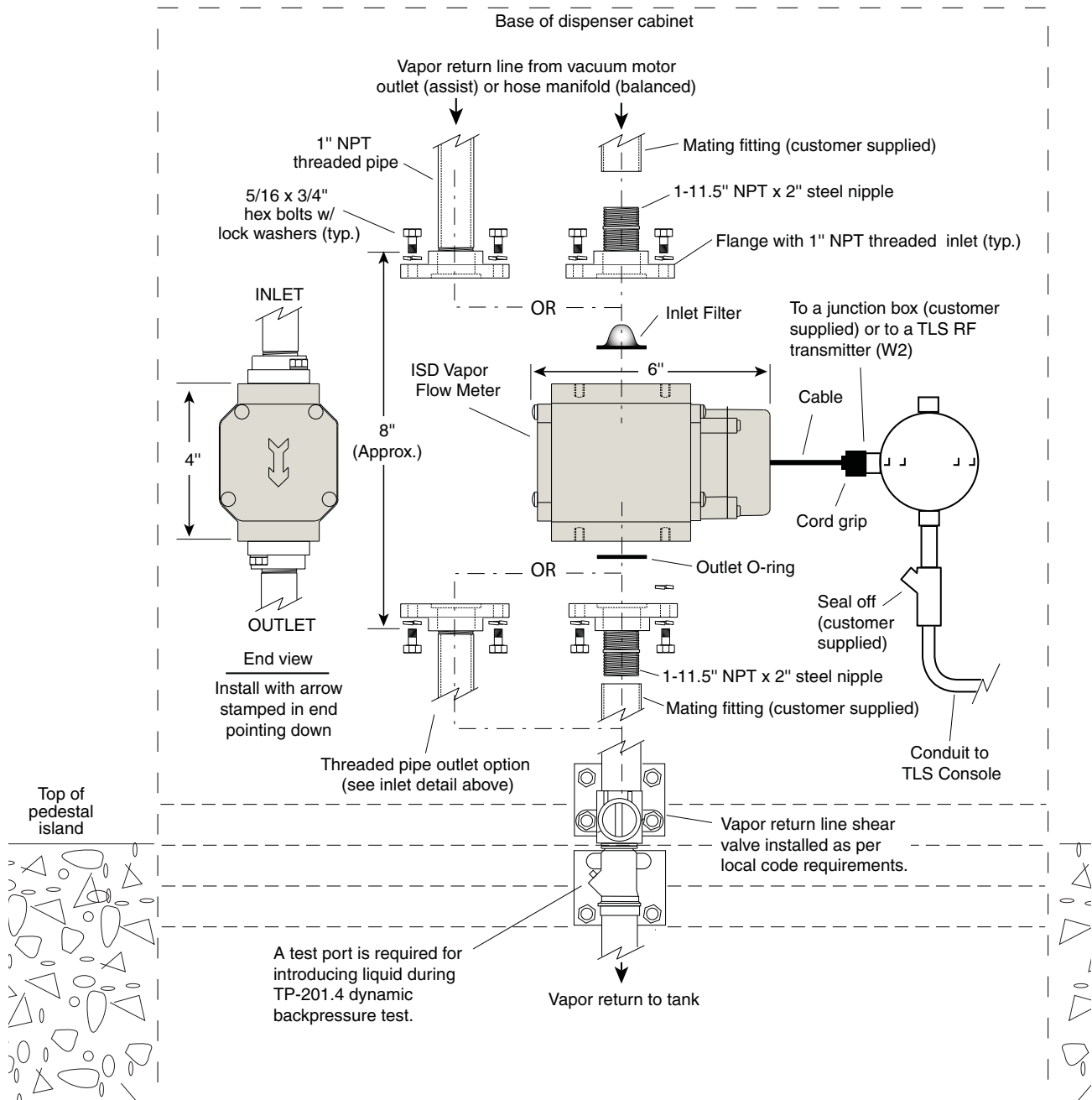


Figure 1. Example Vapor Flow Meter Installation Above Shear Valve



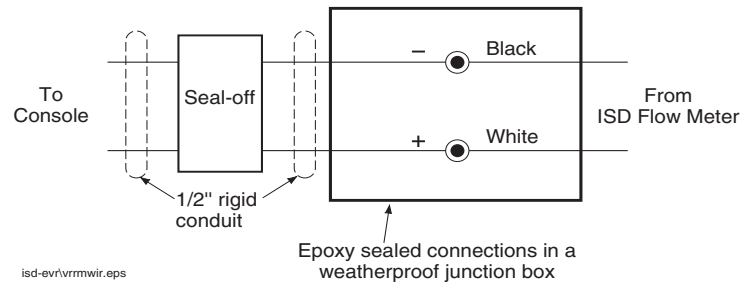


Figure 2. Field wiring Vapor Flow Meter - Observe Polarity

## Installation Steps - Vacuum Assist System Below Shear Valve

**NOTE: The Vapor Flow Meter should be installed prior to setting the dispenser in place or prior to installing any vacuum assist retrofit kits. If retrofitting the vacuum assist system, follow all manufacturer's instructions.**



1. Before installing this device, turn Off, tag/lock out power to the system, including console and submersible pumps.
2. Remove the dispenser's lower sheet metal doors to access the vapor plumbing, if necessary.
3. If a retrofit vacuum assist kit will be installed, remove any hardware specified in the manufacturer's installation instructions. Do not install the retrofit assembly at this time.
4. Remove any unneeded field installed plumbing between the vapor shear valve and the vapor return line fitting. Figure 3 shows two example installations of the Vapor Flow Meter with the required lateral or wye fitting for running the TP-201.4 back pressure test. Approximately 3 inches of clearance is required on both sides of the piping to accommodate the width of the meter body.
5. Connect the lower flange to the pipe that is connected to the lateral or wye access fitting (see Figure 4).
6. Install the Vapor Flow Meter over the lower flange.
7. Connect the upper flange with serviceable screen above the Vapor Flow Meter.
8. Using a close nipple, thread the shear valve into the upper flange.
9. Install the vacuum assist retrofit kit, if required, following the retrofit kit manufacturer's installation instructions - or fit the dispenser to its permanent mounting points.
10. Using nipples, unions, and other plumbing as required, connect the vacuum assist outlet to the shear valve.
11. Route the wiring into the junction box via the supplied cord grip assembly. Connect the wires from the Vapor Flow Meter to the field wiring from the console and cap with wire nuts (see Figure 2) - OR - connect the wires to the TLS RF transmitter (W2).
12. After all other ISD Vapor Flow Meters and the ISD Pressure Sensor are installed, pressurize the tank ullage space and vapor piping to at least 2 inches WC and test for leaks using leak detection solution.

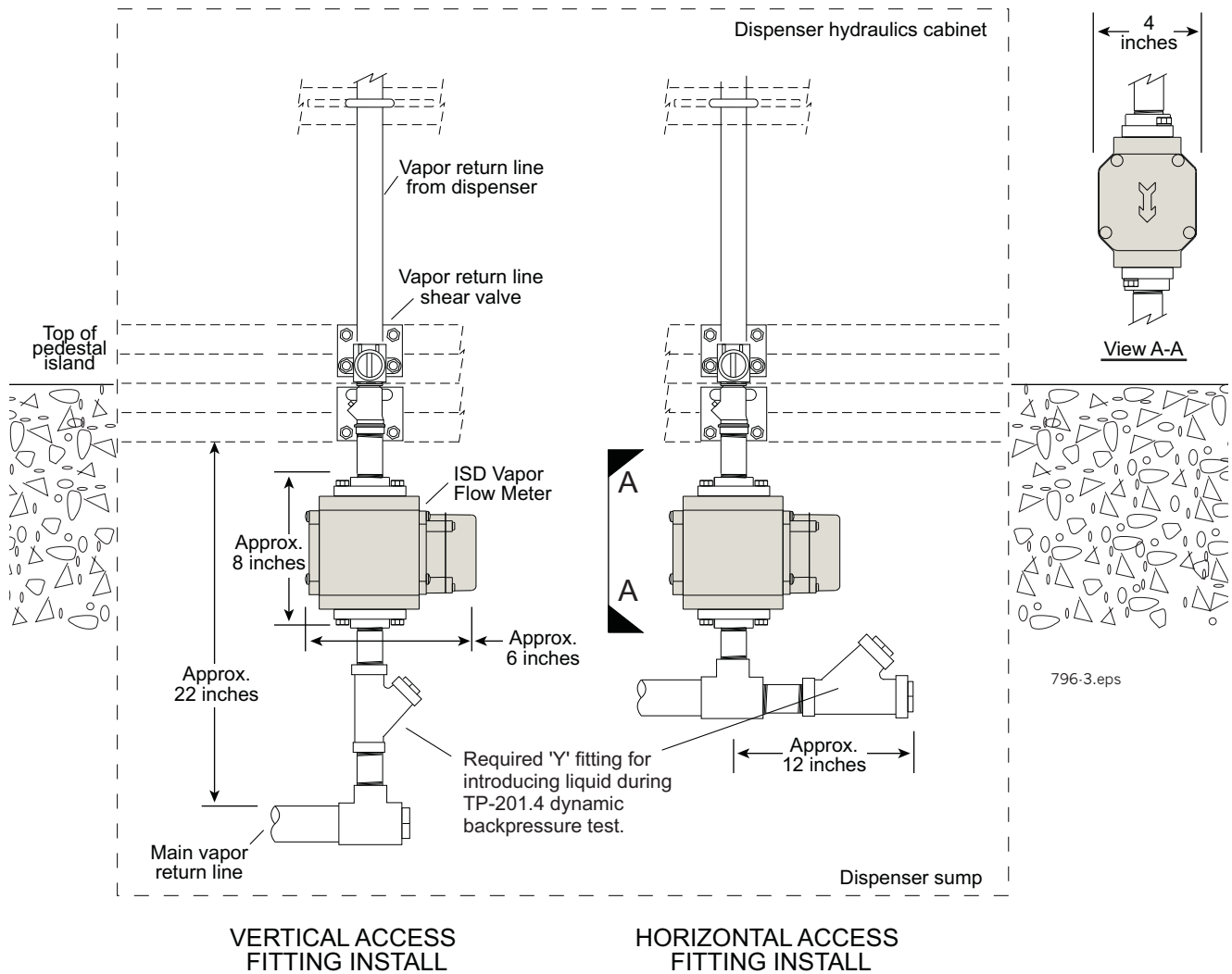


Figure 3. Example flow meter installations with approximate clearances

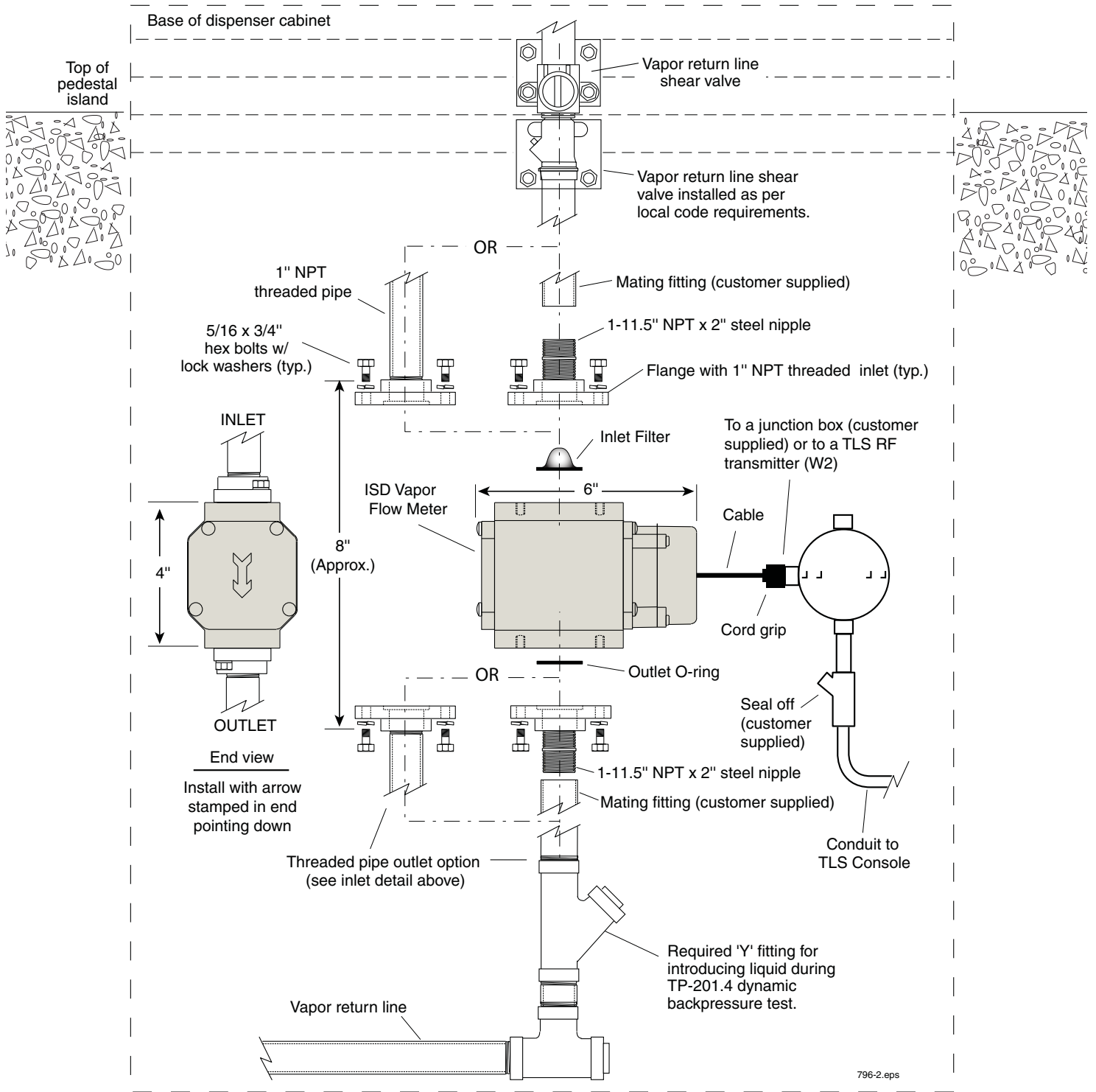


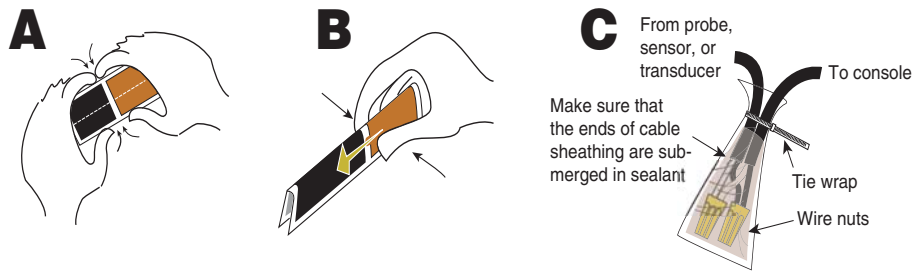
Figure 4. Example Vapor Flow Meter Installation Below Shear Valve

## Seal and Connect Field Wiring

1. Seal wire nuts with epoxy sealant following the instructions in Figure 5. Note - wire sealing is not required for installations using a wireless interface.



**CAUTION:** Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxy-carboxylate. Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.



**Instructions:**

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.

4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.

consoles/epoxy2w.eps

Figure 5. Epoxy sealing field wiring

2. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.
3. Terminate field wiring into TLS-350 Consoles and connect to Smart Sensor Module located in the intrinsically safe wiring compartment as shown in Figure 6. Terminate field wiring into TLS-450 Consoles and connect to USM Module located in the module bay of the console as shown in Figure 7. Note: you must observe polarity! Also, the cable length between the console and sensor must not exceed the distance stated in the appropriate console's Site Prep manual. For the wireless version, terminate the wires in the TLS RF transmitter (W2).

Note: Intrinsically safe devices must be installed in accordance with Article 504 of the National Electrical Code, ANSI/NFPA 70, for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.

4. Replace the lower sheet metal doors in the dispenser.

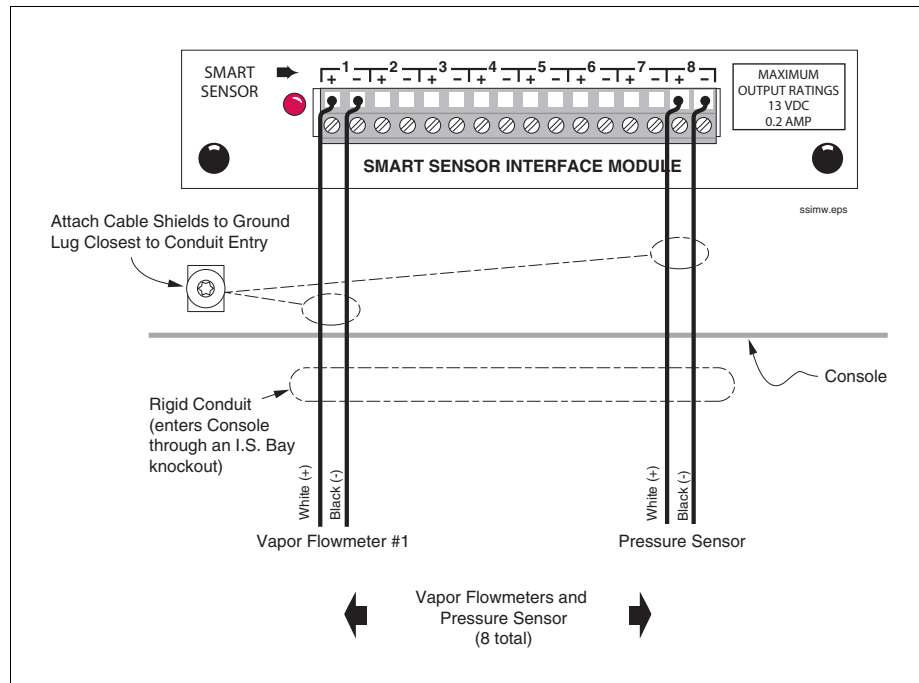


Figure 6. Connecting Vapor Flow Meter to TLS-350 Smart Sensor Interface Module

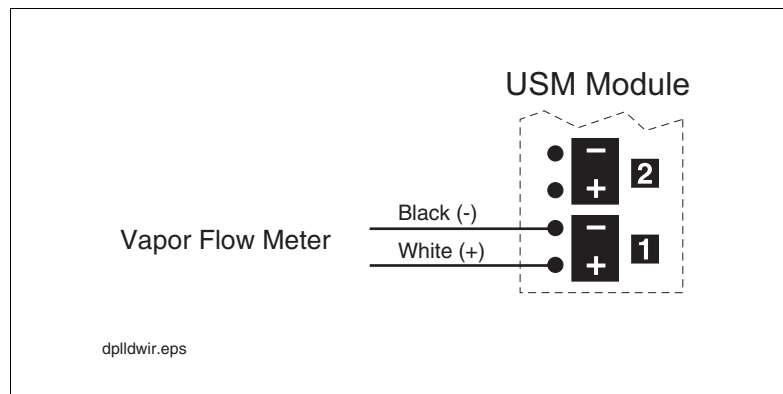
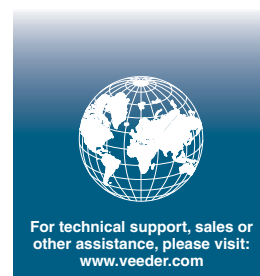


Figure 7. Connecting Vapor Flow Meter to TLS-450 USM Module



**NOTE!** For wireless configurations, see TLS RF System Control Drawing 331940-012.



# Pressure Sensor

## Installation Guide



# Notice

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Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication as approved by ARB.

This publication contains proprietary information which is protected by copyright. All rights reserved. No part of this publication may be modified or translated to another language without the prior written consent of Veeder-Root. Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

## **DAMAGE CLAIMS / LOST EQUIPMENT**

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

## **VEEDER-ROOT'S PREFERRED CARRIER**

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

## **CUSTOMER'S PREFERRED CARRIER**

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

## **RETURN SHIPPING**

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

## **INSTALLATION IN THE STATE OF CALIFORNIA**

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

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**Pressure Sensor Installation**

Contractor Certification Requirements ..... 1  
 Related Documents ..... 1  
 Safety Precautions ..... 2  
 Before You Begin ..... 3  
 Veeder-Root Parts ..... 3  
 Tools Required ..... 5  
 Under Dispenser Installation Steps ..... 5  
 Vapor Vent Stack Installation Step ..... 13

**Figures**

Figure 1. Table 2 Component Pictorial ..... 5  
 Figure 2. Example Pressure Sensor Install In Shear Valve Port - Preferred Non-ISD Installation (Without Vapor Flow Meter) ..... 7  
 Figure 3. Example Pressure Sensor Install In Vapor Return Line - Non-ISD Installation (Without Vapor Flow Meter) ..... 8  
 Figure 4. Example Pressure Sensor Install In Shear Valve Port - Preferred ISD Installation ..... 9  
 Figure 5. Example Pressure Sensor Install In Horizontal Access Fitting Or Vapor Return Line - ISD Installation (With Vapor Flow Meter Below Shear Valve) ..... 10  
 Figure 6. Example Pressure Sensor Install Below Vertical Access Fitting Or Vapor Return Line - ISD Installation (With Vapor Flow Meter Below Shear Valve) ..... 11  
 Figure 7. Field wiring Pressure Sensor - Observe Polarity ..... 12  
 Figure 8. Epoxy sealing field wiring ..... 12  
 Figure 9. Connecting Pressure Sensor to TLS-3XX Smart Sensor Interface Module ..... 13  
 Figure 10. Locating Pressure Sensor Enclosure in Vapor Vent Stack ..... 15  
 Figure 11. Mounting Pressure Sensor Assembly onto Composite Panel ..... 16

**Tables**

Table 1. Under Dispenser - Pressure Sensor Installation Kit (P/N 330020-515) ..... 3  
 Table 2. Vapor Vent Stack - Pressure Sensor Installation Kit (P/N 330020-630) ..... 4

## Pressure Sensor Installation

This manual contains instructions to install a Veeder-Root (In-Station Diagnostic) Pressure Sensor in a dispenser's vapor return line or in a vapor vent stack.

This manual assumes all preliminary site preparation is completed, and that wiring from the console to the Pressure Sensor junction box is in place and meets the requirements set out in the console's Site Prep manual.

### Contractor Certification Requirements

Veeder-Root Contractor Certification Requirements	Installer Certification <sup>6</sup>	ATG Technician Certification <sup>7</sup>	VR Vapor Products Certification <sup>8</sup>
Install <sup>1</sup> ISD	X	X	X
Install PMC	X	X	X
Install CCVP	X	X	X
Install Wireless ISD/PMC	X	X	X
Installation Checkout <sup>2</sup>		X	X
ATG Startup <sup>3</sup> / Training <sup>4</sup> / Service <sup>5</sup>		X	X
ISD Startup / Training / Service			X
PMC Startup / Training / Service			X
CCVP Startup / Training / Service			X
Wireless ISD/PMC Startup / Training / Service			X
Install Pressure Sensor (ATG)	X	X	X
Maintain Pressure Sensor (ATG)		X	X
Calibrate Pressure Sensor (ATG)		X	X
Clear ATG Pressure Sensor Alarm (ATG)		X	X
Clear ISD/PMC Alarms (ISD/PMC)			X
<sup>1</sup> Perform wiring and conduit routing; equipment mounting		<sup>6</sup> UST Monitoring Systems – Installer (Level 1)	
<sup>2</sup> Inspect wiring and conduit routing; equipment mounting		<sup>7</sup> Certified UST Monitoring Technician	
<sup>3</sup> Turn power on, program and test the systems		<sup>8</sup> VR Vapor Products	
<sup>4</sup> Provide supervised field experience in service techniques and operations			
<sup>5</sup> Troubleshoot and provide routing maintenance			








**Warranty Registrations** may only be submitted by selected Distributors. Certified installers are required to provide the GDF operator with the completed Equipment Warranty Notice, form 577013-868, for their records.

### Related Documents







- 576013-879 TLS-3XX Series Consoles Site Prep and Installation Manual
- 577013-800 ISD Setup and Operation Manual
- 577013-801 PMC Setup and Operation Manual
- 577013-937 In-Station Diagnostics (ISD) Install, Setup, & Operation Manual
- 331940-012 TLS-RF System Control Drawing
- 577013-964 TLS RF Wireless 2 System (W2) Installation and Maintenance Guide

## Safety Precautions

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

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

# ⚠ WARNING

        	<p><b>This product is to be installed and operated in the highly combustible environment of a gasoline dispenser where flammable liquids and explosive vapors may be present.</b></p> <p><b>FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.</b></p> <p><b>The following hazards exist:</b></p> <ol style="list-style-type: none"> <li><b>1. Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.</b></li> <li><b>2. Product leakage could cause severe environmental damage or explosion resulting in death, serious personal injury, property loss and equipment damage.</b></li> </ol> <p><b>Observe the following precautions:</b></p> <ol style="list-style-type: none"> <li><b>1. Read and follow all instructions in this manual, including all safety warnings.</b></li> <li><b>2. To be installed in accordance with the National Electrical Code (NFPA 70) and the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A).</b></li> <li><b>3. Before installing this device, turn Off, tag/lock out power to the system, including console and submersible pumps.</b></li> <li><b>4. To protect yourself and others from being struck by vehicles, block off your work area during installation or service.</b></li> <li><b>5. Substitution of components may impair intrinsic safety.</b></li> </ol>
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## Before You Begin

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- Comply with all recommended safety practices identified by OSHA (Occupational Safety and Health Administration) and your employer.
- Review and comply with all the safety warnings in the installation manuals and any other national, State or Local requirements.
- When direct wiring to a TLS console, a 2-conductor, 18 AWG shielded cable must be installed in intrinsically safe conduit from the dispenser or from the vapor vent stack to the TLS console.
- The Pressure Sensor must be installed in a VERTICAL position with the sensing port pointing down. Its connection in the base of the dispenser to the vapor return line must be made BELOW the vapor return line shear valve mechanism, AND BELOW the Vapor Flow Meter outlet (if a flow meter is installed).
- For all connections requiring sealant, use only UL classified yellow Gas/TFE Teflon tape.
- When installing on a vent stack, customer supplied pipe and pipe fittings shall be standard full-weight (ASTM Schedule 40) wrought iron or steel.
- Customer supplied copper tubing shall be soft tempered, 1/4-inch O.D., with a minimum wall thickness of 0.0265 inches.
- Pipe threads shall be in accordance with the Standard for Pipe Threads, General Purpose (Inch) ANSI/ASME B1.20.1-1983.

## Veeder-Root Parts

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Veeder-Root parts and kits required to install the Pressure Sensor are listed in Table 1 and Table 2.

**Table 1. Under Dispenser - Pressure Sensor Installation Kit (P/N 330020-515)**

Item	Qty.	Description	P/N
1	1	Pressure sensor	331946-001 or 861190-201
2	4	Male connector 68CA-4-4, brass 1/4" tube to 1/4" pipe	514100-430
3	1	Union 62CA-4, brass 1/4" tube size	514100-431
4	1	Plug 59CA-4, brass 1/4" tube size	514100-432
5	1	Universal sensor mounting kit - miscellaneous assortment of U-bolts, brackets, clamps, and fasteners	330020-012
6	2	Wire nut	576008-461
7	1	Sealing pack	514100-304
8	1	Cord grip	331028-011
9	2	Tie wrap	510901-337
10	1	Shim	332061-001
11	1	Ball Valve, 3-way, 1/4"	576008-649
12	1	Copper tube, soft, 1/4" OD, 36" length	332151-001

**Table 2. Vapor Vent Stack - Pressure Sensor Installation Kit (P/N 330020-630)**

Item	Qty.	Description	P/N
1	1	Pressure sensor	331946-001 or 861190-201
2	1	Enclosure, NEMA 4X- modified	333004-001
3	1	Panel, composite, modified	333005-001
4	2	Male elbow 169CA-4-4, brass 1/4" tube to 1/4" pipe	579066-001
5	2	Male connector 68CA-4-4, brass 1/4" tube to 1/4" pipe	514100-430
6	1	Plug 59CA-4, brass 1/4" tube size	514100-432
7	1	Bulkhead union 62CABH-4, brass 1/4" tube size	514100-476
8	2	Washer, 0.469 x 1.125 x 0.063", zinc	510904-573
9	1	Tube - copper, 1/4" OD, short S bend	333006-001
10	1	Tube - copper, 1/4" OD x 8" length	333018-001
11	1	Ball valve, 3-way, 1/4"	576008-649
12	1	Hub, conduit, liquid tight, 1/2", zinc	576010-715
13	3	Conduit clamp, 2", steel - std duty	514100-478
14	3	1/4-20 x 0 .75" hex bolt - steel	026-620-1
15	3	Washer, flat, 1/4", zinc	514100-374
16	3	1/4-20, hex nut w/lock washer	511000-251
17	1	Vent, porous, flanged, 0.17 x 0.42"	514100-477
18	2	Wire nut	576008-461
19	1	Sealing pack	514100-304
20	1	Cord grip	331028-011
21	2	Tie wrap	510901-337
22	1	Shim	332061-001
23	1	Manual, Installation VR Pressure Sensor	577013-797
24	1	Manual, ISD Setup & Operation	577013-800
25	1	Manual, PMC Setup & Operation	577013-801
26	1	ISD Quick Reference Guide	577013-842
27	1	Warranty card, ISD system	577013-868
28	1	Manual, ISD Setup & Operation, VST	577013-937
29	2	Conduit clamp, 3", steel, std duty	514100-482
30	1	Label - eVRgreen	333041-001

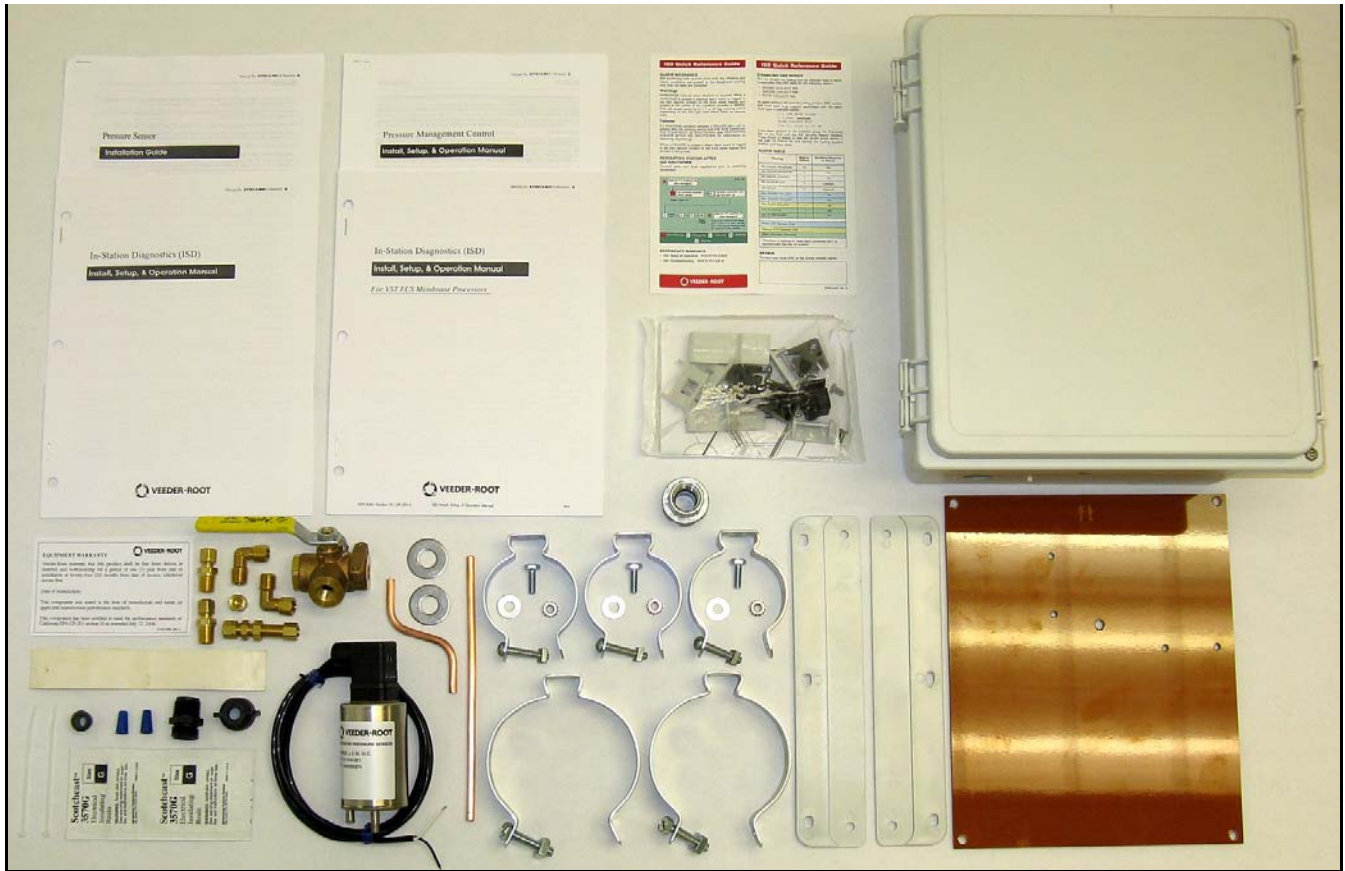


Figure 1. Table 2 Component Pictorial

## Tools Required

1. Wrenches suitable for tightening tubing/pipe fittings.
2. Necessary pipe fitter’s equipment (including threading equipment as needed) and a non-hazardous work space suitable to modify the dispenser vapor line or the vapor vent stack for Pressure Sensor installation.
3. Torx bit for tamper-resistant screws (VR P/N 330020-635).

**NOTE: this bit is required to open and close the enclosure door.**

## Under Dispenser Installation Steps



1. Before installing this device, turn Off, tag/lock out power to the system, including console and submersible pumps.
2. Determine which dispenser is closest to the tank being monitored. Remove that dispenser’s lower sheet metal doors to gain access to the vapor plumbing.
3. Refer to Pressure Sensor dispenser installation examples in Figure 2 through Figure 6 to locate a suitable port or plumb a suitable fitting for the Pressure Sensor tubing in either the vapor return shear valve or in the

vapor return line. **NOTE: In ISD installations, the pressure port used must be below the vapor flow meter outlet.**

4. Install one of the 68CA-4-4 male connectors (item 2 in Table 1) from the kit into the tapped hole.
5. Install Pressure Sensor (item 1 in Table 1) vertically to the dispenser frame or piping using the 2-inch conduit clamp, rubber shim, and necessary bolts, nuts, and washers from the included Universal Sensor Mounting kit. Wrap the rubber shim (item 10 in Table 1) around the sensor before inserting it into the clamp. Also make sure the sensor cable outlet is facing up and the pressure sensing port tube in the base of the sensor is facing down.
6. Attach one end of the 62CA-4 union (item 3 in Table 1) to the pressure sensing port in the base of the Pressure Sensor.
7. Install the remaining 68CA-4-4 male connectors (item 2 in Table 1) from the kit into each of the three ports in the 3-way calibration valve (item 13 in Table 1).
8. Measure, fabricate, and install a 1/4" OD copper tube (item 12 in Table 1) that runs between the 62CA-4 union in the base of the sensor and the center port of the 3-way calibration valve.
9. Measure, fabricate, and install a 1/4" OD copper tube that runs between the 1/4" tube end of the male connector fitting installed beneath the shear valve mechanism and the right port on the 3-way valve, being careful not to create any potential liquid traps (Note 3-way valve orientation in Figure 6).
10. Screw the 59CA-4 plug, item 4, from the kit onto the left port's male connector. Make sure the valve's handle is set to connect the sensor to the vapor return line and not to the capped (ambient) port.

**Important!** All plumbing's pitch to drain should be 1/4" vertical per 12" horizontal to eliminate liquid traps.

11. Route the cable from Pressure Sensor to the Pressure Sensor junction box in the dispenser. Observing polarity, connect the sensor wiring to the field wiring from console and cap with wire nuts (see Figure 7) - OR - terminate the wiring in the TLS RF transmitter (W2). In wireless installations, the wiring is not sealed and does not run back to the TLS console and Steps 12, 13 and 14 ARE NOT REQUIRED.
12. Seal wire nuts in epoxy sealant following the instructions in Figure 8.
13. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.
14. Terminate field wiring into TLS Console and connect to Smart Sensor Module (TLS-3XX - Figure 9). Note: observe polarity! The cable length between the console and sensor must not exceed the distance stated in the TLS-3XX Site Prep manual (P/N 576013-879).

Note: Intrinsically safe devices must be installed in accordance with Article 504 of the National Electrical Code, ANSI/NFPA 70, for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.

This intrinsically safe Pressure Sensor P/N 331946-001, has only been evaluated for connection to a UL listed TLS-3XX Liquid Level Gauge / Leak Detector.

Conductors of different intrinsically safe circuits run in the same cable/conduit must have at least 0.01 inch (0.25 mm) of insulation.

15. After the Pressure Sensor is installed, pressurize the tank ullage space and vapor piping to at least 2 inches WC and test for leaks using leak detection solution.
16. Replace lower dispenser sheet metal doors onto dispensers.

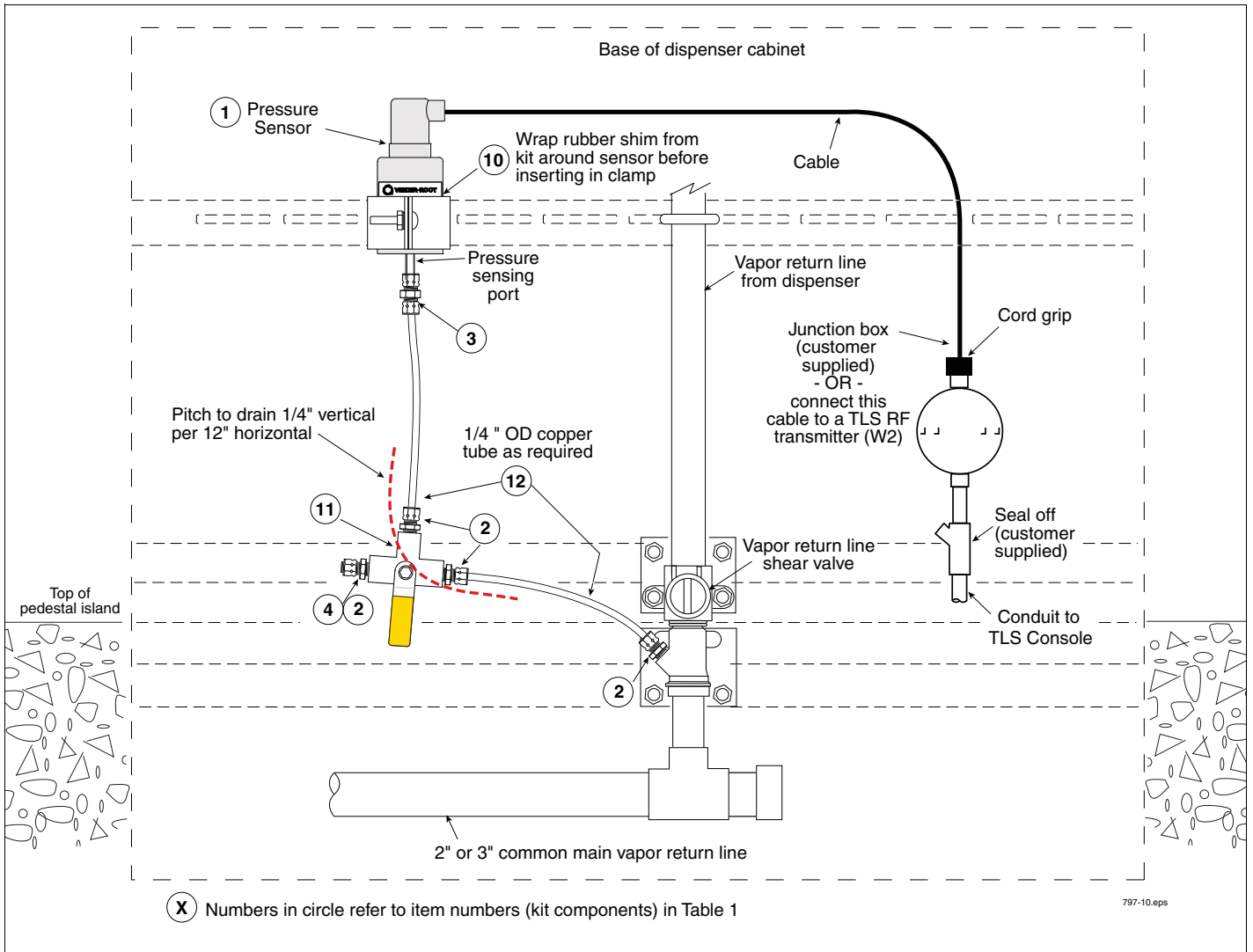


Figure 2. Example Pressure Sensor Install In Shear Valve Port - Preferred Non-ISD Installation (Without Vapor Flow Meter)



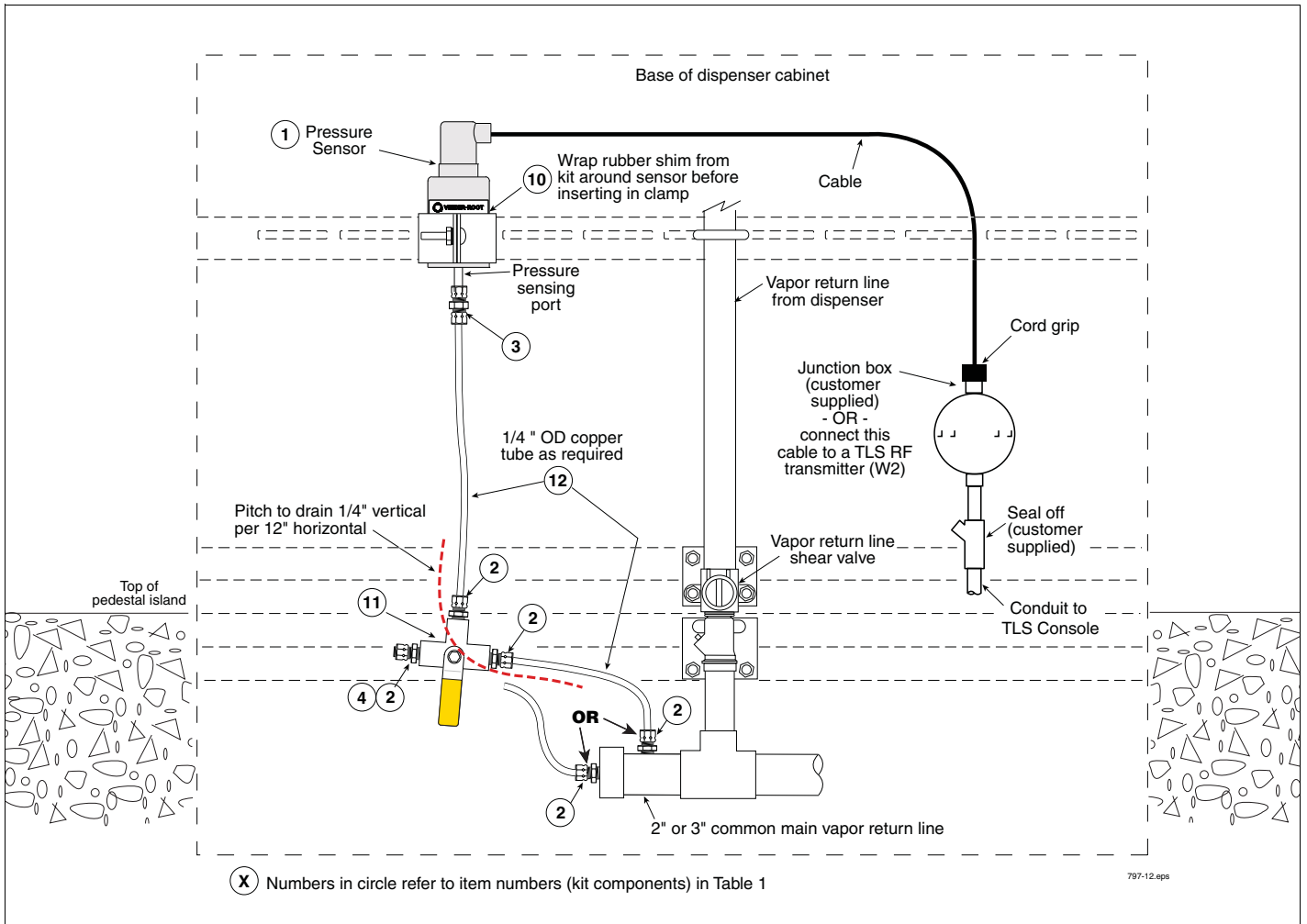


Figure 3. Example Pressure Sensor Install In Vapor Return Line - Non-ISD Installation (Without Vapor Flow Meter)

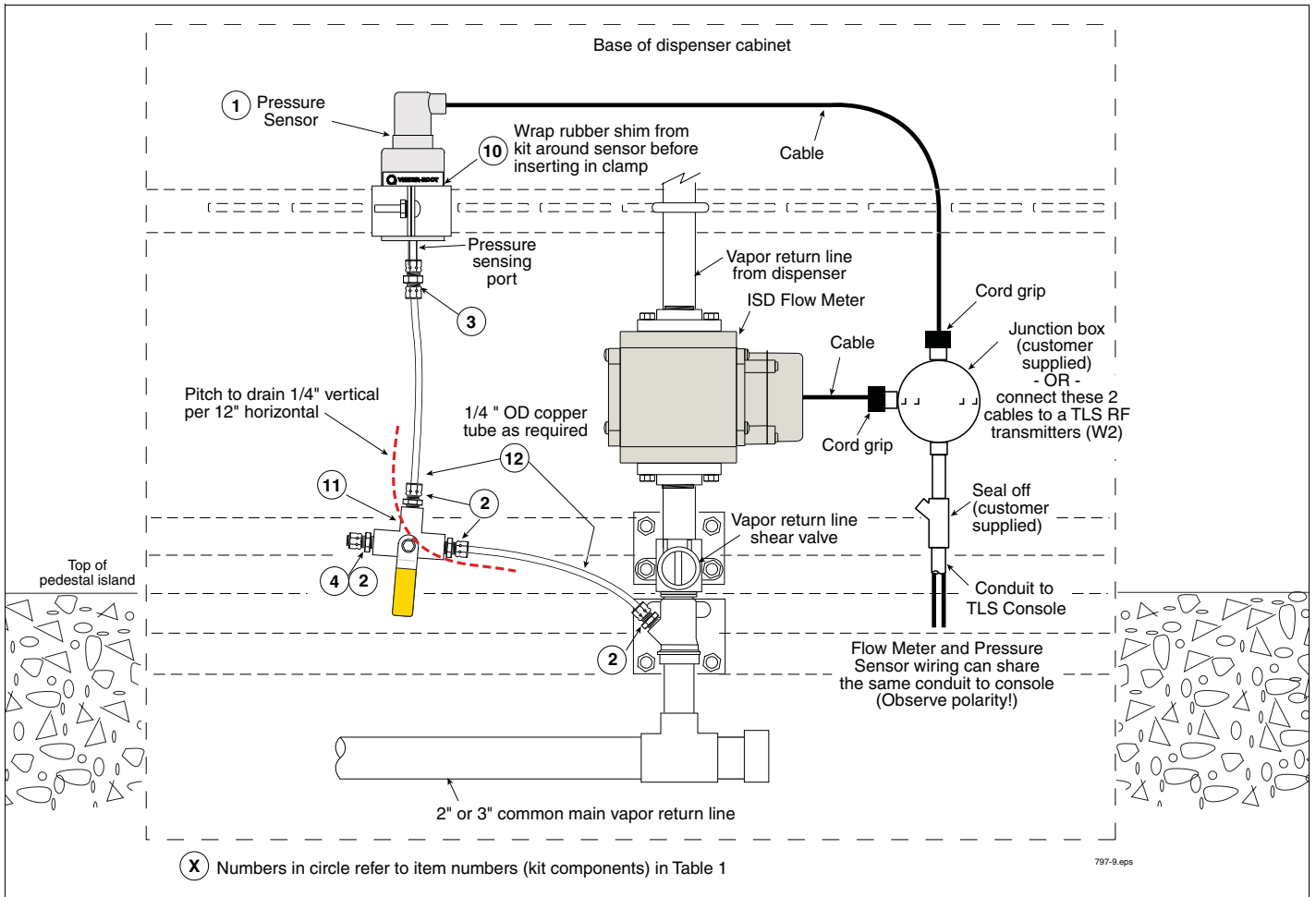


Figure 4. Example Pressure Sensor Install In Shear Valve Port - Preferred ISD Installation (With Vapor Flow Meter Above Shear Valve)

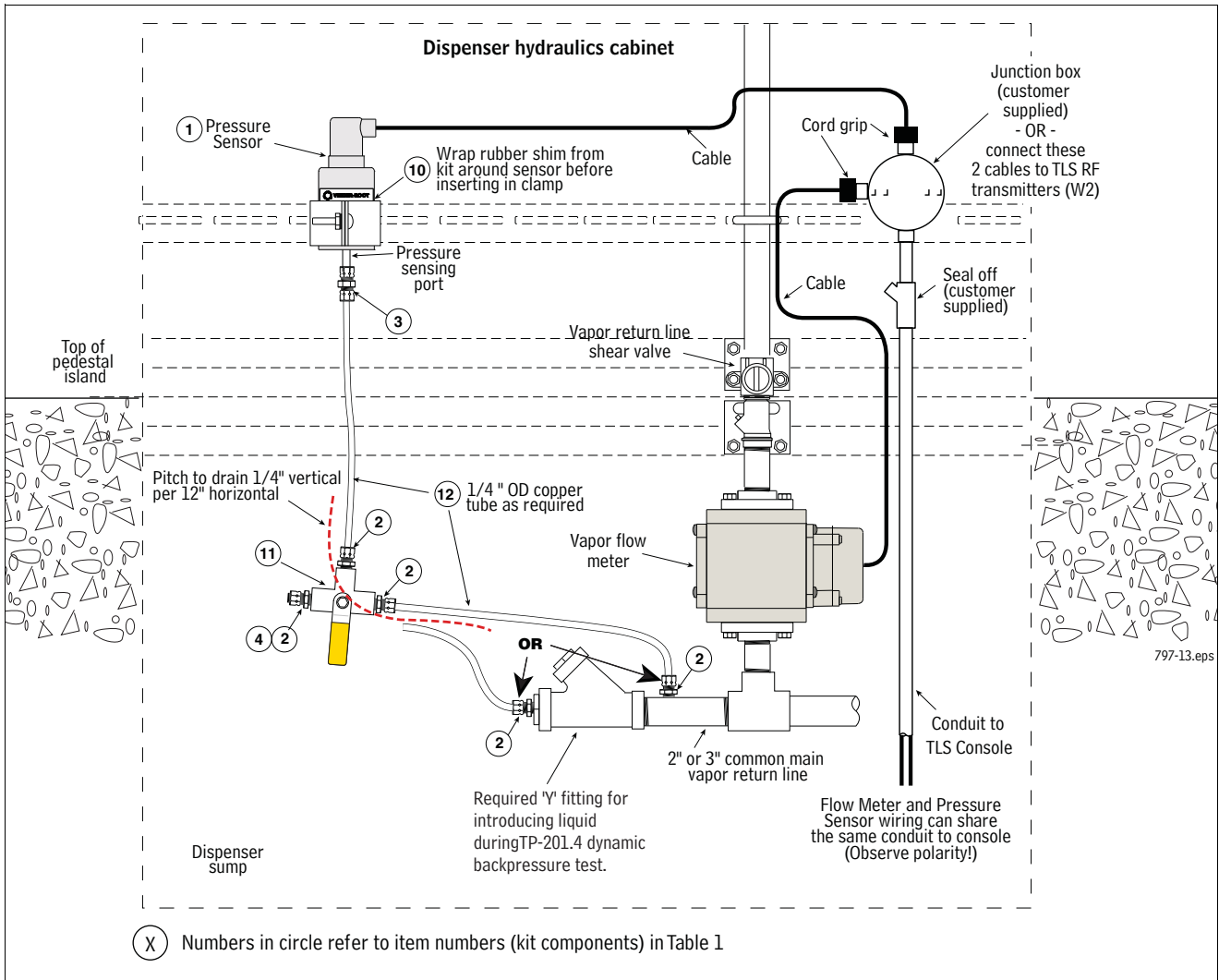


Figure 5. Example Pressure Sensor Install In Horizontal Access Fitting Or Vapor Return Line - ISD Installation (With Vapor Flow Meter Below Shear Valve)

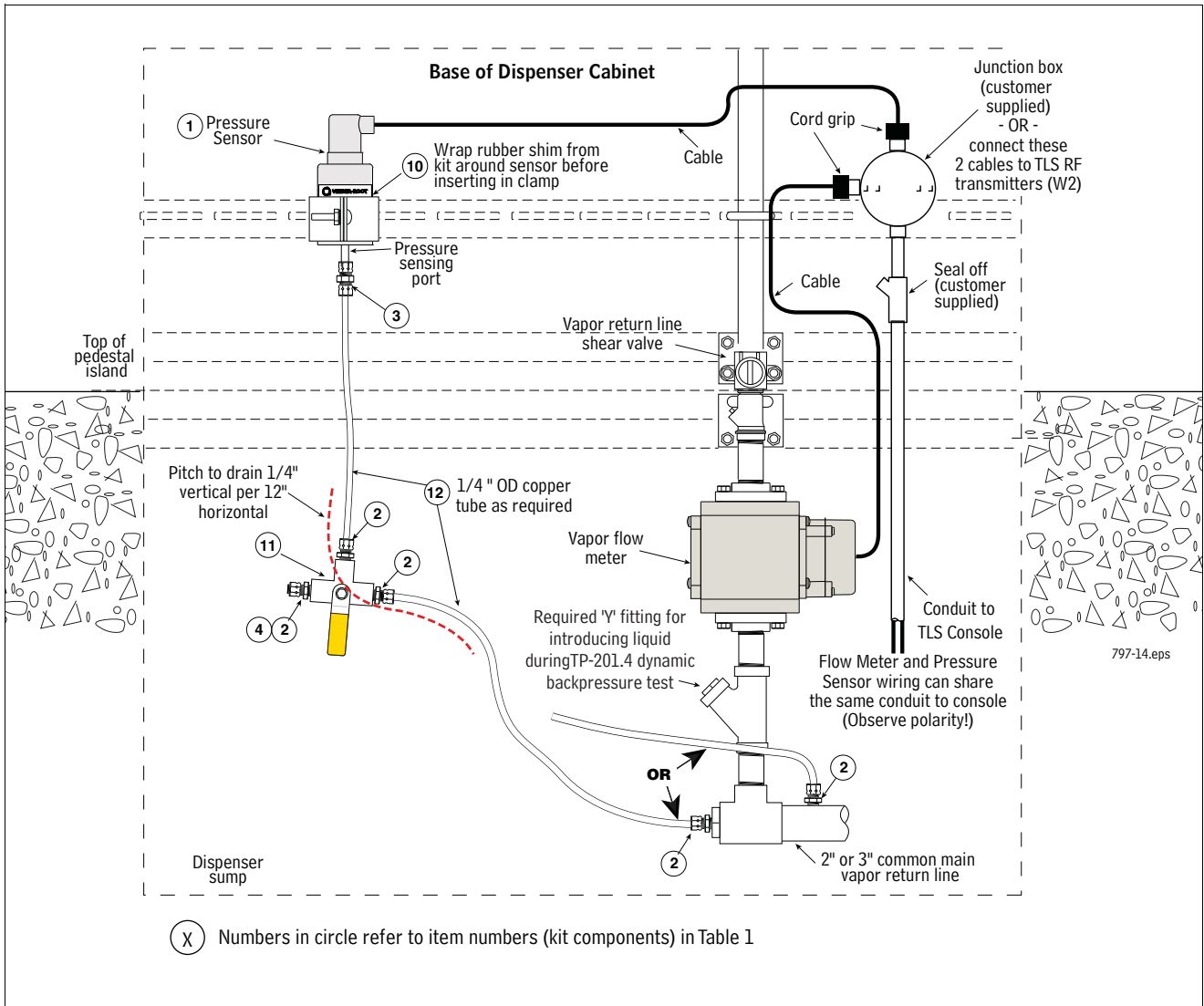


Figure 6. Example Pressure Sensor Install Below Vertical Access Fitting Or Vapor Return Line - ISD Installation (With Vapor Flow Meter Below Shear Valve)

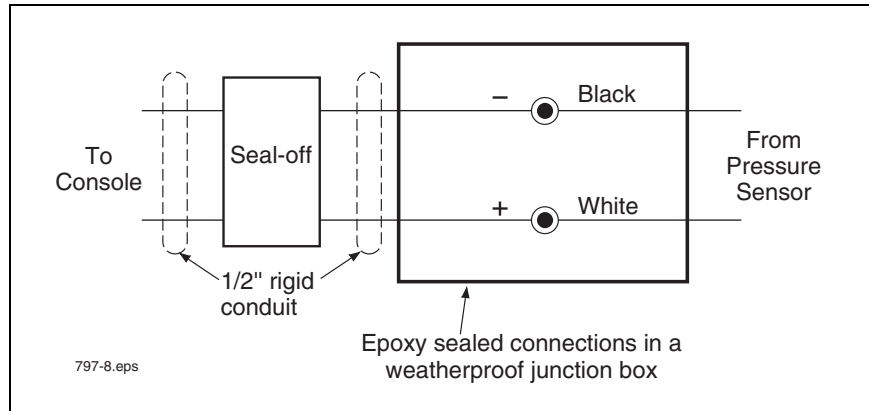


Figure 7. Field wiring Pressure Sensor - Observe Polarity

797-6.eps

**Instructions:**

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.
4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.

**CAUTION:** Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxy-carboxylate.

**Precautions:** Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

NOTE: Not required for wireless installations!

Figure 8. Epoxy sealing field wiring

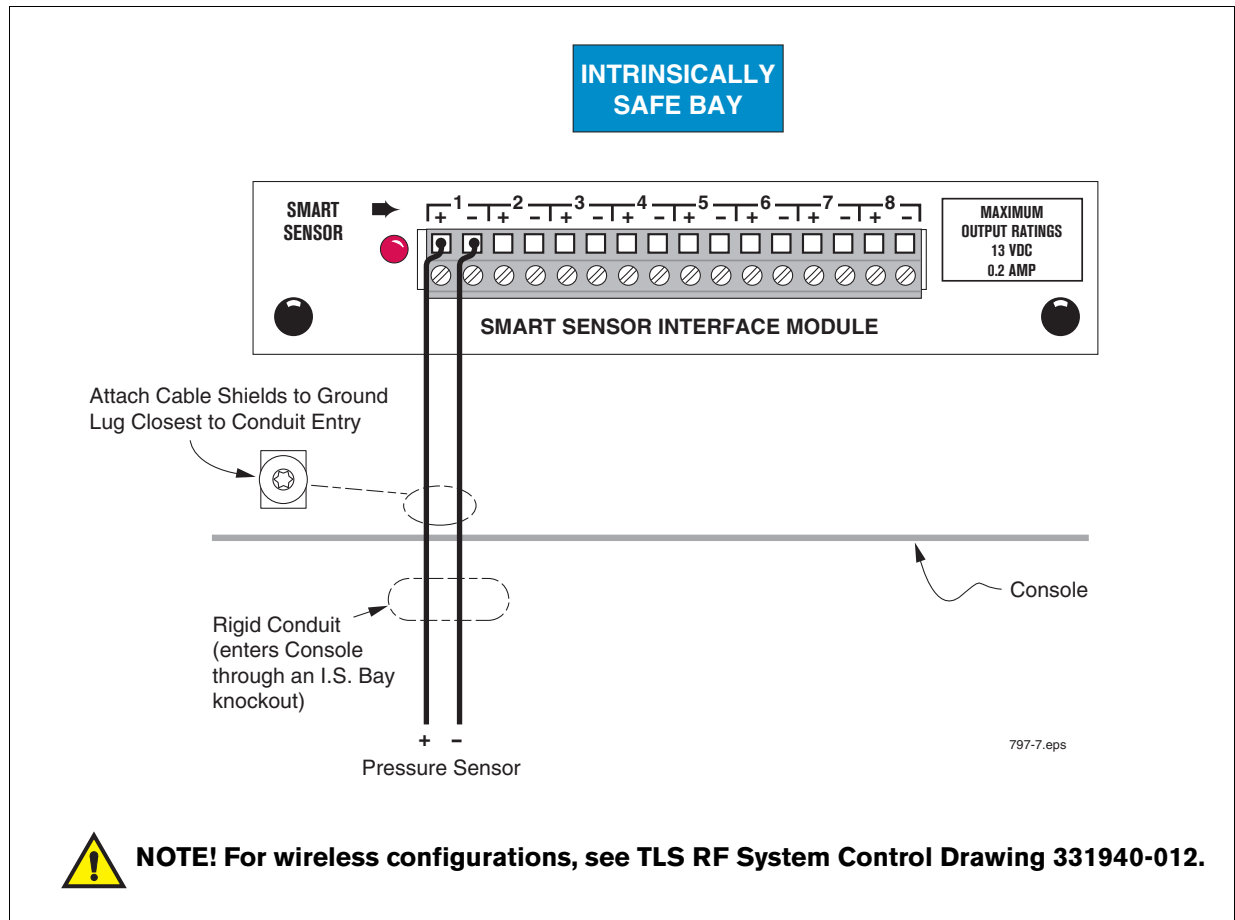


Figure 9. Connecting Pressure Sensor to TLS-3XX Smart Sensor Interface Module

## Vapor Vent Stack Installation Step

1. Before installing this device, perform all required safety procedures to gain access inside the vapor vent stack.
2. Determine which vapor vent stack line is closest to the tank being monitored. Select this line for the addition of the pressure sensor.

**CAUTION: Installation of the pressure sensor on the vapor vent stack is only allowed at facilities equipped with a “Veeder-Root Vapor Polisher” or “Franklin Fueling System Healy Clean Air Separator.”**

3. Locate a suitable port in an existing Schedule 40 piping fitting (tee, cross, etc.) or plumb a suitable Schedule 40 pipe fitting (tee, cross, etc.) into the vapor vent stack line (maximum length of copper tubing limited by dimension in Figure 10).
4. Install the pressure sensor (item 1 in Table 2) vertically onto the center of the composite panel (item 3 in Table 2) using a 2-inch conduit clamp, rubber shim, and necessary bolts, nuts, and washers included in the kit. Be sure the top symbol on the panel is facing upwards (see Figure 11). Wrap the rubber shim (item 22 in Table 2) around the sensor before inserting it into the clamp. Also make sure the sensor cable outlet is facing up

and the pressure sensing port tube in the base of the sensor is facing down. Locate the pressure sensor in the clamp, but leave the conduit clamp screw somewhat loose for later sensor height adjustment.

5. Install two 169CA-4-4 male elbows (item 4 in Table 2) into each end of the 3-way calibration valve (item 11 in Table 2) as shown (see Figure 11).
6. Install one 68CA-4-4 male connector (item 5 in Table 2) into the center port of the 3-way calibration valve, and then directly attach it to the pressure sensor inlet port (see Figure 7).
7. Screw the 59CA-4 plug (item 6 in Table 2) onto the left port's male elbow (see Figure 11).
8. Install the two plastic enclosure mounting plates to the back of the enclosure. Use the four short flat-head screws included in the enclosure hardware bag.
9. Install the composite panel into the enclosure (item 2 in Table 2) such that the sensor cable outlet is facing up and the pressure sensing port tube in the base of the sensor is facing down. The top symbol on the panel should be facing upward. Use the four short screws included in the enclosure hardware bag.
10. Make sure that the white flanged porous vent (factory installed - item 17 in Table 2) is still securely installed into the hole in the bottom of the enclosure (see Figure 11).
11. Insert the S-bend 1/4" OD copper tube (item 9 in Table 2) into the right-side male elbow of the 3-way calibration valve, but do not fully tighten the compression nut (see Figure 11).
12. Locate the 62CABH-4 bulkhead union (item 7 in Table 2) and remove the compression nut and the adjustable nut then place a large washer (item 8 in Table 2) against the fixed, integral body nut. Slide the compression nut that was removed onto the bottom portion of the S-bend tube.
13. Partially insert the bulkhead union into the bottom center hole in the enclosure. Slide a large washer over the body, and thread the adjustable nut back onto the body.
14. Insert the bottom portion of the S-bend tube into the bulkhead union and fully tighten the bulkhead union adjustable nut against the large washer and enclosure wall. Adjust the pressure sensor vertically in the shim / conduit clamp to make sure the S-bend tube is fully inserted into the union and male elbow.
15. Fully tighten the compression nuts to connect the S-bend tube to the union and to the male elbow. Tighten the sensor conduit clamp screw to secure the sensor in its final vertical position (see Figure 11).
16. Mount the plastic enclosure onto the vapor vent stack or suitable rigid structure ABOVE the vapor vent stack port using two conduit clamps (for 2" or 3" pipe), bolts, nuts, and washers included, or use other customer supplied suitable mounting hardware (Example: Unistrut®). Leave the mounting hardware somewhat loose for later enclosure height adjustment (see Figure 10).
17. Measure, fabricate, and install customer supplied pipe and pipe fittings between the vapor vent stack port and within a few inches of the bulkhead union in the bottom of the enclosure.
18. Install one 68CA-4-4 male connector (item 5 in Table 2) onto the top of the new pipe (see View A-A, Figure 10).
19. Measure, fabricate, and install 1/4" OD copper tubing (item 10 in Table 2) between the bulkhead union and the male connector. Adjust the enclosure vertically on vent pipe to make sure the copper tube is fully inserted into the bulk head union and male connector.
20. Fully tighten the compression nuts to secure the fabricated tube to the bulkhead union and to the male connector. Tighten the enclosure mounting hardware to secure the enclosure in its final vertical position.

Note: **Important!** All plumbing's pitch to drain should be 1/4" vertical per 12" horizontal to eliminate any potential liquid traps.

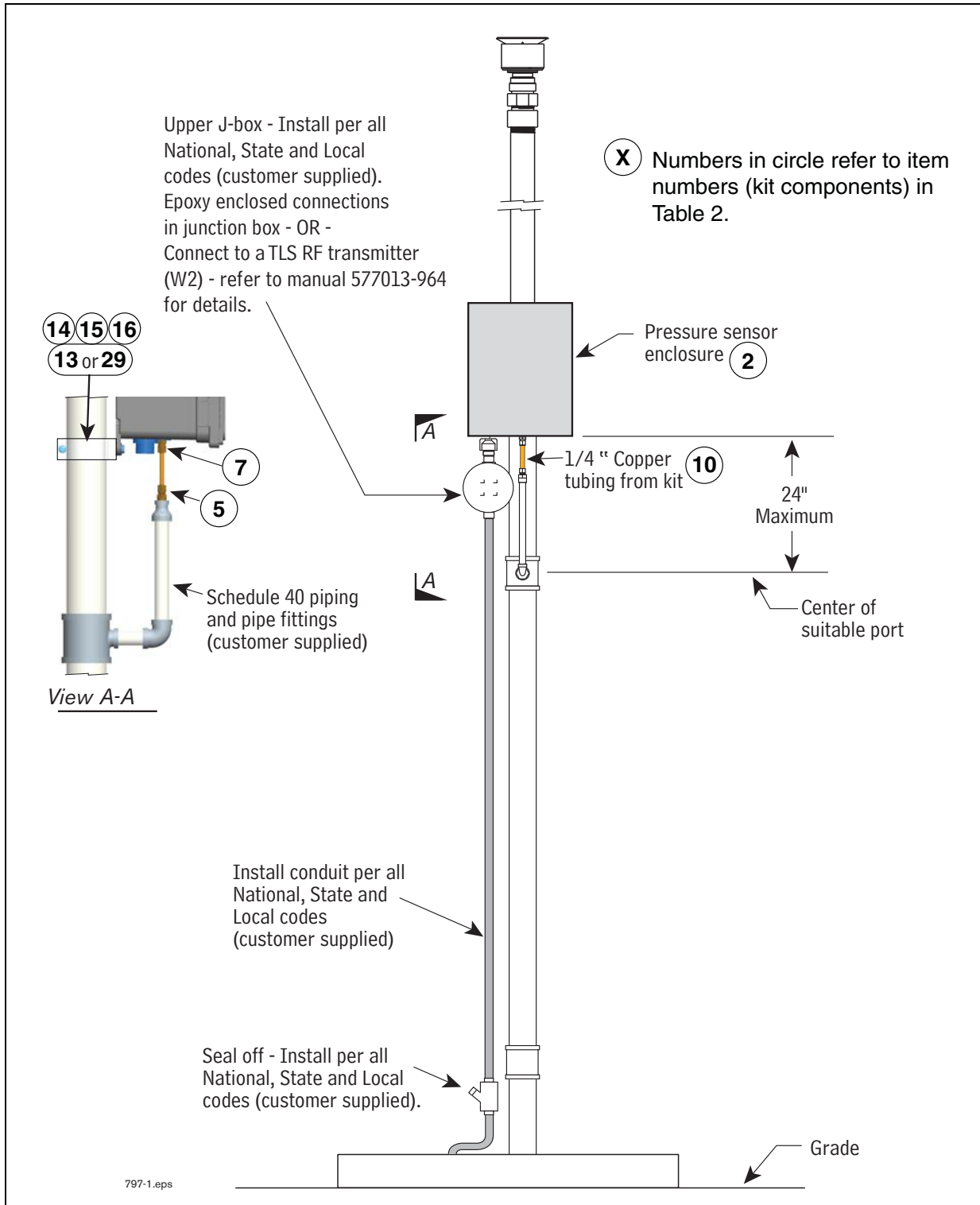


Figure 10. Locating Pressure Sensor Enclosure in Vapor Vent Stack



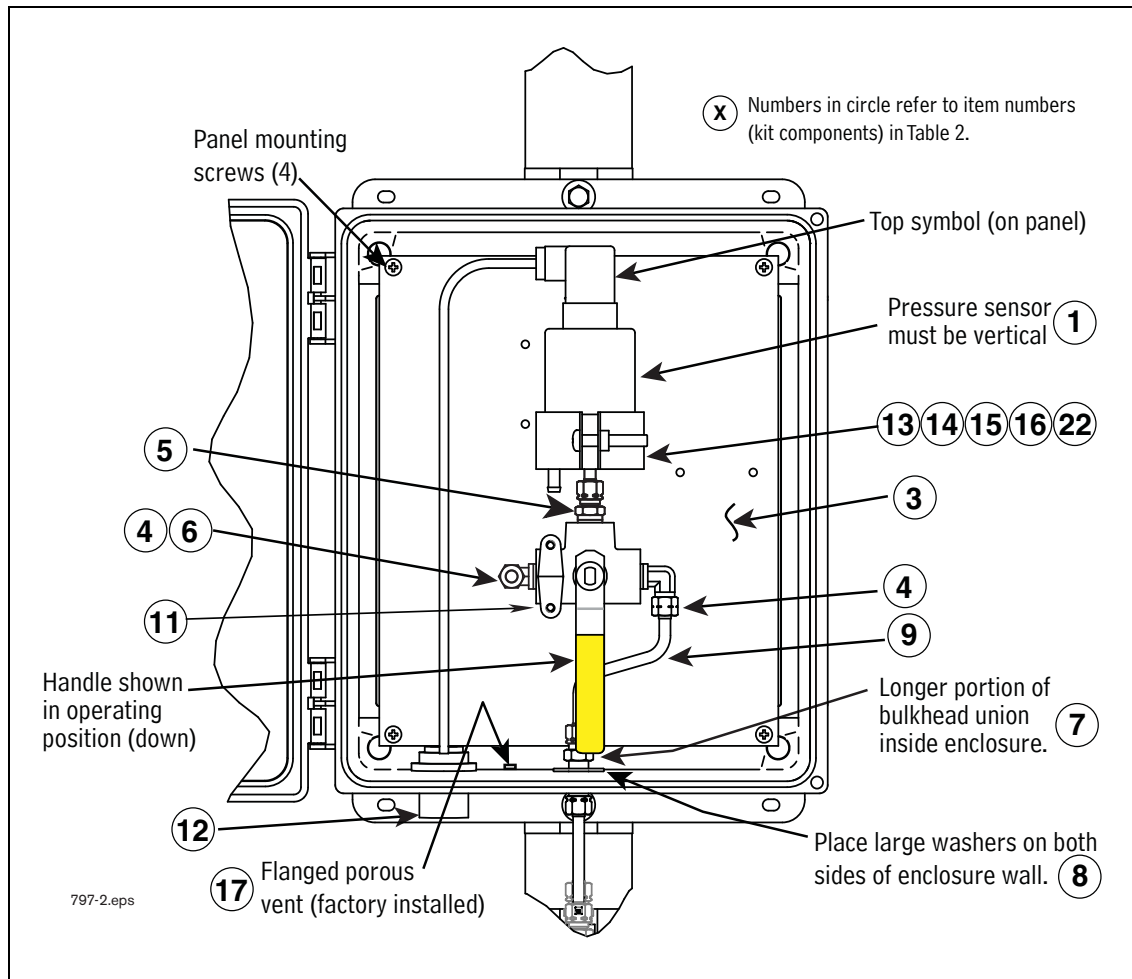


Figure 11. Mounting Pressure Sensor Assembly onto Composite Panel

21. Make sure the valve's handle is set to connect the sensor to the vapor vent stack and not to the capped (ambient) port.
22. Install two tamper-resistant screws from the enclosure hardware bag into the two holes on the enclosure door (if not already installed) using a Torx bit for tamper-resistant screws. Discard any remaining items in the enclosure hardware bag.
23. When direct wiring to a TLS console, install 1/2" electrical conduit from the conduit hub in the bottom of the enclosure to the customer supplied weather-proof junction box (see Figure 10). For wireless installations, using the TLS RF, Steps 23 - 27 are not required.
24. Route the cable from the pressure sensor to the junction box under the enclosure. Observing polarity, connect the sensor wiring to the field wiring from console and cap with wire nuts (see Figure 10).
25. Seal wire nuts in epoxy sealant following the instructions in Figure 8.
26. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.

27. Terminate field wiring into TLS Console and connect to Smart Sensor Module (TLS console - Figure 9). Note: observe polarity! The cable length between the console and sensor must not exceed the distance stated in the TLS-3XX Site Prep manual (P/N 576013-879).

Note: Intrinsically safe devices must be installed in accordance with Article 504 of the National Electrical Code, ANSI/NFPA 70, for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.

This intrinsically safe Pressure Sensor (P/N 331946-001), has only been evaluated for connection to a UL listed TLS-3XX Liquid Level Gauge / Leak Detector.

Conductors of different intrinsically safe circuits run in the same cable/conduit must have at least 0.01 inch (0.25 mm) of insulation.

28. After the Pressure Sensor is installed, pressurize the tank ullage space and vapor piping to at least 2 inches WC and test for leaks using leak detection solution.
29. Close the enclosure door and secure by threading the tamper-resistant screws into the enclosure body using a Torx bit for tamper-resistant screws.
30. Affix the eVRgreen label (item 30 in Table 2) to the enclosure door as desired.



# TLS RF Wireless 2 System (W2)

## Installation and Maintenance Guide



# Notice

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Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication as approved by ARB.

This publication contains proprietary information which is protected by copyright. All rights reserved. No part of this publication may be modified or translated to another language without the prior written consent of Veeder-Root.

Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

## **DAMAGE CLAIMS / LOST EQUIPMENT**

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

## **VEEDER-ROOT'S PREFERRED CARRIER**

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

## **CUSTOMER'S PREFERRED CARRIER**

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

## **FCC INFORMATION**

This equipment complies with the requirements in Part 15 of the FCC rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference.

## **RETURN SHIPPING**

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

## **FOR INSTALLATIONS IN THE STATE OF CALIFORNIA**

Please refer to the California Air Resources Board Vapor Recovery Certification Phase II EVR Executive Order web site ([www.arb.ca.gov/vapor/eo-evrphaseII.htm](http://www.arb.ca.gov/vapor/eo-evrphaseII.htm)) for the latest manual revisions pertaining to Executive Order VR202 (Healy Phase II EVR System Including ISD System), VR 203 (VST Phase II EVR System) and VR 204 (VST Phase II EVR System Including ISD System).

<b>Introduction</b>	
Procedures Contained Within This Manual .....	2
Contractor Certification Requirements .....	2
RF Transmitter Considerations .....	2
Related Documents .....	3
Product Marking Information .....	3
Related Documents .....	3
Safety Warnings .....	5
Safety Symbols .....	5
General Precautions .....	6
General Precautions.....	6
Special Tools Required .....	6
National Electrical Code Compliance .....	6
TLS RF-To-TLS Console Wiring.....	6
TLS RF AC Power Wiring.....	7
TLS RF Wireless System Site Layout .....	8
<b>Equipment Dimensions.....</b>	<b>9</b>
<b>Pre-Installation Component Setup and Functional Check .....</b>	<b>11</b>
<b>TLS RF Installation</b>	
Selecting A Location .....	14
Mounting the TLS RF .....	14
Wiring the TLS RF .....	14
<b>ISD Component Installation</b>	
Vapor Flow Meter Installation - Dispenser .....	22
Vapor Return Pressure Sensor Installation .....	24
Vent Stack Installation Example .....	24
Connecting Cables To The Transmitter .....	27
Receiver Installation .....	29
Repeater Installation .....	32
<b>Network Setup</b>	
Hardware Overview .....	34
Identifying Devices in the TLS RF Wireless Site Network .....	35
Entering Device Numbers for the Site Network .....	35
Transmitter Device Number.....	35
TLS RF Device Number .....	36
Entering the Site ID Number .....	36
Site Startup Procedure .....	37
Initial TLS Console Setup Procedure .....	37
<b>Diagnostics</b>	
Alarms .....	38
Battery Diagnostics .....	38
Wireless Sensor Diagnostic Menu (TLS-350 Consoles) .....	38
<b>Appendix A: Regulatory Information</b>	
Federal Communications Commission Notice .....	1
MODIFICATIONS.....	1
CABLES .....	1
Canadian Notice .....	2

AVIS CANADIEN .....	2
Battery Warning .....	2
Wireless Notices .....	2
U.S. Regulatory Wireless Notice .....	2
Canadian Regulatory Wireless Notice .....	2
System Specifications .....	2

**Appendix B: Device DIP Switch Settings**

TLS RF Number Settings .....	1
Transmitter/Receiver/Repeater DIP Switch Settings .....	2

**Appendix C: Lithium Battery Safety Data**

Lithium Battery Disposal Considerations .....	1
---	---

**Figures**

Figure 1. Example TLS RF Wireless System Site Layout .....	8
Figure 2. TLS RF Dimensions And Designated Conduit Knockouts .....	9
Figure 3. Wireless Component Dimensions .....	10
Figure 4. Connecting Wiring To Device Terminal Blocks .....	11
Figure 5. Wiring The Battery Cable To The Transmitter.....	12
Figure 6. Wiring AC Power To The TLS RF .....	15
Figure 7. Wiring Receiver To The TLS RF .....	16
Figure 8. Connecting RS-485 Wiring.....	17
Figure 9. Power Connections To A Daisy Chained TLS RFs .....	18
Figure 10. RS-485 Cable Connections When Daisy Chaining Two TLS RFs .....	19
Figure 11. Wiring Data Outputs from TLS RF to TLS Console.....	20
Figure 12. TLS RF Diagnostic LEDs And Switch Locations .....	21
Figure 13. Attaching Transmitter To Battery Support Bracket.....	22
Figure 14. Example VFM Transmitter Installation In Dispenser .....	23
Figure 15. VRPS Mounted In Universal Enclosure On The Vent Stack .....	25
Figure 16. Example VRPS Transmitter/battery Pack Installation In The Universal Enclosure .....	26
Figure 17. Connecting Input Wiring To Transmitter Terminal Blocks .....	27
Figure 18. Wiring The Transmitter.....	28
Figure 19. Attaching Mounting Bracket To Receiver Or Repeater .....	30
Figure 20. Wiring The Receiver.....	31
Figure 21. Wiring The Repeater .....	33
Figure 22. Example Site Network Diagram .....	34
Figure 23. Device Battery Status In TLS-350 SmartSensor Diagnostic Menu .....	39
Figure B-1. TLS-RF switch settings .....	1
Figure B-2. DIP switch settings .....	2
Figure B-3. S1: DIP switch positions 1-3 — (W2) All Devices .....	3
Figure B-4. S1: DIP switch positions 4-8 — (W2) All Devices .....	3
Figure B-5. S2: DIP switch positions 1-4 — (W2) Vapor Flow Meter.....	4
Figure B-6. S2: DIP switch positions 5-8 — (W2) All Devices .....	4

**Tables**

Table 1. Wireless 2 Devices Per TLS Console .....	1
Table 2. Wireless Component Kit Numbers .....	1

## Introduction

This manual describes site preparation and installation procedures for the Veeder-Root TLS RF Wireless 2 System (W2) for Vapor Recovery monitoring. The TLS RF Wireless 2 System (W2) features two-way communication utilizing a client/server architecture resulting in improved data collection.

Veeder-Root strongly recommends the use of hard wiring for connecting Veeder-Root sensors to the TLS Console. Wired connections provide a robust communication link that is far superior to wireless networks.

A wide variety of devices can be integrated into the TLS RF Wireless 2 System (W2) network depending on the console(s) installed as shown in Table 1. Wireless component kit part numbers are shown in Table 2.

**Table 1. Wireless 2 Devices Per TLS Console**

Consoles	Wireless Device	Total Number of Wireless Devices per TLS console
	Vapor Flow Meter	
8470 TLS-350 Console		32
8482 TLS-350R Console	Up to 32	32

**Table 2. Wireless Component Kit Numbers**

V-R Kit Order Number	V-R Component Number					
	RF Console 332242-002	Transmitter 332235-016	Repeater 332440-030	Receiver 332440-029	Battery Pack 332425-011	Enclosure 330020-716
858090-203	X		X	X		
858090-204	X		X	X		
858090-205		X			X	
330020-716						X
330020-668	X					
330020-674		X				
330020-670			X			
330020-669				X		
330020-718					X	



## Procedures Contained Within This Manual

- Mounting the TLS RF and connecting power wiring.
- Installing Receiver, Repeater and Transmitters.
- Connecting the TLS RF to the TLS console.

After installing the TLS RF Wireless System devices, you must configure the sensors in the console following instructions contained in the TLS Console's System Setup Manual.

## Contractor Certification Requirements

Veeder-Root Contractor Certification Requirements	Installer Certification <sup>6</sup>	ATG Technician Certification <sup>7</sup>	VR Vapor Products Certification <sup>8</sup>
Install <sup>1</sup> ISD	X	X	X
Install PMC	X	X	X
Install CCVP	X	X	X
Install Wireless ISD/PMC	X	X	X
Installation Checkout <sup>2</sup>		X	X
ATG Startup <sup>3</sup> / Training <sup>4</sup> / Service <sup>5</sup>		X	X
ISD Startup / Training / Service			X
PMC Startup / Training / Service			X
CCVP Startup / Training / Service			X
Wireless ISD/PMC Startup / Training / Service			X
Install Pressure Sensor (ATG)	X	X	X
Maintain Pressure Sensor (ATG)		X	X
Calibrate Pressure Sensor (ATG)		X	X
Clear ATG Pressure Sensor Alarm (ATG)		X	X
Clear ISD/PMC Alarms (ISD/PMC)			X
<sup>1</sup> Perform wiring and conduit routing; equipment mounting		<sup>6</sup> UST Monitoring Systems – Installer (Level 1)	
<sup>2</sup> Inspect wiring and conduit routing; equipment mounting		<sup>7</sup> Certified UST Monitoring Technician	
<sup>3</sup> Turn power on, program and test the systems		<sup>8</sup> VR Vapor Products	
<sup>4</sup> Provide supervised field experience in service techniques and operations			
<sup>5</sup> Troubleshoot and provide routing maintenance			

**Warranty Registrations** may only be submitted by selected Distributors. Certified installers are required to provide the GDF operator with the completed Equipment Warranty Notice, form 577013-868, for their records.

## RF Transmitter Considerations

Installation of this equipment in wet or below grade locations requires that the installer take steps to ensure that the equipment is mounted above the maximum water level.



**CAUTION! – The Transmitter will not function properly in water. Also, submersion of the Transmitter in water can cause permanent damage to the internal electronics.**

**Wireless 2 devices will not function properly if certain conditions arise such as, but not limited to, the following:**

- **Ambient Interference – Due to site layout or vehicles parked in the RF transmission path. For example, CSLD will not function if the transmission path is blocked for more than a few minutes.**
- **Improper equipment installation – Keep objects from improperly coming in contact with the antenna. Follow these installation instructions and mount the transmitter in a fixed position to**

**ensure maximum RF connectivity. Antenna orientation is significant in achieving an optimal transmission path.**

- **Equipment Sump Parameters – Sumps intended for use with RF equipment must accommodate the worst case rainfall condition that could reasonably occur. The RF Transmitter and antenna are weatherproof but will not function properly underwater.**

TLS System performance will be degraded should any of the above conditions occur and is not covered under the Veeder-Root Product Warranty. Corrective actions to such conditions are the responsibility of the station-site owner. Veeder-Root is not liable for any event that is a result of an improper installation or use of this equipment.

It is important that installers have knowledge of all relevant procedures before installing a wireless system. Read and understand all manuals thoroughly. If you do not understand a procedure, contact a certified contractor or contact Veeder-Root. Each TLS Console has its own setup and installation manuals.

## Related Documents

IOM 13 VR-203 and VR-204 or IOM 18 VR-202  
IOM 15 VR-204  
576013-623  
331940-012

Vapor Pressure Sensor Installation Guide  
ISD Balance Flow Meter Installation Guide  
TLS-3XX System Setup Manual  
TLS RF System Control Drawing

## Product Marking Information

### RELATED DOCUMENTS

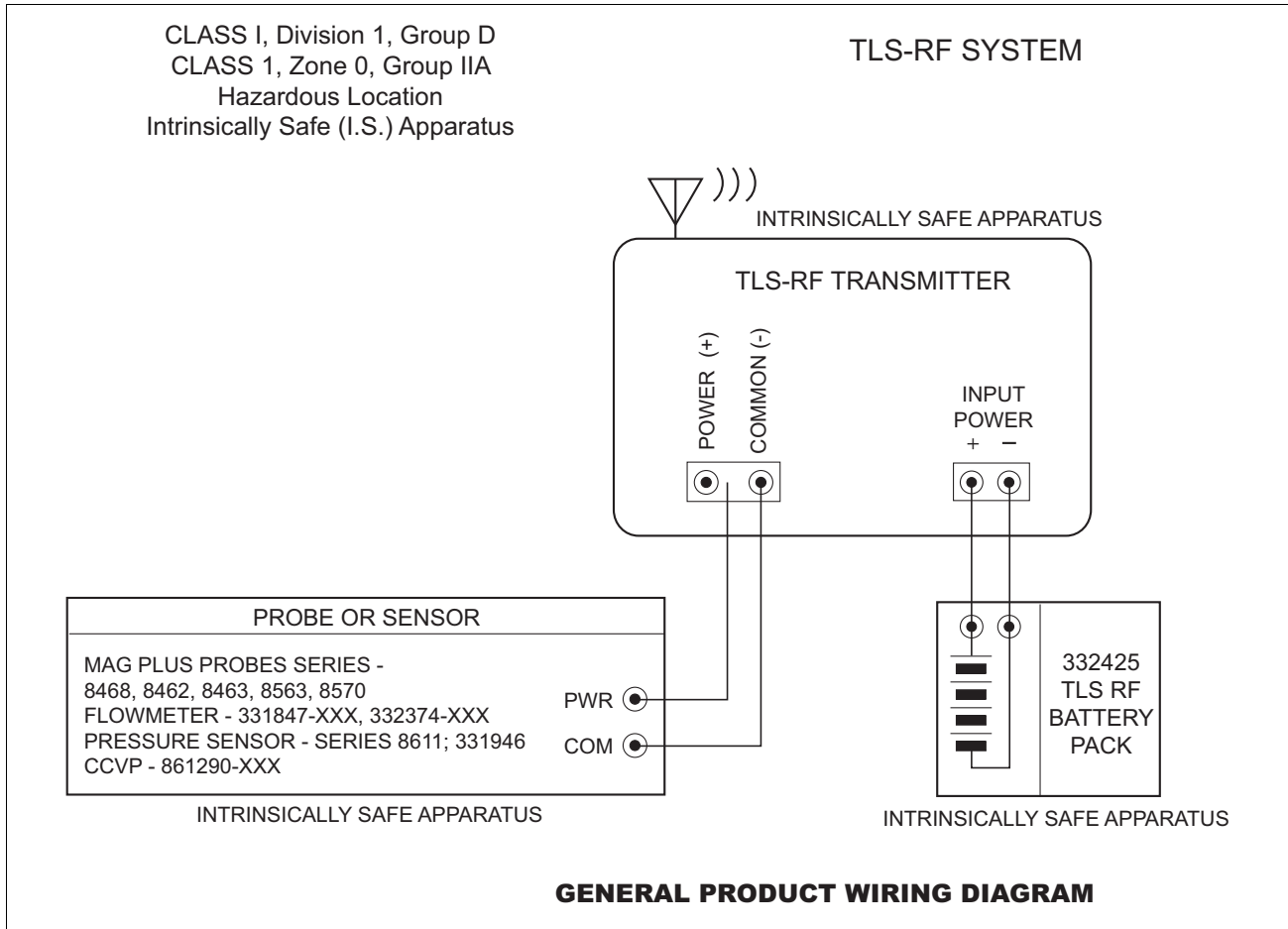
#### ***Documents Required to Install Equipment***

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
<b>Associated Apparatus</b>	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS-50 or TLS2 or TLS-IB	331940-014
TLS4/8601	331940-018
TLS-XB/8603	331940-019
<b>Intrinsically Safe Apparatus for Wireless Applications</b>	
Tank Gauge Accessories	331940-012

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system,

maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.








**Product Label Contents**

	I.S. CIRCUIT FOR HAZLOC DEVICE	F/N XXXXXX-XXX
CL I, DIV. 1, GP.D		S/N XXXXXX
CL I, ZONE 0	$-40^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$	
AEx ia IIA	MANUAL NO. 577013-964	
Ex ia IIA		
TC=T4		
SECURITE INTRINSEQUE		

## Safety Warnings





To protect yourself and your equipment, observe the following warnings and important information:




<b>⚠ WARNING</b>	
    	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p><b>FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.</b></p> <ol style="list-style-type: none"> <li>1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock.</li> <li>2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.</li> <li>3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service.</li> <li>4. Do not alter or modify any component or substitute components in this kit.</li> <li>5. <b>Warning!</b> Substitution of components may impair intrinsic safety.</li> <li>6. Field wiring to the Probe must not share a conduit with any non-intrinsically safe device's wiring.</li> <li>7. <b>Warning!</b> To prevent ignition of flammable or combustible atmospheres, disconnect battery before servicing.</li> <li>8. Materials used in the construction of this device contain aluminum. Care must be taken to avoid ignition hazards due to impact or friction.</li> <li>9. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required.</li> </ol>

**NOTE** Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

## Safety Symbols

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

 <p><b>EXPLOSIVE</b> Fuels and their vapors are extremely explosive if ignited.</p>	 <p><b>FLAMMABLE</b> Fuels and their vapors are extremely flammable.</p>
 <p><b>ELECTRICITY</b> High voltage exists in, and is supplied to, the device. A potential shock hazard exists.</p>	 <p><b>TURN POWER OFF</b> Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.</p>

 <p><b>WARNING</b> Heed the adjacent instructions to avoid damage to equipment, property, environment or personal injury.</p>	 <p><b>READ ALL RELATED MANUALS</b> Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.</p>
 <p><b>SAFETY BARRICADES</b> Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.</p>	

## General Precautions

Retain and follow all product safety and operating instructions. Observe all warnings on the product and in the operating instructions. To reduce the risk of bodily injury, electric shock, fire, or damage to the equipment, observe the following precautions.



**FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.**

### GENERAL PRECAUTIONS

Heed service markings: Opening or removing the console cover may expose you to electric shock. Servicing of Veeder-Root equipment must be done by Veeder-Root authorized service contractors.

Use product with approved equipment: This product should be used only with Veeder-Root components identified as suitable for use with the TLS RF Wireless System.

Use the correct external power sources: This product should be operated only from the type of power sources indicated on the electrical ratings labels affixed to the components. If you are not sure of the type of power source required, consult your Veeder-Root authorized service contractor.

When not in use, a longer battery life can be achieved by keeping the battery pack in a cool, dry location where the temperature never exceeds 30°C or 86°F and does not go below 10° C or 50° F.

### SPECIAL TOOLS REQUIRED

- #15 Torx screwdriver
- Small blade screwdriver (maximum blade width 3/32")
- Wire strippers

## National Electrical Code Compliance

The following information is for general reference and is not intended to replace recommended National Electric Code (NEC) procedures. It is important for the installer to understand that electrical equipment and wiring located in Class I, Division 1 and 2 installations shall comply with the latest appropriate articles found in the National Electric Code (NFPA 70) and the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A), or other local code such as the CEC, Canadian Electrical Code.

### TLS RF-TO-TLS CONSOLE WIRING

#### Wire Type

To ensure the best operating systems available, Veeder-Root **REQUIRES** the use of shielded cable.

**Wire Length**

Improper system operation could result in undetected potential environmental and health hazards if the TLS RF-to-TLS Console wire runs exceed 1000 feet. Wire runs must be less than 1000 feet to meet intrinsic safety requirements.

**Splices**

Veeder-Root recommends that a minimum number of splices are used in the wire run between the TLS RF and the TLS Console. Each splice degrades signal strength and could result in poor system performance.

**Wire Gauges - Color coded**

Shielded cable must be used in all installations. TLS RF-to-TLS Console wires must be #14 to #18 AWG stranded copper wire and installed as a Class 1 circuit.

**Alternate Method**

When approved by the local authority having jurisdiction, 22 AWG wire such as Belden 88761 may be suitable in installations with the following provisions:

- Wire run is less than 750 feet
- Capacitance does not exceed 100 pF/foot
- Inductance does not exceed 0.2  $\mu$ H/foot

**TLS RF AC POWER WIRING**

Wires carrying 120 or 240 Vac from the power panel to the TLS RF must be at least #14 AWG copper wire for line, neutral and chassis ground (3); and #12 AWG copper wire for barrier ground (1).

NOTE: Note: See page 32 for details of Repeater Power Wiring.

### TLS RF Wireless System Site Layout

Figure 1 illustrates an example TLS RF Wireless System installation. The Repeater component may be required if the system Receiver, mounted on building's outside wall, has difficulty receiving signals from any of the Transmitters. See page 32 for Repeater installation.

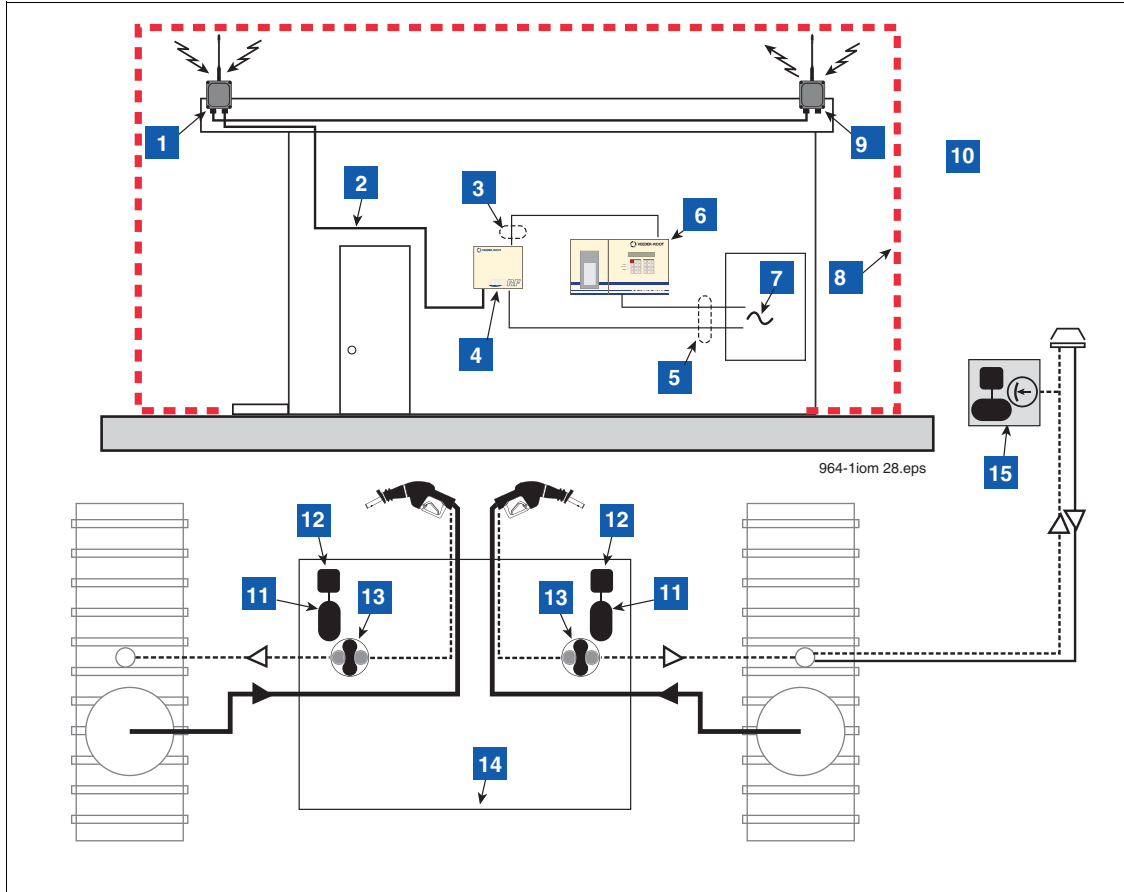


Figure 1. Example TLS RF Wireless System Site Layout

#### LEGEND FOR NUMBERED BOXES IN Figure 1

To be installed in accordance with the National Electrical Code, NFPA 70 and the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A), or other local codes such as the CEC, Canadian Electrical Code.

**WARNING! Substitution of components may impair intrinsic safety.**

Circuitry within the console barrier forms an intrinsically safe, energy-limited system. This system is intrinsically safe for use in a Class I, Group D hazardous location.

- 1. Receiver (1 per RF System)
- 2. RS-485 Cable (Belden #3107A or equiv.)
- 3. NOTE: Intrinsically safe wiring shall be installed in accordance with Article 504-20 of the NEC, ANSI/ NFPA 70. Max cable length 1000 ft. (304 m).W2 Receiver (1 per RF System)

- 4. TLS-RF
- 5. Conduit that enters power wiring knockout.
- 6. TLS console (Vm = 250 V)
- 7. 120 or 230 Vac from power panel
- 8. Non-hazardous area
- 9. Repeater (1 per RF System)
- 10. Hazardous area (Class I, Div. 1, Group D)
- 11. Transmitter
- 12. Battery pack
- 13. Vapor Flow meter
- 14. Dispenser sump
- 15. VPRS sensor (w/transmitter/battery in enclosure)



# Equipment Dimensions

Dimensions of the TLS RF are shown in Figure 2.

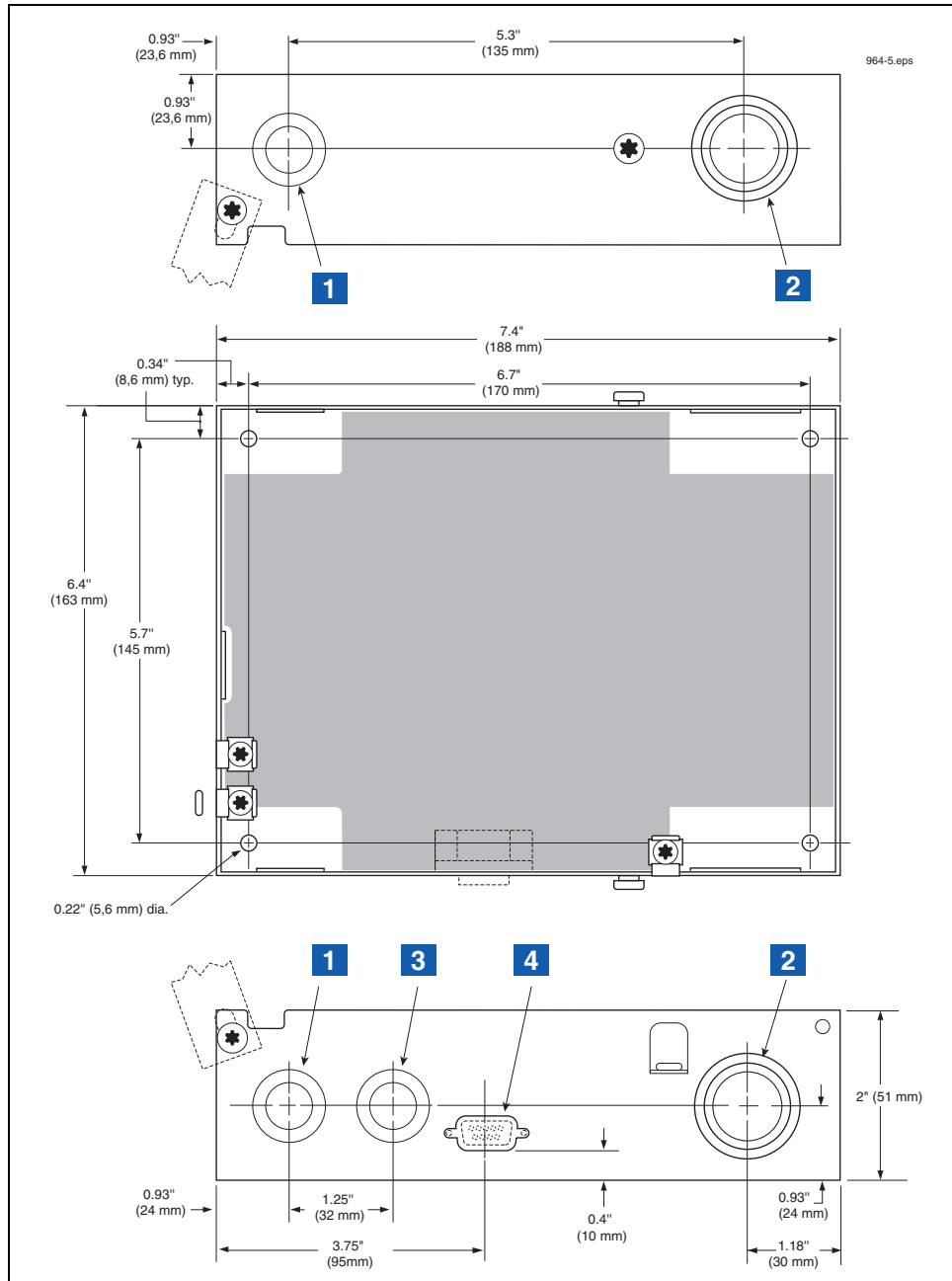


Figure 2. TLS RF Dimensions And Designated Conduit Knockouts

## LEGEND FOR NUMBERED BOXES IN Figure 2

- |   |                    |
|---|--------------------|
| 1. Designated power wiring knockouts              | 3. RS-485 knockout |
| 2. Designated intrinsically-safe wiring knockouts | 4. RS-232 knockout |



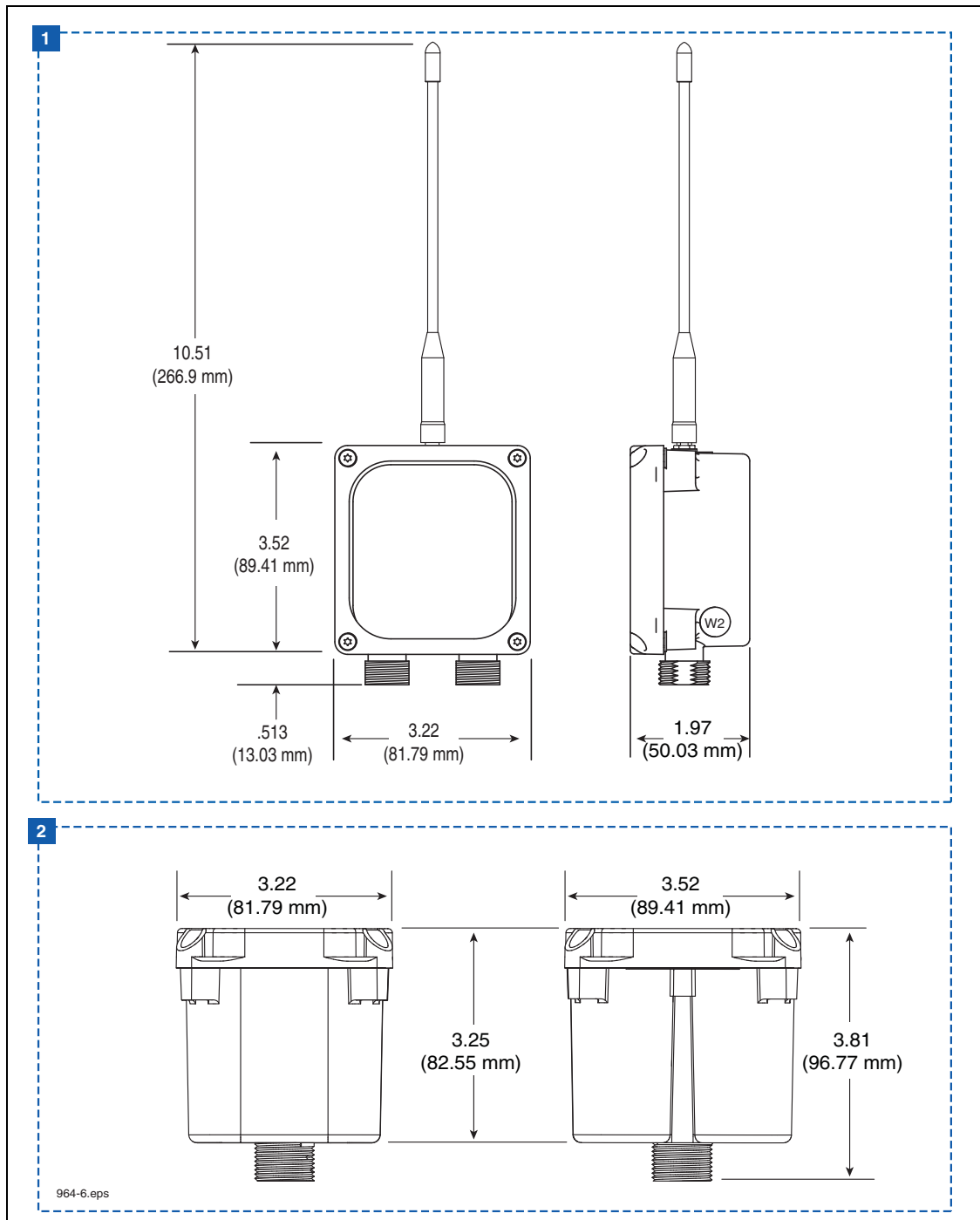


Figure 3. Wireless Component Dimensions

LEGEND FOR NUMBERED BOXES IN Figure 3	
1. W2 Receiver, W2 Transmitter, and W2 Repeater dimensions	2. Battery housing dimensions

## Pre-Installation Component Setup and Functional Check

The steps below describe the process of verifying the Wireless System component functionality; listed steps are only for one TLS RF. If there are more than 8 Sensors installed at the site, refer to Appendix B on how to setup the DIP Switches for auxiliary TLS RF(s).

1. Remove all the hardware from their boxes; lay the TLS RF, Receiver, Repeater, and all the Transmitters on a table.
2. Set Site ID for the Receiver, Repeater, and all the Transmitters (refer to Appendix B on how to set up the Site ID). Typically the Site ID is set to 0 (default). **If there is a nearby wireless site, the Site IDs must be different.**
3. Set all Transmitter's Device Numbers and connect the battery cables to all the Transmitters. Label each Transmitter with its site ID.
  - a. Using a #15 torx driver, remove the cover of the Transmitter.
  - b. Remove the nut from the battery cable cord grip (right side cord grip) and slide it over the non-connector end of the battery cable.
  - c. Make sure the battery/dc power cable is not connected to the battery pack or dc power source at this time. Push the battery cable through the battery cable cord grip bushing and into the Transmitter.
  - d. Strip back the cable jacket and wires as shown in Figure 4.
  - e. Connect the battery pack/dc power cable to the BATTERY terminal block (white to +IN and black to -IN) as shown in Figure 5.
  - f. **Hand tighten both cable entry cord grip nuts to prevent water entry!**
  - g. Replace the cover of the Transmitter, but do not tighten down cover screws at this time.

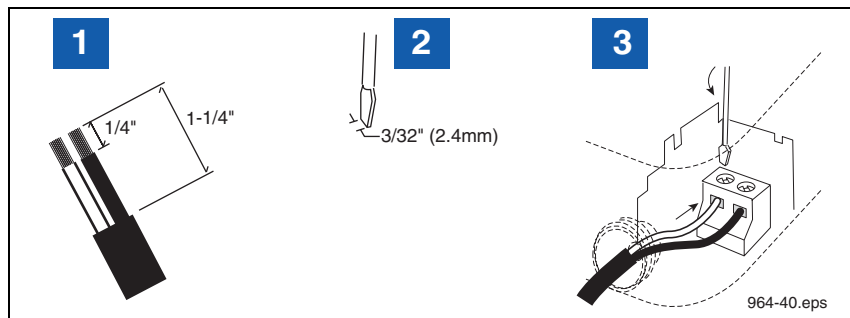


Figure 4. Connecting Wiring To Device Terminal Blocks

### LEGEND FOR NUMBERED BOXES IN Figure 4

- |  |   |
|--|---|
| 1. Strip back cable and wire jackets the amount shown. | 3. Both wires must be tight in terminals! |
| 2. Use a screwdriver with the proper blade width.      |   |

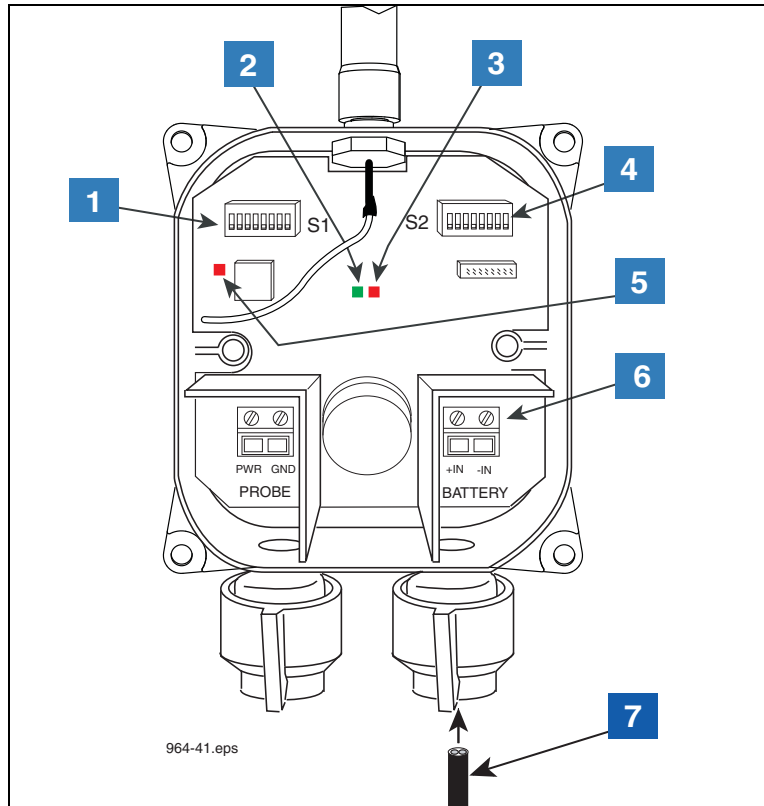


Figure 5. Wiring The Battery Cable To The Transmitter

**LEGEND FOR NUMBERED BOXES IN Figure 5**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1. S1 DIP switch</li> <li>2. Green LED – Unit status.</li> <li>3. Red LED – Radio status.</li> <li>4. S2 DIP switch</li> <li>5. Red LED – Flashes only when radio is powered on in Diagnostic Mode.</li> </ul> | <ul style="list-style-type: none"> <li>6. Battery power-in terminals (+IN and –IN). Observe polarity!</li> </ul> <p style="text-align: center;"> <b>Pay close attention to the polarity of the +15 Vdc. Reversing the connections can cause damage to the TLS RF.</b></p> <ul style="list-style-type: none"> <li>7. Cable from battery pack</li> </ul> |
|---|--|

4. Using a #15 torx driver, open the covers of the TLS RF, Repeater and Receiver. Make a temporary ac power cord with a grounded plug on one end. Connect the ac power cord to the TLS RF's input power terminals and ground terminal (refer to Figure 6 and Figure 7). Connect a necessary length of RS-485 cable from the TLS RF's RS-485 terminals to the Receiver's RS-485 terminals (refer to Figure 20). Connect a necessary length of 2-conductor cable from the Receiver's Repeater terminals to the Repeater's Repeater terminals (refer to Figure 21).
5. The steps below are to verify the communication between the TLS RF Unit and the Receiver.
  - a. Plug the TLS RF's ac power cord into a 120/240 Vac outlet. Confirm the Green /Red LEDs (refer to item 2 in Figure 12), are flashing rapidly. This is an indication there is RS-485 network activity between the TLS RF and the Receiver.
  - b. If it is, continue to Step 6.
  - c. If it is not, check PWR LED (refer to item 3 in Figure 12), if not lit; check power wiring. If the wiring is correct, measure the voltage across the twisted pair power wires, it should read +15Vdc. If it is not, the TLS RF is bad.

- d. If the Red LED (refer to item 2 in Figure 12) is not flashing, confirm the TLS RF address is set to Master (refer to Appendix B, Figure B-1 on how to set the TLS RF Device Number). If it is, the TLS RF has failed.
  - e. If the Red LED is flashing and the Green LED is not flashing, the TLS RF is not receiving a response from the Receiver.
  - f. Confirm the Receiver PWR LED is lit (refer to item 1 in Figure 20). If not check the power wiring.
    - If the power wiring is correct, measure across the +15V and GND (refer to item 4 in Figure 20), it should be +15Vdc. If it is not, measure the voltage across the +15V and GND terminals in the TLS RF, it should read +15Vdc. If it does, replace the twisted pair power wires. If it does not, the Receiver is bad.
    - Check the RS-485 Green LED (refer to item 1 (PWR LED) in Figure 20), if it is flashing; it is receiving Data from the TLS RF. If it is not flashing, check the RS-485 cabling between the TLS RF and the Receiver.
    - Check the Red LED (XMIT LED, [item 1 in Figure 20]), if it is flashing; check the cabling. If it is not flashing, the Receiver is at fault; replace the Receiver.
6. This step is to verify to make sure Data from the Transmitter is being received by the TLS RF. Make sure the power to the Repeater is off.
- a. Connect the first Transmitter's battery cable to a battery pack; noting the Red LED should be flashing momentarily then followed by the Green LED (refer to item 2 and 3 in Figure 5). Since there is no Sensor connected, the two LEDs should be flashing. This is an indication a Sensor communication error and is acceptable at this step.  
**TIP - Normal flashing is when an LED turns On for over 1 second and turns Off for over 1 second. Error flashing is when an LED turns On and Off every 1/2 second or less.**
  - b. Go to the TLS RF, open its cover. One of the 8 Red received LEDs should be flashing (refer to item 5 in Figure 12). Observe which LED is lit and compare it against the Transmitter Device Number; they should match. For example, if the Transmitter ID is set to 1, the LED number 1 in the TLS RF should be flashing.
  - c. If the Transmitter Device Number and the LED in the TLS RF do not match, disconnect the Transmitter's battery cable from the battery pack. Move this DIP switches back and forth a few times to make sure they are set properly. Reset this DIP Switch to the correct setting; reconnect the battery cable; confirm that the correct LED is flashing.
  - d. If they still do not match, disconnect the Transmitter's battery cable from the battery pack; change the Transmitter Device Number to different setting and repeat Step 6.
  - e. If resetting the Transmitter to a different Device Number and the LED position in the TLS RF matches; that DIP Switch position is bad, the Transmitter is at fault.
  - f. If resetting the Transmitter to a different Device Number and the LEDs in the TLS RF and the Transmitter are not matched; remove the power from the Transmitter and put it aside.
  - g. Repeat Step 6 with the next Transmitter.
  - h. If both Transmitters have the same problems, it could be the Receiver or the TLS RF.
  - i. In the case where the LED in the TLS RF is not flashing, check the Site ID in the Receiver and the Transmitter to make sure they are correct. If the Site IDs are correct, the Transmitter or the Receiver is at fault. NOTE: Sometimes it is necessary to disconnect the battery cable from the battery pack and wait for 2 minutes and retry again to make sure the connection is established properly.
7. If all the Transmitters have been verified to be working properly, they are now ready to be installed.
8. Unplug the TLS RF, disconnect the temporary power cable and RS-485 cable to the Receiver and close the cover of the TLS RF, but do not tighten the cover screws at this time.
9. Disconnect the temporary RS-485 and 2-conductor cables from the Receiver and replace its cover, but do not tighten at this time. Disconnect the temporary 2-conductor cable from the Repeater and replace its cover, but do not tighten at this time.

## TLS RF Installation

### Selecting A Location

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#### WARNING



Explosive vapors or flammable liquids could be present near locations where fuels are stored or being dispensed. The TLS RF is not explosion proof.

An explosion or fire resulting in serious injury or death, property loss and equipment damage could occur if the console is installed in a volatile, combustible or explosive atmosphere (Class I, Division 1 or 2).

Do not install this unit in a volatile, combustible, or explosive atmosphere.

The TLS RF must be mounted indoors, protected from severe vibration, extremes in temperature and humidity, and other conditions that could harm computerized electronic equipment.

Ensure that the TLS RF is located where neither it nor its associated cabling will be damaged by doors, furniture, etc. Consider the ease of routing wiring, and ducting to the TLS console. Check that the mounting surface is strong enough to support the unit's weight of about 4 pounds.

### Mounting the TLS RF

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Install the unit's fastening devices to the mounting surface using the hole pattern (6.7" x 5.7") shown in Figure 2. Mounting screws up to 3/16" diameter may be used.

Install metal conduit (1/2-inch I.P.S.) between the upper power side knockout on the unit and the power panel. Figure 2 shows the two designated knockouts (one each on top and bottom) through which power wiring can safely enter the unit.

Also install metal conduit (1/2-inch I.P.S.) between the lower intrinsically-safe wiring knockout on the TLS RF and an intrinsically-safe wiring knockout on the TLS console for device data wiring.

### Wiring the TLS RF

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#### WARNING



The unit contains voltages which can be lethal.

Connecting power wires to a live circuit can cause electrical shock that may result in serious injury or death.

Turn power off at the circuit breaker before connecting wiring to the TLS RF.

Attach conduit from the power panel to the unit's power wiring knockouts only (1 on top and 1 on bottom, ref. Figure 2)

To connect power wiring see Figure 6. To connect Receiver wiring see Figure 7. To daisy chain two TLS RFs, see Figure 9 and Figure 10. To connect TLS RF data output wiring to the TLS console see Figure 6.



**WARNING! Do not apply power to the TLS RF Console until all device wiring is complete. This includes the wiring for the Receiver, Repeater, the probes and additional TLS RF Consoles.**

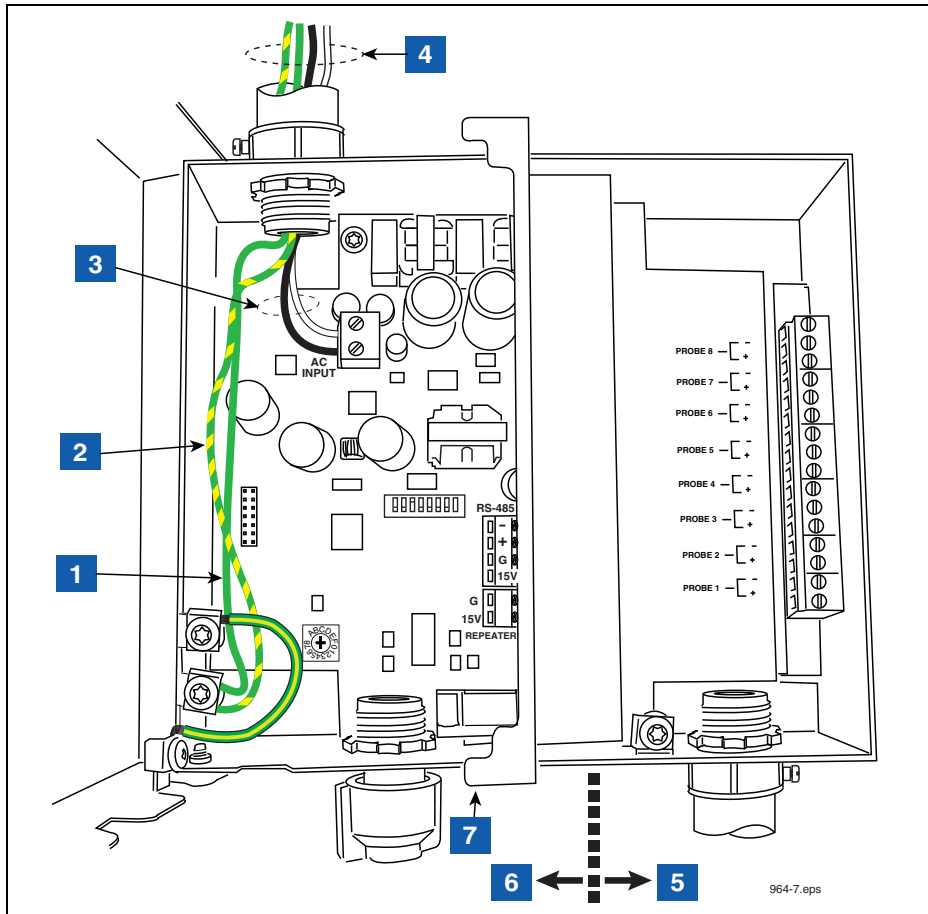


Figure 6. Wiring AC Power To The TLS RF

**LEGEND FOR NUMBERED BOXES IN Figure 6**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Attach chassis ground wire (#14 AWG) to ground lug.</li> <li>2. Protective earthing conductor (green and yellow). Attach #12AWG barrier ground wire to ground lug. Ground must be the same as the supply and less than 1.0 ohms to ground.</li> <li>3. AC power input wires (#14 AWG) to AC INPUT terminals.</li> <li>4. POWER WIRING NOTES:             <ul style="list-style-type: none"> <li>• Barrier ground must be #12 AWG or larger diameter.</li> <li>• Check to be sure that the electrical resistance between the unit ground lug and a known good earth ground is less than 1 ohm.</li> <li>• Connect the power supply wires in the power panel to a separate dedicated circuit.</li> <li>• Electrical rating power input - 120 Vac or 240 Vac, 50/60 Hz, 2 A max.</li> <li>• See Figure 2 for actual locations of power conduit knockouts into the unit. Power wiring must enter only in one of these knockouts.</li> </ul> </li> </ol> | <ol style="list-style-type: none"> <li>5. Intrinsically-safe side</li> <li>6. Power side</li> <li>7. RS-232 diagnostic port:             <ul style="list-style-type: none"> <li>• Baud rate - 9600</li> <li>• Data length - 8</li> <li>• Parity - None</li> <li>• Stop bits - 1</li> </ul> </li> </ol> |
|---|--|

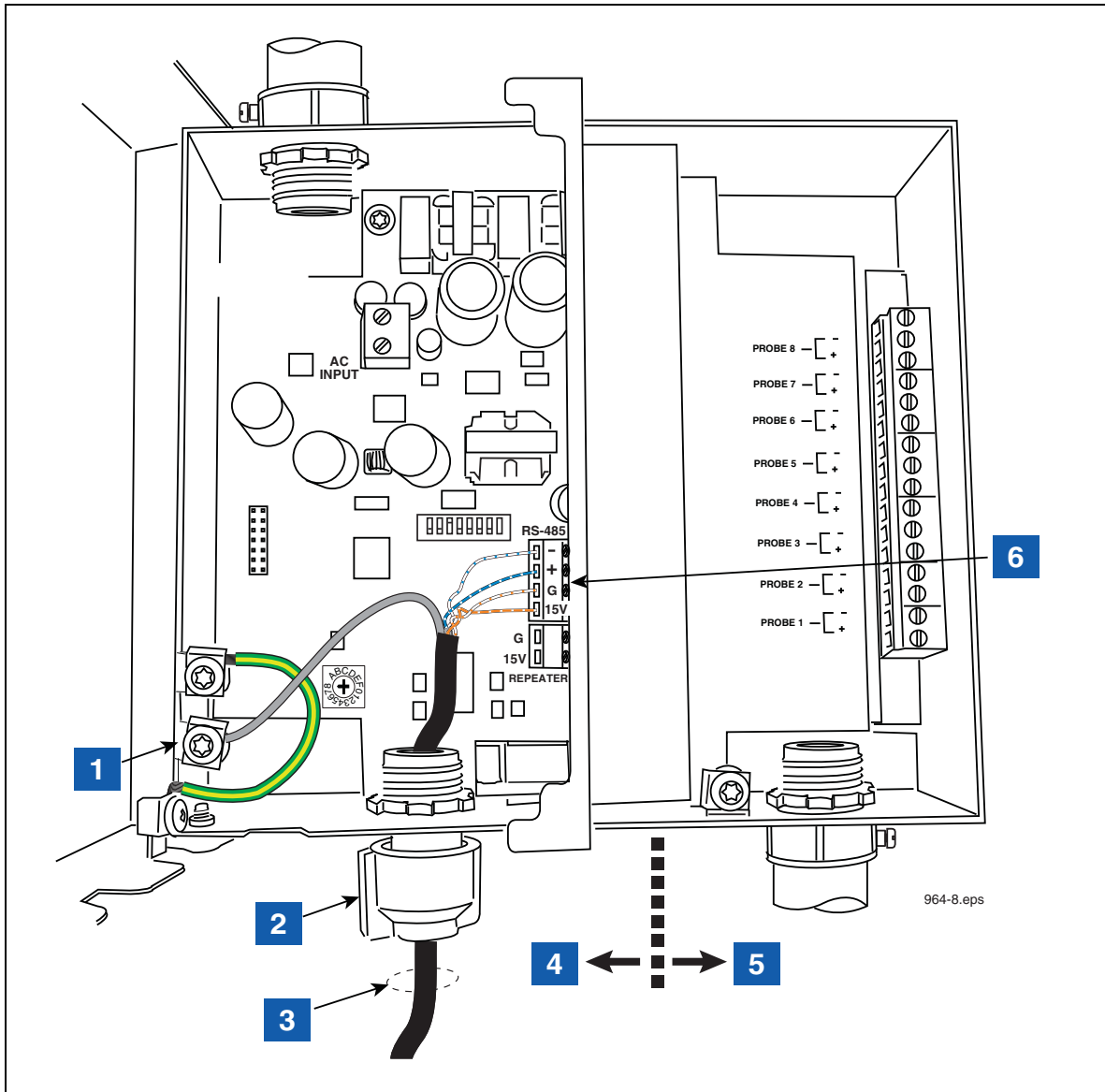


Figure 7. Wiring Receiver To The TLS RF

**LEGEND FOR NUMBERED BOXES IN Figure 7**

- 1. Connect the shield of the RS-485 cable to the ground lug.
- 2. Cord grip
- 3. RS-485 cable to Receiver
- 4. Power side
- 5. Intrinsically-safe side
- 6. NOTE: Attach one end of RS-485 cable to the RS-485 terminals in the TLS RF and other end to the RS-485 terminals in the Receiver. One twisted pair connects to terminals - and + (RS-485 signals) and the second twisted pair connects to terminals +15 and G (Receiver power).

6 (Cont'd).  
Connect each of the four wires to the same terminals in the Receiver (ref. Figure 20).

NOTE: see Figure 4 for wire connection tips. NOTE: In sites with more than one TLS RF, the Receiver is only connected to the master TLS RF.

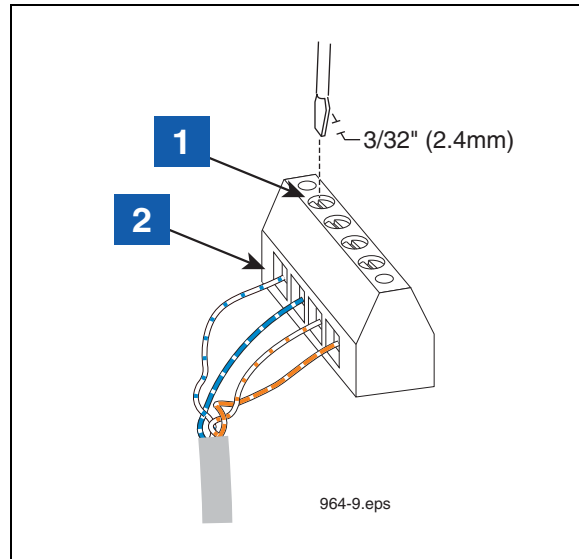


Figure 8. Connecting RS-485 Wiring

**LEGEND FOR NUMBERED BOXES IN Figure 8**

- |   |  |
|---|--|
| <p>1. Use small blade screwdriver and loosen terminal by turning top screw over desired terminal counter clockwise. DO NOT raise screw head above top of hole or it may disengage from clamp.</p> | <p>2. Insert 1/4" stripped wire into terminal clamp's side opening and tighten screw clockwise until wire cannot be moved in or out.</p> |
|---|--|



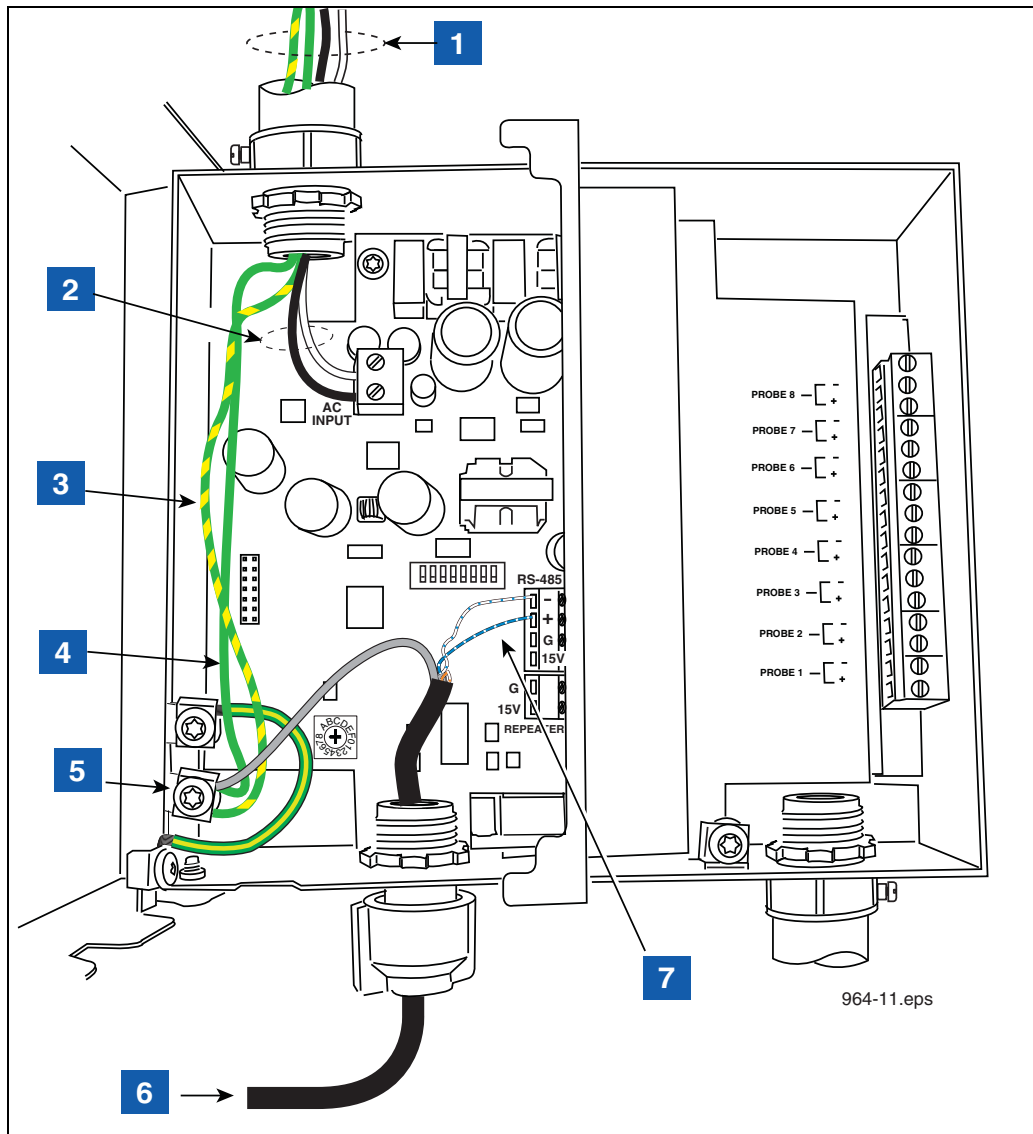


Figure 9. Power Connections To A Daisy Chained TLS RFs

**LEGEND FOR NUMBERED BOXES IN Figure 9**

- |  |  |
|--|--|
| <p>1. POWER WIRING NOTES:</p> <ul style="list-style-type: none"> <li>• Barrier ground must be #12 AWG or larger diameter.</li> <li>• Check to be sure that the electrical resistance - between the unit ground lug and a known good earth ground is less than 1 ohm.</li> <li>• Connect the power supply wires in the power panel to a separate dedicated circuit.</li> <li>• Electrical rating power input - 120 Vac or 240 Vac, 50/60 Hz, 2 A max.</li> <li>• See Figure 2 for actual locations of power conduit knockouts into the unit. Power wiring must enter only in one of these knockouts.</li> </ul> <p>2. AC power input wires (#14 AWG) to AC input terminals.</p> | <p>3. Protective earthing conductor (green and yellow). Attach #12AWG barrier ground wire to ground lug. Ground must be the same as the supply and less than 1.0 ohms to ground.</p> <p>4. Attach chassis ground wire (#14 AWG) to ground lug.</p> <p>5. Connect the shield of the RS-485 cable to the ground lug.</p> <p>6. RS-485 cable from master TLS RF.</p> <p>7. See Figure 10 for connections.</p> |
|--|--|

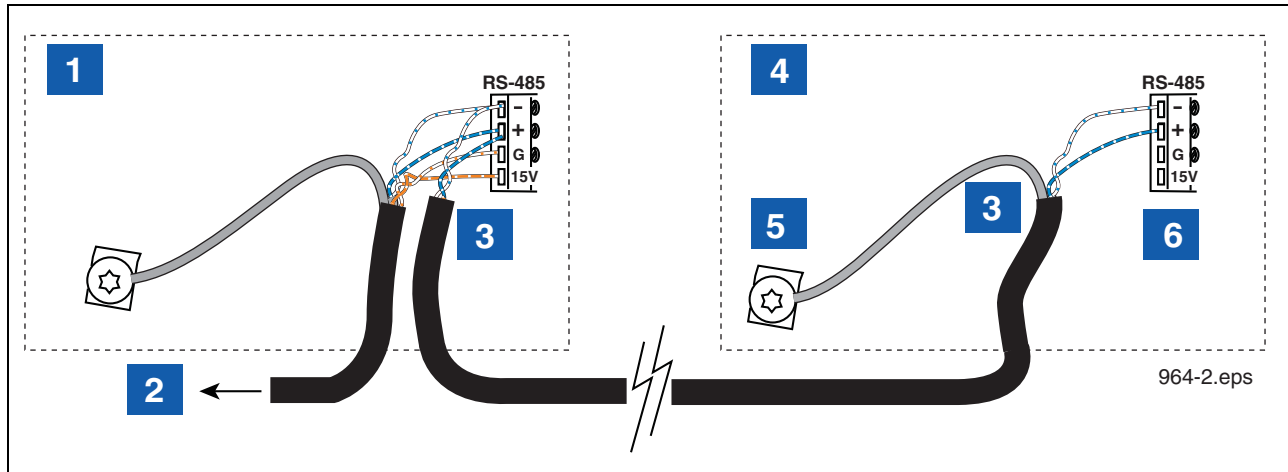


Figure 10. RS-485 Cable Connections When Daisy Chaining Two TLS RFs

**LEGEND FOR NUMBERED BOXES IN Figure 10**

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Master TLS RF</li> <li>2. RS-485 cable to Receiver.</li> <li>3. RS-485 cable to auxiliary TLS RF. Cut the unused twisted pair back to the cable's jacket at each end of the cable. Maximum cable length is 500 feet if a communication grade cable is used.</li> <li>4. Auxiliary TLS RF</li> </ol> | <ol style="list-style-type: none"> <li>5. Connect the shield of the RS-485 cable to the ground lug.</li> <li>6. Connect like colored wires of the twisted pair to like terminals in the auxiliary TLS RF. Each additional TLS RF connects in the same way.</li> </ol> |
|---|---|

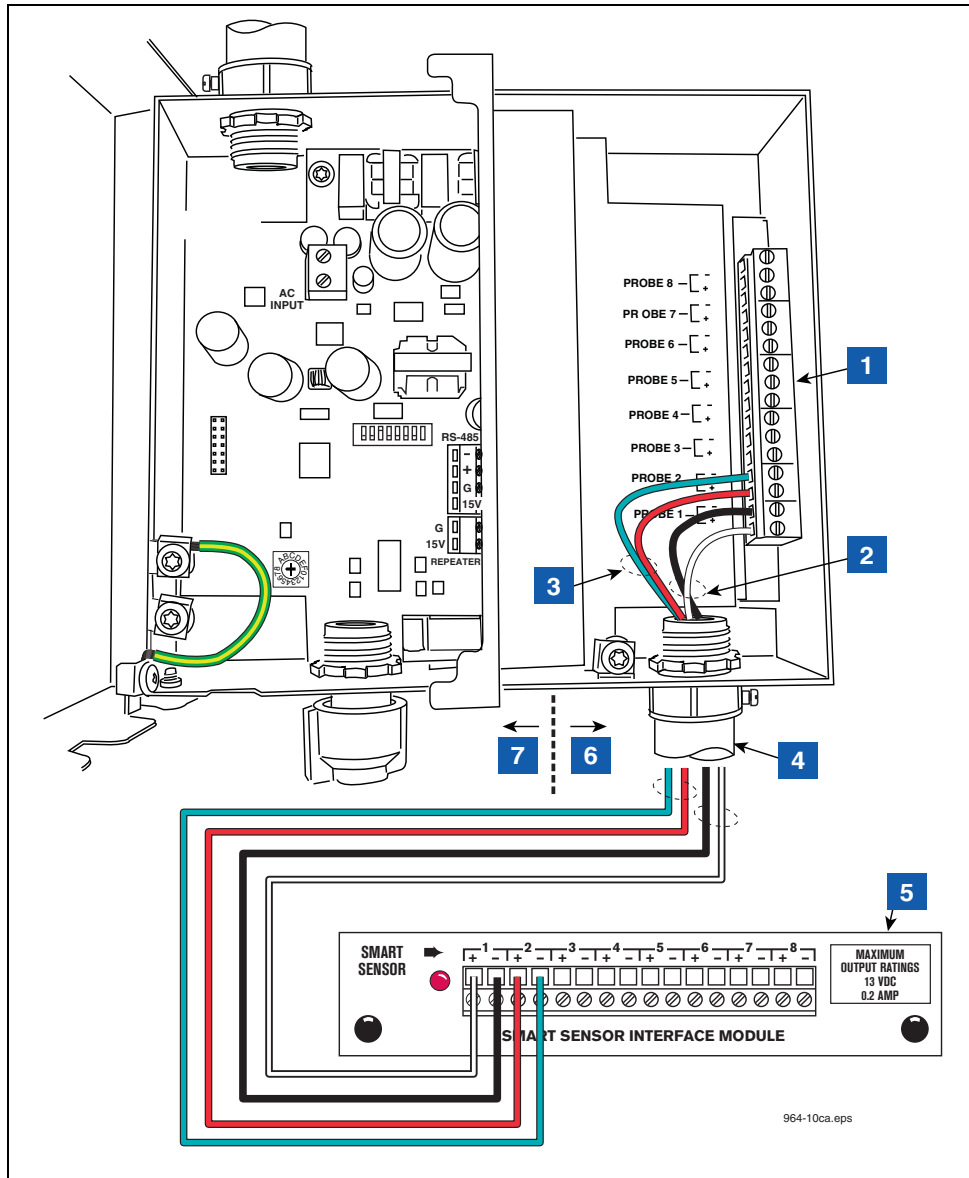


Figure 11. Wiring Data Outputs from TLS RF to TLS Console

**LEGEND FOR NUMBERED BOXES IN Figure 11**

Note: Output wiring from the TLS RF to the TLS console is an intrinsically safe circuit.

NOTE: Intrinsically safe wiring shall be installed in accordance with Article 504-20 of the NEC, ANSI/NFPA 70.

1. Received Transmitter data output terminals (1-8).
2. In this example, device output 1 is a Flow Meter - Observe polarity. Note: each time a transmission is received from this device, LED 1 (see item 5 in Figure 12) will flash.
3. In this example, device output 2 is a Flow Meter - Observe polarity. Note: each time a transmission is received from this device, LED 2 (see item 5 in Figure 12) will flash.

4. 1/2" i.p.s. conduit to TLS console
5. SmartSensor interface module in TLS console
6. Intrinsically-safe side
7. Power side



Figure 12 locates the diagnostic lights and setup switches in the TLS RF.

Each TLS RF in the site network must have a unique device set number (0,1,2 or 3). The factory default setting is '0'. You must select '0' for the master TLS RF. The site's Receiver must also be connected to the master TLS RF.

If a second TLS RF is required, enter '1' in the auxiliary TLS RF. For additional TLS RFs, enter '2' for the third and '3' for the fourth.

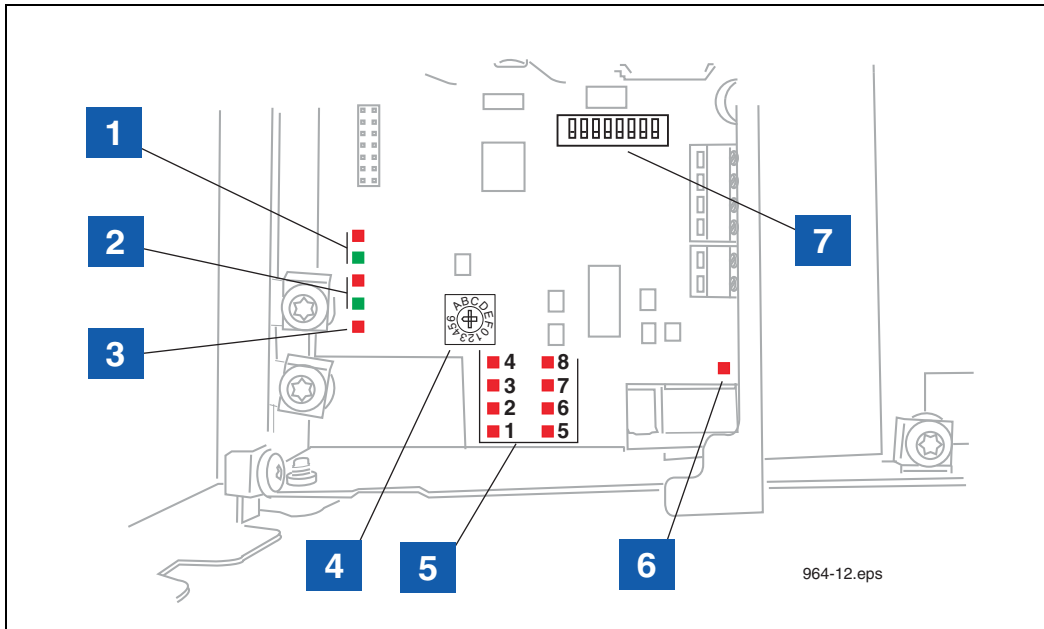


Figure 12. TLS RF Diagnostic LEDs And Switch Locations

**LEGEND FOR NUMBERED BOXES IN Figure 12**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. These LEDs flash when there is comm activity on RS-232 port (Red = TX, Green = RX).</li> <li>2. These LEDs flash when there is comm activity on the RS-485 network (between TLS RF and Receiver).</li> <li>3. Red LED is lit when TLS RF is powered on.</li> <li>4. Device time out rotary switch selects the maximum allowed time to wait for communication from Transmitter before a Comm alarm is posted by TLS console (see Appendix B for selections). Position 1 (10 minutes) is the factory default setting.</li> </ol> | <ol style="list-style-type: none"> <li>5. These red LEDs flash when a message is received from a Transmitter in the monitored device set. LED 1 is the device wired to I.S. output terminal 1. LED 2 is the device wired to output terminal 2, etc.</li> <li>6. Red LED flashes when TLS console is polling for device data.</li> <li>7. S2 DIP switches 1-2 enter device set address (see Appendix B).</li> </ol> |
|--|--|

## ISD Component Installation

### Vapor Flow Meter Installation - Dispenser

1. A Transmitter/battery pack pair must be installed with the Veeder-Root Vapor Flow Meter (VFM) in the dispenser cabinet.
2. Install the VFM in the dispenser following instructions accompanying the VFM.
3. Using two taptite screws from the kit, attach the Transmitter housing to the side of the battery support bracket that has the two circular slots (see Figure 13). Do not tighten screws at this time.
4. Remove the cover from the transmitter. Attach the non-connector end of the cable from the VFM to the transmitter as described in the section below entitled "Connecting Cables To The Transmitter" on page 27, then attach the transmitter/L bracket assembly to the back mounting surface using two #10 taptite screws from the kit.
5. Determine a support location within the dispenser cabinet that will allow you room for the transmitter/battery support bracket. Clamp the bracket to an available support structure (see Figure 14).
6. Rotate the Transmitter antenna as close as possible to a horizontal position then tighten two mounting screws in housing.
7. Insert the battery pack into its support bracket - do not connect the battery cable to the battery pack at this time.
8. Do not replace dispenser sheet metal cover until completing the "Site Startup Procedure".

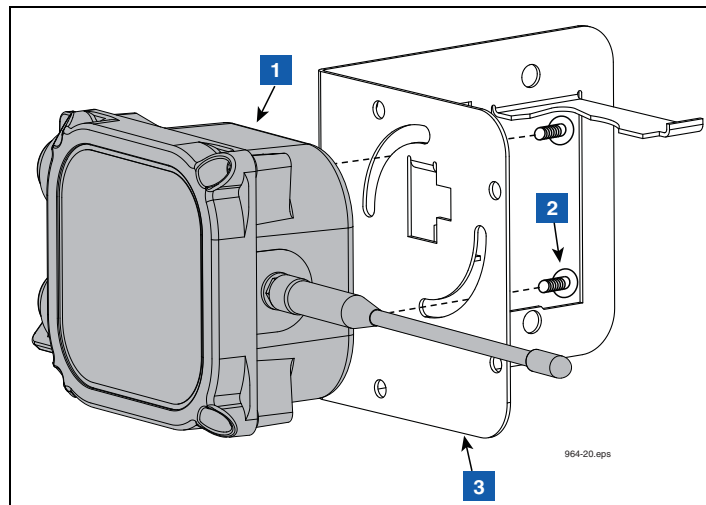


Figure 13. Attaching Transmitter To Battery Support Bracket

#### LEGEND FOR NUMBERED BOXES IN Figure 13

1. Transmitter
2. #10 x 1/2" taptite screws (2)
3. Battery support bracket

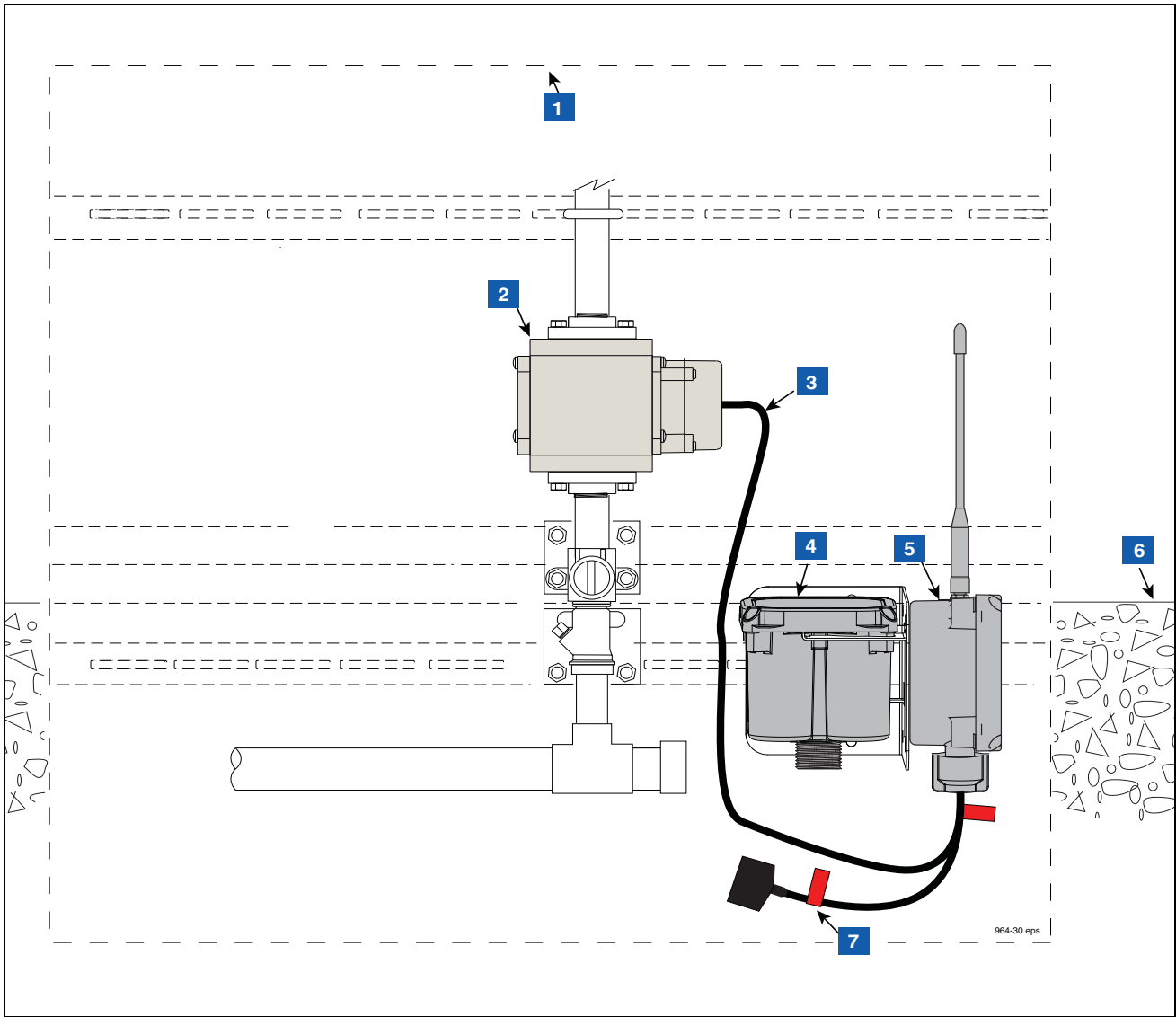


Figure 14. Example VFM Transmitter Installation In Dispenser

**LEGEND FOR NUMBERED BOXES IN Figure 14**

- |                              |   |
|------------------------------|---|
| 1. Base of dispenser cabinet | 5. Transmitter  |
| 2. VFM                       | 6. top of dispenser pedestal                                  |
| 3. VFM cable                 | 7. Battery caution label attached to battery cable (2 places) |
| 4. Battery pack              |   |

## Vapor Return Pressure Sensor Installation

---

### VENT STACK INSTALLATION EXAMPLE

1. A Transmitter/battery pack pair must be installed with the Veeder-Root Vapor Return Pressure Sensor (VRPS) in the Universal Enclosure and mounted on the vent stack (see Figure 15).
2. Install the VRPS sensor in the Universal Enclosure following instructions accompanying the sensor. During the installation, all required National, State and local safety codes must be followed.
3. Using two #10 taptite screws from the Universal Enclosure kit, attach the Transmitter housing to the side of the L bracket from the Universal Enclosure kit - do not attach L bracket/transmitter assembly to the back mounting surface at this time.
4. Get the battery pack mounting bracket from the Universal Enclosure kit and put the threaded connector fitting of the battery housing through the large hole in the bracket.
5. Get the thin hex nut from the kit and screw it onto the battery housing cable connector threaded fitting until snug (see item 4 in Figure 16).
6. Attach the battery housing/bracket assembly to the back mounting surface of the Universal Enclosure using two #10 taptite screws from the kit (see item 5 in Figure 16).
7. Connect the VRPS and battery cables to the VRPS transmitter as described in the section below entitled "Connecting Cables To The Transmitter" on page 27, then attach the transmitter/L bracket assembly to the back mounting surface using two #10 taptite screws from the kit.





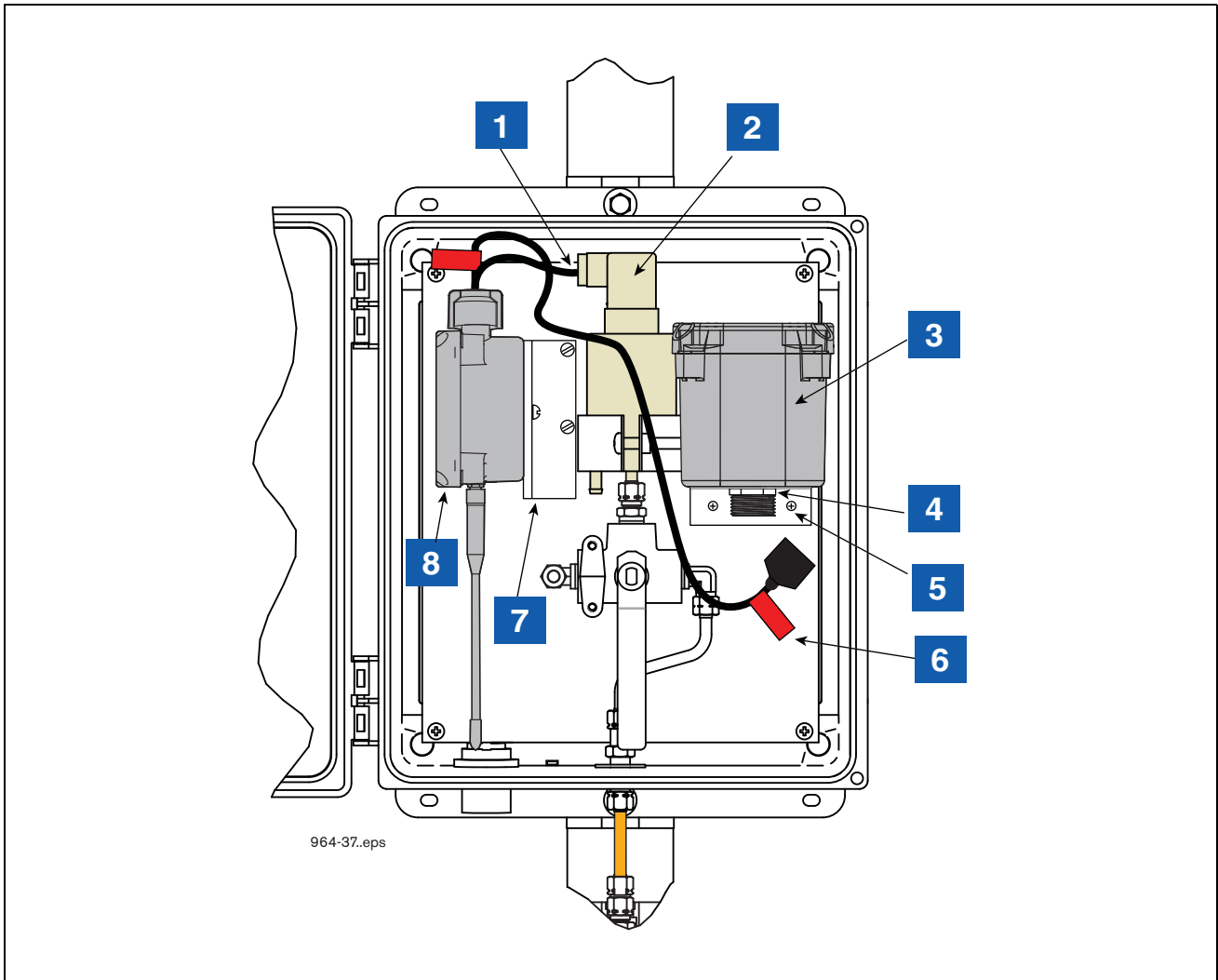


Figure 16. Example VRPS Transmitter/battery Pack Installation In The Universal Enclosure

**LEGEND FOR NUMBERED BOXES IN Figure 16**

- |                 |   |
|-----------------|---|
| 1. VRPS cable   | 5. Attach Battery L bracket using two #10 taptite screws      |
| 2. VRPS         | 6. Battery caution label attached to battery cable (2 places) |
| 3. Battery pack | 7. Attach Transmitter L bracket using two #10 taptite screws  |
| 4. Thin hex nut | 8. Transmitter  |

## Connecting Cables To The Transmitter

Note: The dip switches in each transmitter must be set to the proper dip switch settings listed in Appendix B. If the dip switches are set incorrectly, this device will fail to operate properly.

1. Using a #15 torx driver, remove the cover of the Transmitter.
2. Make sure the battery/DC power cable is not connected to the battery pack (item 7 in Figure 14) or dc power source at this time.



**WARNING! To prevent ignition of flammable or combustible atmosphere disconnect power before servicing.**

3. Remove the nut from the probe/sensor cable cord grip (left side cord grip) and slide it over the non-connector end of the probe/sensor cable. Push the end of the cable into the Transmitter.
4. Strip back cable jacket and wires as shown in Figure 17.
5. All probe/sensor cables connect to the PROBE terminal block the SAME WAY - the white wire to the PWR terminal and the black wire to the GND terminal as shown in Figure 18.

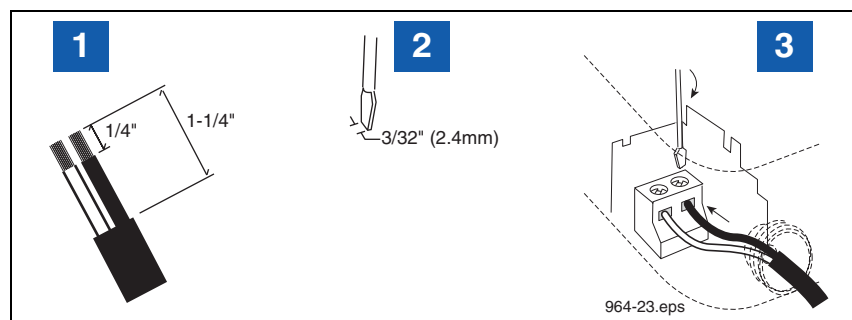


Figure 17. Connecting Input Wiring To Transmitter Terminal Blocks

### LEGEND FOR NUMBERED BOXES IN Figure 17

- |  |   |
|--|---|
| 1. Strip back cable and wire jackets the amount shown. | 3. Both wires must be tight in terminals! |
| 2. Use a screwdriver with the proper blade width.      |   |

6. Remove the nut from the power cable cord grip (right side cord grip) and slide it over the non-connector end of the power cable. Push the end of the cable into the Transmitter.
7. Strip back cable jacket and wires as shown in Figure 17.
8. Connect power cable wires to the BATTERY terminal block placing the white wire in the +IN terminal and the black wire in the -IN terminal as shown in Figure 18.



9. **Hand tighten both cable entry cord grip nuts to prevent water entry!**

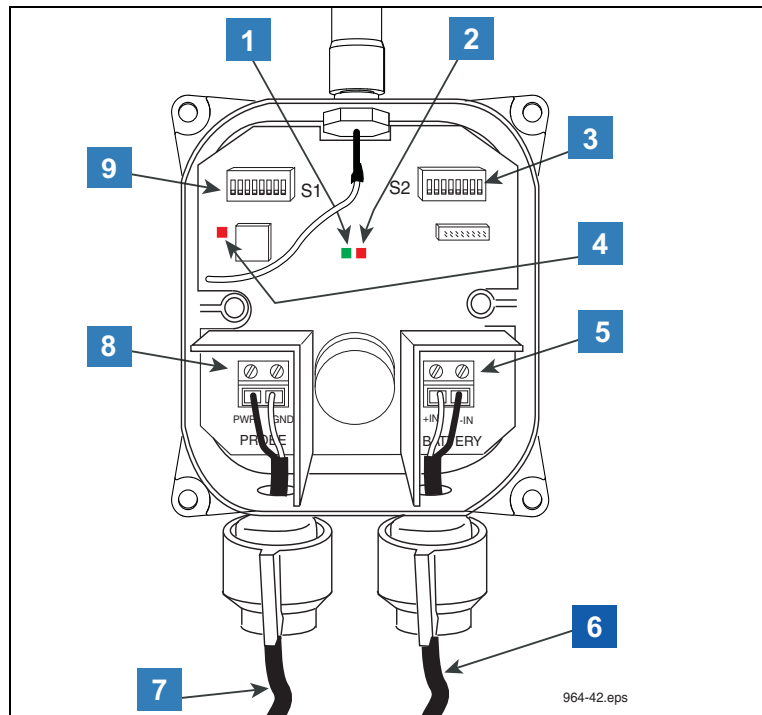


Figure 18. Wiring The Transmitter

#### LEGEND FOR NUMBERED BOXES IN Figure 18

- |  |  |
|--|--|
| 1. Green LED – Unit status.  | 6. Cable from battery or DC power source.                    |
| 2. Red LED – Radio status.   | 7. Cable from probe/sensor.                                  |
| 3. S2 DIP switch.  | 8. PROBE input terminals (PWR and GND).<br>OBSERVE POLARITY! |
| 4. Red LED – Flashes only when radio is powered on in Diagnostic Mode. | 9. S1 DIP switch.  |
| 5. BATTERY power-in terminals (+IN and –IN). Observe polarity!         |  |



**Pay close attention to the polarity of the battery input connections. Reversing the connections can cause damage to the TLS RF.**

10. To assure a water-tight seal between the cover and the enclosure, follow these steps:
  - a. Insert the four cover screws through the cover and then press on the retaining washers to hold the screws in place.
  - b. Make sure that the cover gasket is free of dirt and debris on both sides of the gasket and that the inside of the cover is clean in the gasket area.
  - c. Position the gasket into the cover groove, assuring that it is pressed fully into the groove and sitting completely flat.
  - d. Assemble the cover onto the enclosure, tightening the screws in a couple of turns each. Using an alternating 'X' pattern, continue to tighten the screws until they are all tight.
11. If you haven't done so already, attach the red battery labels from the installation kit onto the power cable below the power cord grip and at the battery pack connector or DC power source.
12. Do not attach the power cable at the battery pack or dc power source until ready to begin the "Site Startup Procedure".

## Receiver Installation

---

1. One Receiver is required per site and it is mounted in the vertical position (antenna up) on the outer wall of the same building housing the TLS RF. The Receiver is attached to its mounting bracket with #10 x 1/2" taptite screws from its install kit (see Figure 19). The L-bracket is then mounted on the outer wall of the building using appropriate fasteners (customer supplied). If the Receiver will be exposed to the weather, attach the L-bracket to the mounting surface inside a weatherproof enclosure. This enclosure is not required when mounting the Receiver under a roof overhang and shielded from the weather.

NOTE: When locating the mounting position, keep in mind that the RS-485 cable connecting the Receiver to the TLS RF must be less than 250 feet in length. Avoid placing the Receiver near motors (e.g., power roof vents), fluorescent lighting (min. 1 foot separation), pumps, welders.

Locate the Receiver on the same side of the building as the transmitters. If additional transmitters are either too far away or on the opposite side of the building, the Repeater can be located either on a structure near the remote transmitter(s) or on the opposite side of the building facing those transmitter(s) - see Repeater installation.



### **The Receiver is only suitable for use in a non-hazardous location.**

2. Run the RS-485 cable (Belden #3107A or equiv.) from the TLS RF through the building's wall to the Receiver. Caulk the cable where it passes through wall openings. Use cable clamps at appropriate intervals to secure the cable to the walls.
3. Note that the Receiver cover label indicates the cord grip to be used for the RS-485 cable from the TLS RF and the cable to the Repeater (if used). Remove the cover of the Receiver and set it aside.
4. Set S1 and S2 DIP settings as desired (ref. Appendix B, Figure B-2). NOTE: set all dip switches prior to attaching the TLS RF RS-485 cable as the dip switches are only read during power up.
5. Slide the nut over the cable. Choose the correct size bushing and slide it over the cable. Dress the cable jacket according to the dimensions in Figure 17. Insert the cable into the appropriate opening at the bottom of the housing. Insert each wire into the appropriate terminal and tighten. Leave a small amount of slack in each wire. Slide the bushing into the bottom of the housing. Hand tighten the nut.
6. Note that there are two twisted pair color-coded wires in the cable (e.g., a white with blue stripe and blue with white stripe pair and a white with orange strip and orange with white stripe pair). One of the pairs is for RS-485 communication (- & + terminals) and the other pair is for Receiver power (+15 Vdc & Gnd). Using Figure 20 as a guide, attach the wires of the two twisted pairs to the RS-485 terminals.

Record which wire attaches to each terminal to help you attach the other end of that wire to the identically marked terminal in the TLS RF.

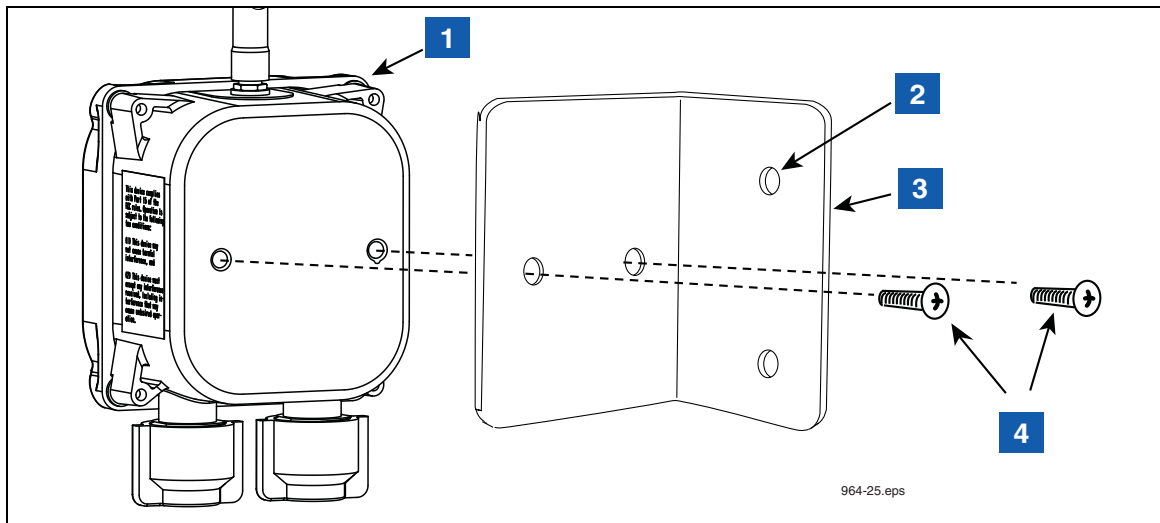


Figure 19. Attaching Mounting Bracket To Receiver Or Repeater

#### LEGEND FOR NUMBERED BOXES IN Figure 19

- |   |                              |
|---|------------------------------|
| 1. Receiver or Repeater   | 4. #10 x 1/2" taptite screws |
| 2. 0.280" diameter hole (2) – mount this narrow side of bracket to wall or post |                              |
| 3. Mounting bracket.  |                              |

7. Referring to your connection notes in step 5 above, connect the other end of the RS-485 cable to the RS-485 terminal block in the TLS RF (ref. Figure 7 on page 16).
8. If a Repeater is used and powered by the Receiver, push the two wire power cable (to Repeater) through the +15 Vdc cord grip of the Receiver (item 7 in Figure 20).
9. Slide the nut over the cable. Choose the correct size bushing and slide it over the cable. Dress the cable jacket according to the dimensions in Figure 17. Insert the cable into the appropriate opening at the bottom of the housing. Insert each wire into the appropriate terminal and tighten. Leave a small amount of slack in each wire. Slide the bushing into the bottom of the housing. Hand tighten the nut.
10. Attach the dc power cable (white to +15 Vdc and black to GND) to the Repeater terminal block (item 9 in Figure 20).



#### 11. Hand tighten both cable entry cord grip nuts to prevent water entry!

12. To assure a water-tight seal between the cover and the enclosure, follow these steps:
  - a. Insert the four cover screws through the cover and then press on the retaining washers to hold the screws in place.
  - b. Make sure that the cover gasket is free of dirt and debris on both sides of the gasket and that the inside of the cover is clean in the gasket area.
  - c. Position the gasket into the cover groove, assuring that it is pressed fully into the groove and sitting completely flat.
  - d. Assemble the cover onto the enclosure, tightening the screws in a couple of turns each. Using an alternating 'X' pattern, continue to tighten the screws until they are all tight.

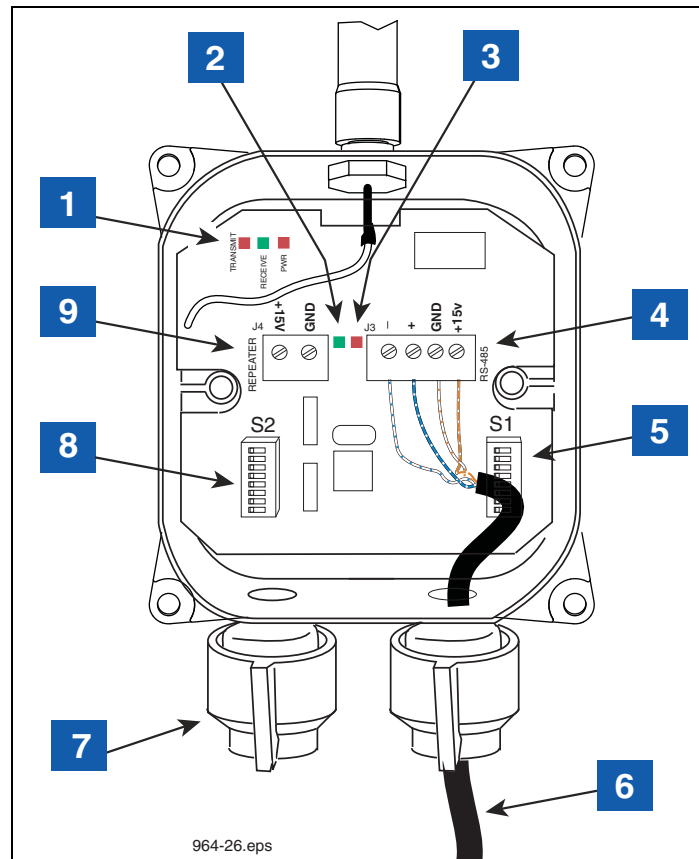


Figure 20. Wiring The Receiver

**LEGEND FOR NUMBERED BOXES IN Figure 20**

1. RS-485 Comm Activity:
  - XMIT (Red) LED – flashes when message transmitted to TLS-RF
  - RCV (Green) LED – flashes when message received from TLS-RF
  - PWR (Red) LED – Receiver power on indicator
2. Green LED – Unit status
3. Red LED – Radio status
4. Connect the color pairs of the RS-485/power cable to the same RS-485 terminals in both the Receiver and the master TLS RF (ref. “Connecting RS-485 Wiring” on page 17).
5. S1 DIP switch
6. RS-485 cable - Maximum cable length is 500 feet if a communication grade cable is used.

7. A solid bushing must be installed to seal the Receiver when this cord grip is unused. In sites where a Repeater is powered from the Receiver, the Repeater’s power cable enters through this cord grip and attaches to the Repeater terminal block (item 9).



**HAND TIGHTEN BOTH CABLE ENTRY CORD GRIP NUTS TO PREVENT WATER ENTRY!**

8. S2 DIP switch
9. +15 Vdc power source for the Repeater. If used, connect two wires from item 9 connector in Receiver to item 7 connector in Repeater, see Figure 21.



**Pay close attention to the polarity of the +15 Vdc and GND wires used as Repeater power source. Reversing these connections can cause damage to the TLS RF.**

## Repeater Installation

---

1. Use of a single repeater is optional but may improve system performance when installed correctly. The Repeater should be located closer to the device transmitters to rebroadcast messages to the Receiver. Use the 15 Vdc power source provided in the Receiver to power the Repeater, or use a customer supplied non-interruptible, Class 2, 15 Vdc power source. The most common method of powering the Repeater power is to use the Repeater power terminal block J4 in the Receiver (see item 9 in Figure 20).

When device transmitters are on the opposite side of the building from the Receiver, the Repeater should be mounted on the side of the building facing those transmitters. Mount the Repeater with its transmitter antenna in the up or vertical orientation.

2. The Repeater is attached to its mounting bracket with #10 x 1/2" taptite screws from its install kit (ref. Figure 19 on page 30). The L-bracket is then attached to the outer wall of the building using appropriate fasteners (customer supplied). If the Repeater will be exposed to the weather, attach the L-bracket to the mounting surface inside a weatherproof enclosure. This enclosure is not required when mounting the Repeater under a roof overhang and shielded from the weather.



**The Repeater is only suitable for use in a non-hazardous location.**

3. Set S1 and S2 as desired (refer to Appendix B). NOTE: set all dip switches prior to connecting the +15 Vdc power cable as the dip switches are only read during power up.
4. Note the cover of the Repeater indicates the cord grip to be used for the cable connecting the Repeater to its dc power source (item 5 in Figure 21). Remove the cover of the Repeater and set it aside.
5. Slide the nut over the cable. Choose the correct size bushing and slide it over the cable. Dress the cable jacket according to the dimensions in Figure 17. Insert the cable into the appropriate opening at the bottom of the housing. Insert each wire into the appropriate terminal and tighten. Leave a small amount of slack in each wire. Slide the bushing into the bottom of the housing. Hand tighten the nut.
6. Connect the 2-wire dc power cable to the Repeater terminal block, white to +15 Vdc and black to GND (see item 7 in Figure 21).



**7. Hand tighten both cable entry cord grip nuts to prevent water entry!**

8. To assure a water-tight seal between the cover and the enclosure, follow these steps:
  - a. Insert the four cover screws through the cover and then press on the retaining washers to hold the screws in place.
  - b. Make sure that the cover gasket is free of dirt and debris on both sides of the gasket and that the inside of the cover is clean in the gasket area.
  - c. Position the gasket into the cover groove, assuring that it is pressed fully into the groove and sitting completely flat.
  - d. Assemble the cover onto the enclosure, tightening the screws in a couple of turns each. Using an alternating 'X' pattern, continue to tighten the screws until they are all tight.
9. The other end of the Repeater's dc power cable connects to the Receiver's +15 Vdc output terminal (ref. item 9 in Figure 20), or to a non-interruptible, Class 2, 15 Vdc power source.

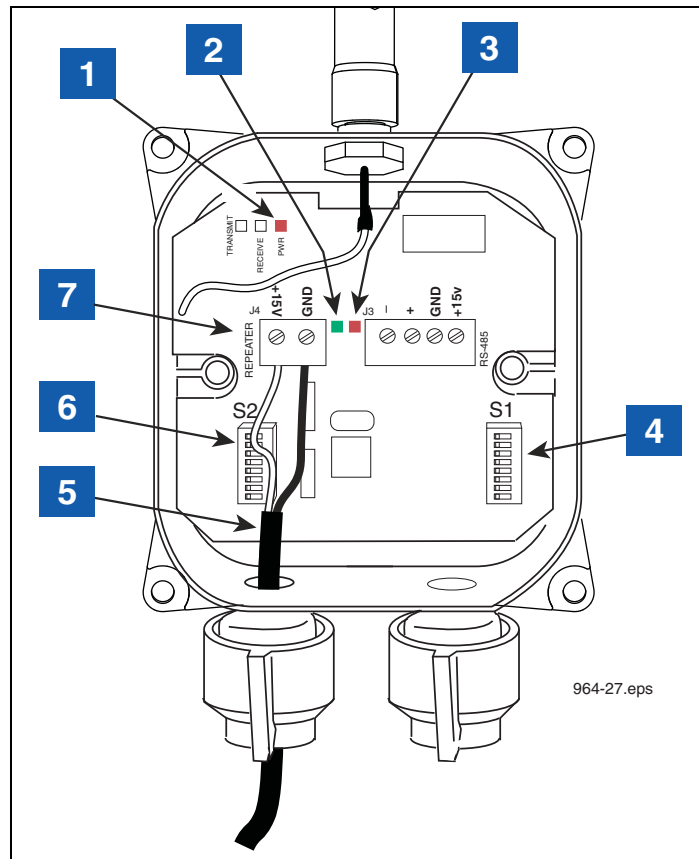


Figure 21. Wiring The Repeater

**LEGEND FOR NUMBERED BOXES IN Figure 21**

- 1. Red LED – on when power is applied.
- 2. Green LED – Unit status
- 3. Red LED – Radio status
- 4. S1 DIP switch
- 5. DC Power input cable (from Receiver [item 9 connector - see Figure 20], or dc power source)

- 6. S2 DIP switch
- 7. DC power input terminals - +15 Vdc and ground



**Pay close attention to the polarity of the +15 Vdc and GND wires from the Receiver or DC power source. Reversing these connections can cause damage to the TLS RF.**



# Network Setup

## Hardware Overview

An example TLS RF Wireless System site network illustrating a 32 Transmitter configuration is shown in Figure 22. The maximum number of Transmitters permissible in a site is 32 (requires 4 TLS RFs).

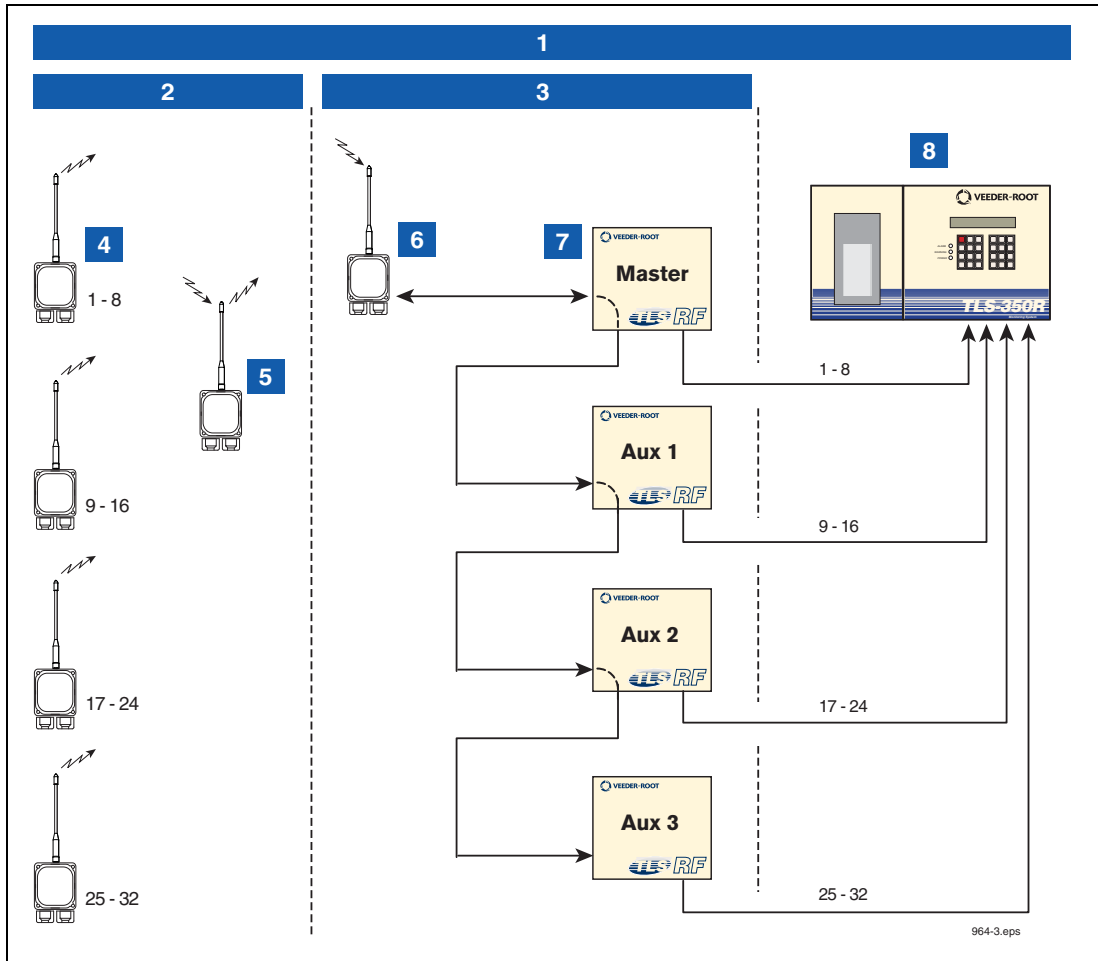


Figure 22. Example Site Network Diagram

### LEGEND FOR NUMBERED BOXES IN Figure 22

- |                     |  |
|---------------------|--|
| 1. Site Network     | 5. Repeater                                |
| 2. Wireless network | 6. Receiver                                |
| 3. VR bus           | 7. TLS RF, one required per 8 Transmitters |
| 4. Transmitters     | 8. TLS console                             |

## Identifying Devices in the TLS RF Wireless Site Network

The Site ID must be identical for all Transmitters, the Repeater, and the Receiver in the site's wireless network. Each Transmitter in the site's wireless network must have a unique Device Number (from 1 – 32). Each TLS RF in the site's network must have a unique Device Number (Master at 0 and Auxiliaries at 1, 2, and/or 3).

All Device Numbers are entered using DIP switches located in each device and are entered in each device before it is installed.

Making up a site network worksheet before actually setting device DIP switches or connecting signal wires will help prevent mistakes when entering Site IDs/Device Numbers or making wiring connections between the TLS RF(s) and the TLS console.

## Entering Device Numbers for the Site Network

### TRANSMITTER DEVICE NUMBER

Each of the transmitters must have a unique Device Number (1 – 32). Enter this number by setting DIP switches 4 – 8 on S1 (see Figure 18 on page 28) in the 'off' position or 'on' position as shown below.

Device Number	S1 DIP Switch Settings					Device Number	S1 DIP Switch Settings				
	4	5	6	7	8		4	5	6	7	8
1	off	off	off	off	on	17	on	off	off	off	on
2	off	off	off	on	off	18	on	off	off	on	off
3	off	off	off	on	on	19	on	off	off	on	on
4	off	off	on	off	off	20	on	off	on	off	off
5	off	off	on	off	on	21	on	off	on	off	on
6	off	off	on	on	off	22	on	off	on	on	off
7	off	off	on	on	on	23	on	off	on	on	on
8	off	on	off	off	off	24	on	on	off	off	off
9	off	on	off	off	on	25	on	on	off	off	on
10	off	on	off	on	off	26	on	on	off	on	off
11	off	on	off	on	on	27	on	on	off	on	on
12	off	on	on	off	off	28	on	on	on	off	off
13	off	on	on	off	on	29	on	on	on	off	on
14	off	on	on	on	off	30	on	on	on	on	off
15	off	on	on	on	on	31	on	on	on	on	on
16	on	off	off	off	off	32	off	off	off	off	off

964-43.eps

## TLS RF DEVICE NUMBER

Each TLS RF in the site network must have a unique Device Number (0 – 3). You must select 0 if it is the only TLS RF in the site, or if it is the TLS RF in a site with multiple TLS RFs that is monitoring the first Device Set (transmitters 1 – 8). You would enter a 1 for the TLS RF monitoring the second Device Number (transmitters 9 – 16), etc. The site's receiver must also be connected to the TLS RF having Device Number '0'. The factory default setting is '0'.

Enter this number by setting DIP switches 1 and 2 on S2 (see Figure 12 on page 21) in the 'off' position or 'on' position as shown below.

Transmitter Device Number	TLS RF Device Number	S2 DIP switch Settings		TLS RF
		1	2	
1-8	0	off	off	Master
9-16	1	off	on	AUX 1
17-24	2	on	off	AUX 2
25-32	3	on	on	AUX 3

964-48.eps

## Entering the Site ID Number

All of the site's Transmitters, Repeater and Receiver must have the same Site ID number (0 – 15) entered in S2 DIP switches 5 - 8 (see settings below). The TLS RF does not require a Site ID. The factory default Site ID number for all components is set to 0.

NOTE: You must change the factory set Site ID when another site is nearby. Adjoining sites will experience data reception 'crosstalk' if both are left at the same number.

Site ID Number	S2 DIP switch Settings				Site ID Number	S2 DIP switch Settings			
	5	6	7	8		5	6	7	8
0	off	off	off	off	8	on	off	off	off
1	off	off	off	on	9	on	off	off	on
2	off	off	on	off	10	on	off	on	off
3	off	off	on	on	11	on	off	on	on
4	off	on	off	off	12	on	on	off	off
5	off	on	off	on	13	on	on	off	on
6	off	on	on	off	14	on	on	on	off
7	off	on	on	on	15	on	on	on	on

964-49.eps

## Site Startup Procedure

---

Depending on the site layout, it is permissible to install RF devices in a variety of locations including dispensers and containment sumps. After all the wireless equipment has been installed, follow the steps below to verify the final setup. For transmitters installed in Dispensers, do not close the dispenser's cover after installing the Transmitter in case signal strength is a problem. Close the dispenser's cover only after the Transmitter passes a second verification process.

1. Turn on power to the TLS RF(s) and leave the covers open.
2. Go to the first Transmitter and connect the power cable to its power source.
3. At the TLS RF you should see one of the 8 red LEDs flashing (item 5 in Figure 12). This is an indication the transmission from the Transmitter is being received. If it is, go to Step 2a. If one of the 8 LEDs is not flashing go to Step 2b.
  - a. Go back to the Transmitter, and if applicable, replace the dispenser's cover. Return to the TLS RF and verify that the same LED is still flashing.
    - i. If it is, disconnect the battery cable from the battery pack and repeat Step 1 on the next Transmitter.
    - ii. If it is not, the Receiver is not picking up the Transmitter's signal. Go back to the Transmitter; remove the dispenser's cover, reorient the antenna or lower the Transmitter, then go back to the TLS RF to verify that the same LED is flashing.
    - iii. If reorienting the antenna or moving the Transmitter doesn't help, disconnect the battery cable from the battery pack and make a note that the signal is not being received at this particular dispenser.
    - iv. Repeat Step 1 with the next Transmitter.
  - b. If applicable, go back to the dispenser, remove the Transmitter's cover; the green LED (item 2 in Figure 5) should be flashing indicating that the sensor is being read. If the green LED is not flashing, check the sensor cable's wiring connections. If the wiring is correct, check Site ID. If it is correct, it means either the Transmitter is bad or there is a problem with the sensor, disconnect the battery cable from the battery pack and continue to Step 1 with the next Transmitter.
4. After verifying that each Transmitter is being received at the TLS RF(s), go around to each Transmitter; reconnect the Transmitters' battery cable to the battery pack. Replace dispenser's cover as appropriate. Go to the TLS console and configure all site sensors. Check for any comm alarms. If none are observed, the startup is complete.

NOTE: If some Transmitters are not being received at the TLS RF, relocating the Receiver and/or the Repeater may improve reception.

## Initial TLS Console Setup Procedure

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**CAUTION! Failure to follow your applicable startup procedure will result in the probes/sensors not being recognized.**

- **Sites with a New TLS-450/, TLS4 or TLS-XB Only**
  1. Power up all wireless devices.
  2. Power up the TLS RF console and wait about 5 minutes.
  3. Power up the TLS-450 console and wait 5 minutes until the device 'Discover Mode' is Complete.
- **Sites with all Other TLS Consoles**
  1. Power up all wireless devices
  2. Power up both the TLS and TLS RF consoles.

# Diagnostics

## Alarms

---

During normal operation when the TLS Console and monitored PMC and ISD System are functioning properly and no warning or alarm conditions exist, the “ALL FUNCTIONS NORMAL” message will appear in the system status area of the console display. Regardless of the TLS Console in use at this site, record the software part number as well as the software revision.

There is an additional alarm, Battery Status (TLS-350 only), when wireless equipment is used in place of wires. ISD, PMC and Smart Sensor warnings and alarm are the same. If a warning or alarm condition occurs as a result of a failure in the wireless communication hardware the system displays the communication failure for the effected Smart Sensor. If more than one condition exists, the display will alternately flash the appropriate messages. The system automatically prints an alarm report showing the warning or alarm type, its location and the date and time the warning or alarm condition occurred.

Any break in link between transmitter and sensor, or between TLS and TLS RF results in Communication Alarm. All other alarms related to individual sensor types, such as sensor fault alarm, are supported as they are with a wired system. When the Sensor Transmitter has determined the communication with the RF box has failed it will command the Vapor Valve to close. The valve will remain closed until an open command is sent (from the TLS) after communication is reestablished.

## Battery Diagnostics

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You can get the battery status from the TLS-350 (with software Version 30A or higher). The battery status is displayed for the wireless sensors, from the Smart Sensor Diagnostics (see Figure 23). The wireless sensors's battery status can also be printed from that screen.

The battery status for the wireless sensors is reported as Full, Medium, Low or Replace.

- Full: greater than or equal to 3.4 Volts
- Medium Range: 3.2V to 3.4 Volts
- Low range: 3.0V to 3.2V
- Replace: Below 3.0V

When the Smart Sensor battery reports a status 'Replace' continuously for 24 hours, a Smart Sensor warning will be posted on the TLS to alert the operator that the battery requires replacement. The warning will persist in the TLS until the battery reports 'Medium' or 'Full'. The alarm will clear at that time. This is a low priority TLS warning which will sound the beeper, flash the yellow warning light, post on the two line display, print on the printer and be recorded in the non-priority alarm history. The warning can be accessed remotely and be reported remotely similar to all TLS warnings and alarms. This warning will not appear in the ISD or PMC reports (only sensor failures are recorded in the ISD and PMC reports).

## WIRELESS SENSOR DIAGNOSTIC MENU (TLS-350 CONSOLES)

The Battery Status for all wireless Smart Sensors will be displayed in the menu after the Serial Number (see Figure 23).

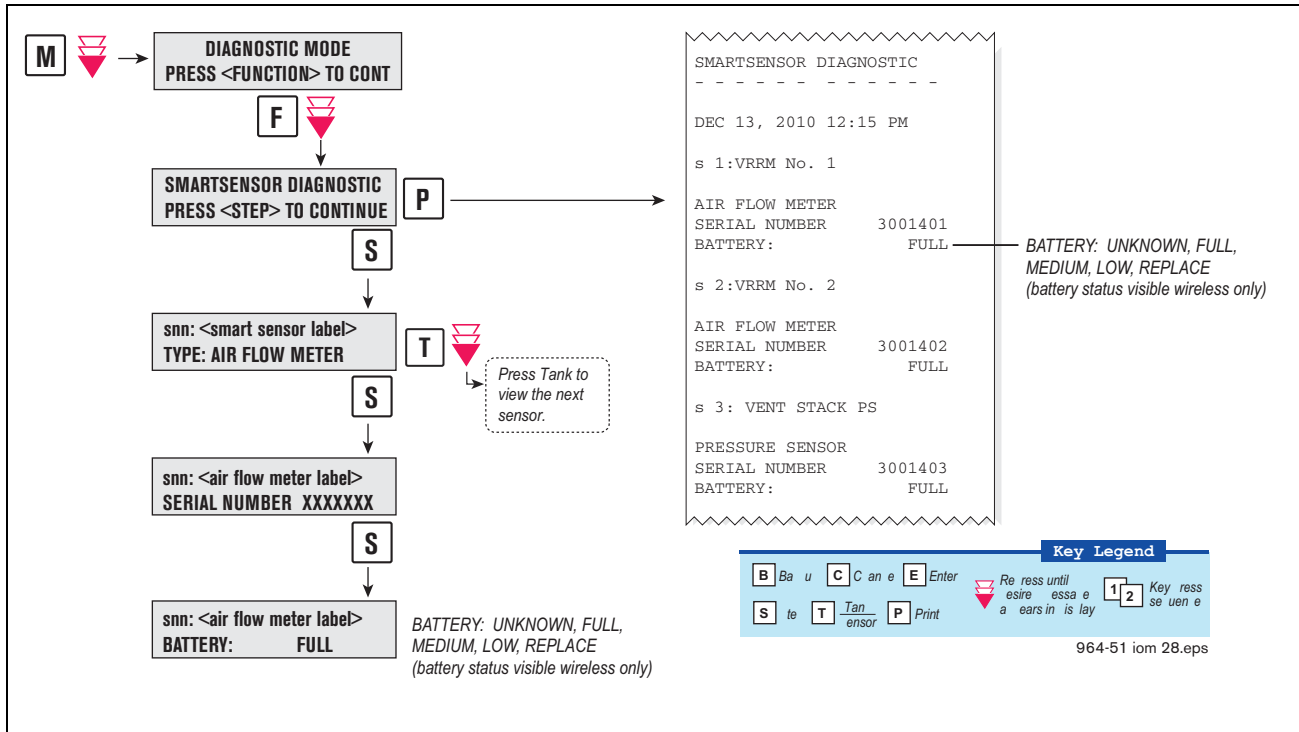


Figure 23. Device Battery Status In TLS-350 SmartSensor Diagnostic Menu

## Appendix A: Regulatory Information

### Federal Communications Commission Notice

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio or television technician for help.

### MODIFICATIONS

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Veeder-Root Company may void the authority to operate the equipment.

### CABLES

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

### DECLARATION OF CONFORMITY FOR PRODUCTS MARKED WITH THE FCC LOGO—UNITED STATES ONLY

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding your product, contact:

Veeder-Root Company  
125 Powder Forest Drive  
Simsbury, CT 06070  
Or, call 1-800-323-1799

For questions regarding this FCC declaration, contact:

Veeder-Root Company  
125 Powder Forest Drive  
Simsbury, CT 06070  
Or, call 1-800-323-1799

To identify this product, refer to the Part, Series, or Model number found on the product.

## Canadian Notice

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This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

### AVIS CANADIEN

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## Battery Warning

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**WARNING: The TLS RF Wireless System Battery Pack contains lithium batteries. To reduce the risk of fire or burns, do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.**



Because of the type of batteries used in TLS RF Wireless System, follow local regulations regarding the safe disposal of the battery. Consult Appendix D of this manual for more information on battery disposal.

## Wireless Notices

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In some environments, the use of wireless devices may be restricted. Such restrictions may apply aboard airplanes, in hospitals, near explosives, in hazardous locations, etc. If you are uncertain of the policy that applies to the use of this device, please ask for authorization to use it prior to turning it on.

## U.S. Regulatory Wireless Notice

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**WARNING: Exposure to Radio Frequency Radiation. The radiated output power of this device is below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized. To avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna should be minimized.**

## Canadian Regulatory Wireless Notice

---

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. The term "IC:" before the certification/registration number only signifies that the Industry Canada technical specifications were met.

## System Specifications

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Note: Not all models described are available in all regions.



# Appendix B: Device DIP Switch Settings

## TLS RF Number Settings

The Dip Switch Locations to set the unique Device number for the TLS RF(s) are shown in the Figure B-1. The TLS RF that monitors the Receiver and Transmitter IDs 1 - 8 is considered the site's master TLS RF and must have its Device ID set to 0 (default).

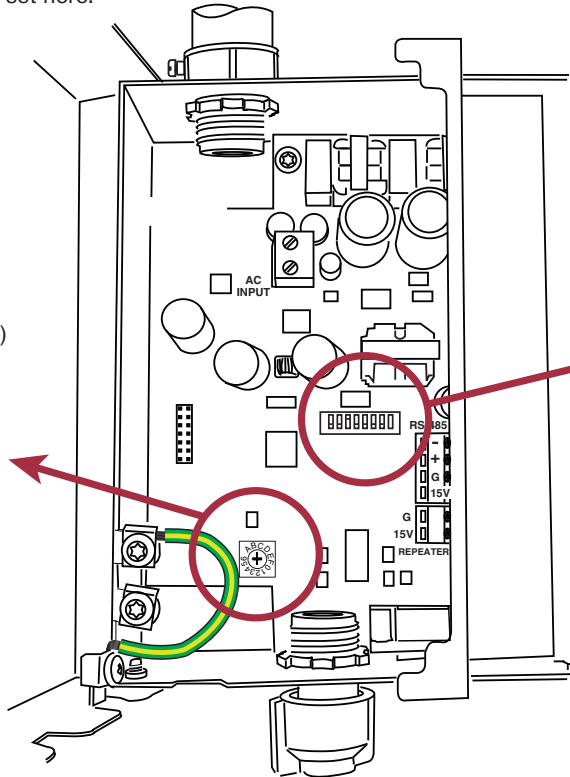


**CAUTION:** Setting the Device Timeout delay to less than 10 minutes may result in Device Out errors since the transmitter's transmit time intervals are programmable and may have been set to a value greater than the Device Timeout you set here.

### TLS RF

Device Timeout  
(Time to Comm alarm)

Sw Pos	Delay
0	5 m
1	10 m (default)
2	15 m
3	20 m
4	30 m
5	45 m
6	60 m
7	90 m
8	2 h
9	3 h
A	4 h
B	6 h
C	8 h
D	12 h
E	18 h
F	24 h



S2



TLS RF Device ID  
0 = Master

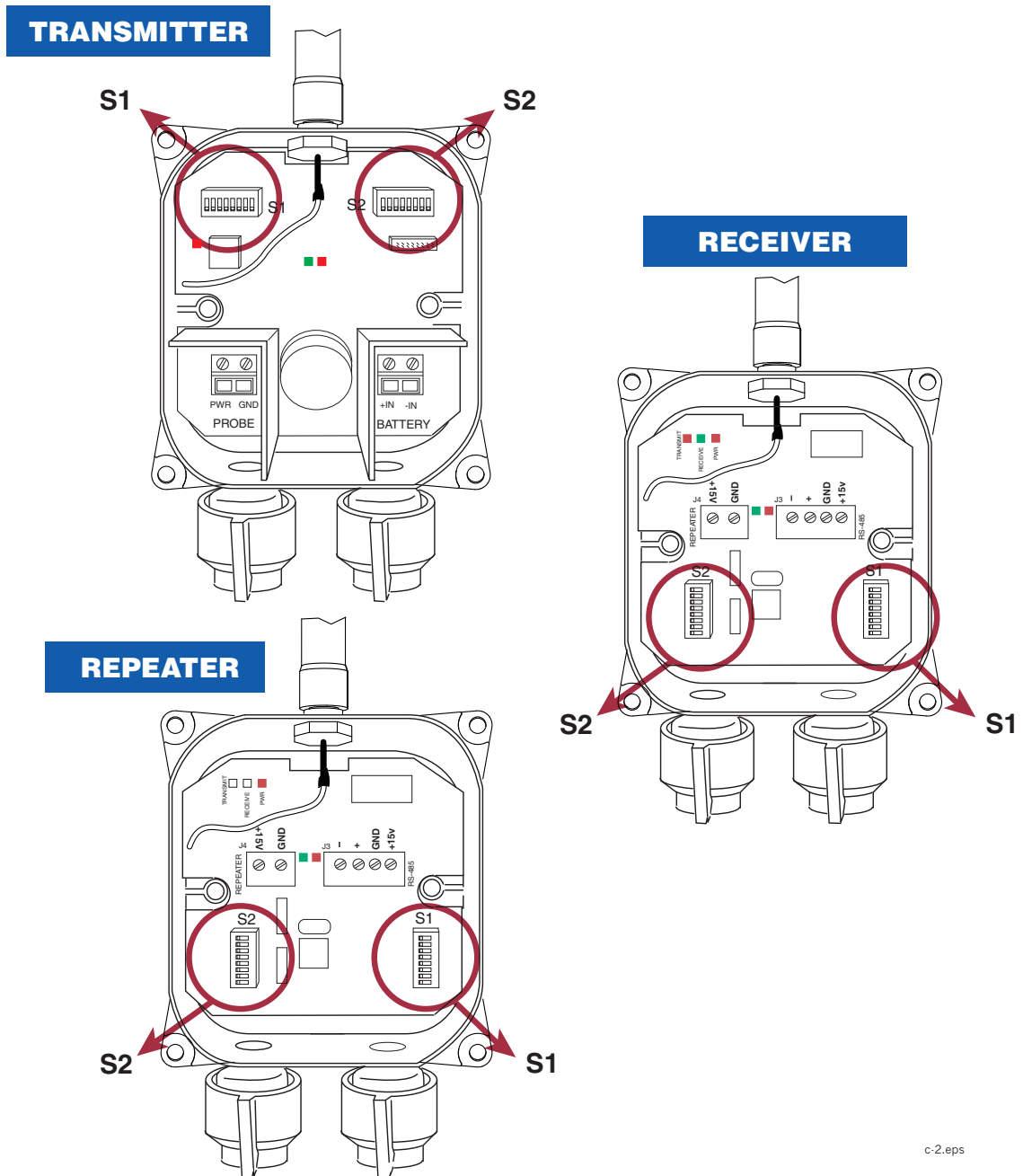
Device ID	Sw1	Sw2	Transmitter IDs
0 (Master)	off	off	1 - 8
1 (Aux 1)	off	on	9 - 16
2 (Aux 2)	on	off	17 - 24
3 (Aux 3)	on	on	25 - 32

964 b-1arb.eps

Figure B-1. TLS-RF switch settings

## Transmitter/Receiver/Repeater DIP Switch Settings

DIP switch locations for the Transmitter, Receiver and Repeater are shown in Figure B-2. Device DIP switch settings for these devices are listed in Figure B-3 through Figure B-6 (use the appropriate settings for your software version 1 or 3).



c-2.eps

Figure B-2. DIP switch settings

All Wireless 2 (W2) Transmitters			
S1: Positions			Function
1	2	3	
OFF	OFF	OFF	Enable Transmitter

c-3.eps

Figure B-3. S1: DIP switch positions 1-3 – (W2) All Devices

All Wireless 2 (W2) Transmitters								
S1: Positions					TRANSMITTER			
4	5	6	7	8	Device Number			
OFF	OFF	OFF	OFF	ON	1 (Master TLS-RF Device 1)		Master TLS RF	
OFF	OFF	OFF	ON	OFF	2 (Master TLS-RF Device 2)		Connects to	
OFF	OFF	OFF	ON	ON	3 (Master TLS-RF Device 3)		Receiver	
OFF	OFF	ON	OFF	OFF	4 (Master TLS-RF Device 4)			
OFF	OFF	ON	OFF	ON	5 (Master TLS-RF Device 5)			
OFF	OFF	ON	ON	OFF	6 (Master TLS-RF Device 6)			
OFF	OFF	ON	ON	ON	7 (Master TLS-RF Device 7)			
OFF	ON	OFF	OFF	OFF	8 (Master TLS-RF Device 8)			
OFF	ON	OFF	OFF	ON	9 (Aux 1 TLS-RF Device 1)		Aux 1 is the second	
OFF	ON	OFF	ON	OFF	10 (Aux 1 TLS-RF Device 2)		TLS RF Console	
OFF	ON	OFF	ON	ON	11 (Aux 1 TLS-RF Device 3)			
OFF	ON	ON	OFF	OFF	12 (Aux 1 TLS-RF Device 4)			
OFF	ON	ON	OFF	ON	13 (Aux 1 TLS-RF Device 5)			
OFF	ON	ON	ON	OFF	14 (Aux 1 TLS-RF Device 6)			
OFF	ON	ON	ON	ON	15 (Aux 1 TLS-RF Device 7)			
ON	OFF	OFF	OFF	OFF	16 (Aux 1 TLS-RF Device 8)			
ON	OFF	OFF	OFF	ON	17 (Aux 2 TLS-RF Device 1)		Aux 2 is the third	
ON	OFF	OFF	ON	OFF	18 (Aux 2 TLS-RF Device 2)		TLS RF Console	
ON	OFF	OFF	ON	ON	19 (Aux 2 TLS-RF Device 3)			
ON	OFF	ON	OFF	OFF	20 (Aux 2 TLS-RF Device 4)			
ON	OFF	ON	OFF	ON	21 (Aux 2 TLS-RF Device 5)			
ON	OFF	ON	ON	OFF	22 (Aux 2 TLS-RF Device 6)			
ON	OFF	ON	ON	ON	23 (Aux 2 TLS-RF Device 7)			
ON	ON	OFF	OFF	OFF	24 (Aux 2 TLS-RF Device 8)			
ON	ON	OFF	OFF	ON	25 (Aux 3 TLS-RF Device 1)		Aux 3 is the fourth	
ON	ON	OFF	ON	OFF	26 (Aux 3 TLS-RF Device 2)		TLS RF Console	
ON	ON	OFF	ON	ON	27 (Aux 3 TLS-RF Device 3)			
ON	ON	ON	OFF	OFF	28 (Aux 3 TLS-RF Device 4)			
ON	ON	ON	OFF	ON	29 (Aux 3 TLS-RF Device 5)			
ON	ON	ON	ON	OFF	30 (Aux 3 TLS-RF Device 6)			
ON	ON	ON	ON	ON	31 (Aux 3 TLS-RF Device 7)			
OFF	OFF	OFF	OFF	OFF	32 (Aux 3 TLS-RF Device 8)			

c-4.eps

Figure B-4. S1: DIP switch positions 4-8 – (W2) All Devices

Wireless 2 (W2) Vapor Flowmeter					
S2: Positions				Transmitter Interval in Seconds	
1	2	3	4	Read	TX
OFF	ON	OFF	OFF	32	32

\* →

\* = Required settings

c-9.eps

Figure B-5. S2: DIP switch positions 1-4 – (W2) Vapor Flow Meter

Wireless 2 (W2) Transmitters, Receiver and Repeater (All Site ID settings must be the same)						
S2: Positions				TRANSMITTER	REPEATER <sup>1</sup>	RECEIVER <sup>1</sup>
5	6	7	8	Site ID	Site ID	Site ID
OFF	OFF	OFF	OFF	0	0	0
OFF	OFF	OFF	ON	1	1	1
OFF	OFF	ON	OFF	2	2	2
OFF	OFF	ON	ON	3	3	3
OFF	ON	OFF	OFF	4	4	4
OFF	ON	OFF	ON	5	5	5
OFF	ON	ON	OFF	6	6	6
OFF	ON	ON	ON	7	7	7
ON	OFF	OFF	OFF	8	8	8
ON	OFF	OFF	ON	9	9	9
ON	OFF	ON	OFF	10	10	10
ON	OFF	ON	ON	11	11	11
ON	ON	OFF	OFF	12	12	12
ON	ON	OFF	ON	13	13	13
ON	ON	ON	OFF	14	14	14
ON	ON	ON	ON	15	15	15

c-10.eps

<sup>1</sup> Set all remaining dip switches (S2 1-4 and S1 1-8) to OFF for both the Repeater and Receiver.

Figure B-6. S2: DIP switch positions 5-8 – (W2) All Devices

## Appendix C: Lithium Battery Safety Data

This appendix contains the manufacturer supplied Transportation Certificate and Material Safety Data Sheet for the lithium batteries used in the TLS RF Wireless 2 (W2) System.

### **Lithium Battery Disposal Considerations**

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1. Waste disposal must be in accordance with the applicable regulations.
2. Disposal of the Lithium batteries should be performed by permitted, professional disposal firms knowledgeable in Federal, State or Local requirements of hazardous waste treatment and hazardous waste transportation.
3. Incineration should never be performed by battery users, but by trained professionals in an authorized facility with proper gas and fume containment.
4. Recycling of battery can be done in authorized facility, through licensed waste carrier.



## TRANSPORTATION CERTIFICATE

Ref. TC-LS 33600 11/2008- 87

This is to certify that the Saft cell type, **LS 33600**, has been subjected and has met the requirements of the UN Recommendations on the Transport of Dangerous Goods, Part III, sub-section 38.3, Manual of Tests and Criteria, 4<sup>th</sup> Revised edition - 2003 - Ref. ST/SG/AC.10/11/Rev. 4), as detailed in Saft-Poitiers internal reports P 0256/03, dated 06/2003.

### Concerned Part Numbers

All the part numbers relative to single LS 33600 cells, whatever their finish mode (with and without end-tabs or wiring and connector assemblies, etc.)

### Product Description

Primary (non-rechargeable), Lithium-Thionyl Chloride (Li-SOCl<sub>2</sub>) D-sized single cell

Nominal Voltage	3.6 Volts
Nominal Capacity	17.0 Ah
Lithium metal content	4.5 grams
Nominal energy	17.0 x 3.6 = 61.2 Wh
Maximum recommended continuous discharge current	250 mA

### Product Classification

#### Worldwide, besides the United States of America

Since it passes the UN-defined transport tests but because its lithium content is above the 1 gram limit, the **LS 33600 individual cell, in all of its finish versions, according to the current UN Recommendations on the Transport of Dangerous Goods - Model regulations, is declared non-exempt from the Dangerous Goods Regulations. It is restricted to transport/ assigned to Class 9, and must be packed in accordance with the relevant packing instructions of the applicable Handbooks and Codes issued by the bodies (IATA-ICAO, IMO, ADR, US-DOT, etc.) in charge of regulating the transportation of dangerous goods.**

#### Within the United States of America

The U.S. DOT CFR 49 Regulations, Parts 171, 172, 173 and 175, are governing the transportation of lithium cells and batteries. Special Provision 188 (in Part 172.102) **defines the LS 33600 single lithium metal cell, in all of its finished versions, as belonging to the "medium primary lithium cell" category, and details the requirements to be met for the different transportation conditions.**

### Signed on Behalf of Saft, Specialty Battery Group

Pascal Hans                      SBG Quality Manager

dated 23/11/08

Alain Kerouanton                SBG Lithium Product Manager

dated 23/11/2008

**Specialty Battery Group – Rue Georges Leclanché BP 1039 – 86060 Poitiers Cedex 09 – France**



## Material/Product Safety Data Sheet (MSDS-PSDS)

LS/LSG/LSH/LST/LSX products	Lithium/Thionyl chloride single cells and multi-cell battery packs
Revision 8 Date 10/2008	



1. Identification of the Substance or Preparation and Company				
Product	Primary Lithium/Thionyl chloride unit cells and multi-cell battery packs (Li-SOCl <sub>2</sub> )			
<b>Production sites</b>	Saft Ltd. River Drive Tyne & Wear South Shields NE33 2TR – UK  Ph. :+44 191 456 1451 Fax :+44 191 456 6383	Saft Rue Georges Leclanché BP 1039 86060 Poitiers cedex 9 France  Ph. :+33 (0)5 49 55 48 48 Fax :+33 (0)5 49 55 48 50	Saft America Inc 313 Crescent Street Valdese NC 28690 – USA  Ph. :+1 828 874 4111 Fax :+1 828 874 2431	Saft Batteries Co., Ltd Zhuhai Free Trade Zone Lianfeng Road Zhuhai 519030 Guangdong Province China  Ph. : +86 756 881 9318 Fax : +86 756 881 9328
<a href="http://www.saftbatteries.com">www.saftbatteries.com</a> (section « Contact »)				
<b>Emergency contact</b> Within the USA		+1 (703) 527 3887 +1 (800) 494 9300	(CHEMTREC US Service Center)	

2. Hazards Identification
<p>Do not short circuit, recharge puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of product. Risk of fire or explosion.</p> <p>The Lithium-Thionyl chloride batteries described in this Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer.</p> <p>Under normal conditions of use, the electrode materials and liquid electrolyte they contain are not exposed to the outside, provided the battery integrity is maintained and seals remain intact. Risk of exposure only in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery container. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.</p>

3. Composition & Information on Ingredients					
Ingredient	Content	CAS No.	CHIP Classification		
Lithium (Li)	3,5-5%	7439-93-2			F; R14/15 C; R34 R14/15, R21, R22, R35, R41, R43 S2, S8, S45
Thionyl chloride (SOCl <sub>2</sub> )	40-46%	7719-09-7			C; R14, R21, R22, R35, R37, R41, R42/43 S2, S8, S24, S26, S36, S37, S45

**MSDS Li-SOCl<sub>2</sub>**  
**Rev. 8 October 2008**



Aluminum chloride anhydrous (AlCl <sub>3</sub> )	1-5%	7446-70-0			R14, R22, R37, R41, R43. S2, S8, S22, S24, S26, S36, S45
Carbon (C <sub>n</sub> )	3-4%	1333-86-4			NONE KNOWN
<i>Amount varies depending on cell size.</i>					

4. First Aid Measures	
<b>Inhalation</b>	Remove from exposure, rest and keep warm. In severe cases obtain medical attention.
<b>Skin contact</b>	Wash off skin thoroughly with water. Remove contaminated clothing and wash before reuse. In severe cases obtain medical attention.
<b>Eye contact</b>	Irrigate thoroughly with water for at least 15 minutes. Obtain medical attention.
<b>Ingestion</b>	Wash out mouth thoroughly with water and give plenty of water to drink. Obtain medical attention.
<b>Further treatment</b>	All cases of eye contamination, persistent skin irritation and casualties who have swallowed this substance or been affected by breathing its vapours should be seen by a doctor.





5. Fire Fighting Measures	
<p>CO<sub>2</sub> extinguishers or, even preferably, copious quantities of water or water-based foam, can be used to cool down burning Li-SOCl<sub>2</sub> cells and batteries, as long as the extent of the fire has not progressed to the point that the lithium metal they contain is exposed (marked by deep red flames). Do not use for this purpose sand, dry powder or soda ash, graphite powder or fire blankets. <b>Use only metal (Class D) extinguishers on raw lithium.</b></p>	
<b>Extinguishing media</b>	Use water or CO <sub>2</sub> on burning Li-SOCl <sub>2</sub> cells or batteries and class D fire extinguishing agent only on raw lithium.

6. Accidental Release Measures	
<p>Remove personnel from area until fumes dissipate. Do not breathe vapours or touch liquid with bare hands. If the skin has come into contact with the electrolyte, it should be washed thoroughly with water. Sand or earth should be used to absorb any exuded material. Seal leaking battery and contaminated absorbent material in plastic bag and dispose of as Special Waste in accordance with local regulations.</p>	





7. Handling and Storage	
<b>Handling</b>	Do not crush, pierce, short (+) and (-) battery terminals with conductive (i.e. metal) goods. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Do not mix new and used batteries. Keep batteries in non conductive (i.e. plastic) trays.
<b>Storage</b>	Store in a cool (preferably below 30°C) and ventilated area, away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 100°C may result in battery leakage and rupture. Since short circuit can cause burn, leakage and rupture hazard, keep batteries in original packaging until use and do not jumble them.
<b>Other</b>	Lithium-Thionyl chloride batteries are not rechargeable and should not be tentatively charged. Follow Manufacturers recommendations regarding maximum recommended currents and operating temperature range. Applying pressure on deforming the battery may lead to disassembly followed by eye, skin and throat irritation.

8. Exposure Controls & Personal Protection				
<b>Occupational exposure standard</b>	Compound	8hr TWA	15min TWA	SK
	Sulfur dioxide	1 ppm	1 ppm	-
	Hydrogen chloride	1 ppm	5 ppm	-
	<b>Respiratory protection</b>	In all fire situations, use self-contained breathing apparatus.		
	<b>Hand protection</b>	In the event of leakage wear gloves.		
	<b>Eye protection</b>	Safety glasses are recommended during handling.		
	<b>Other</b>	In the event of leakage, wear chemical apron.		

9. Physical and Chemical Properties	
<b>Appearance</b>	Cylindrical or prismatic shape
<b>Odour</b>	If leaking, gives off a pungent corrosive odour.
<b>pH</b>	Not Applicable
<b>Flash point</b>	Not applicable unless individual components exposed
<b>Flammability</b>	Not applicable unless individual components exposed
<b>Relative density</b>	Not applicable unless individual components exposed
<b>Solubility (water)</b>	Not applicable unless individual components exposed
<b>Solubility (other)</b>	Not applicable unless individual components exposed



10. Stability and Reactivity	
Product is stable under conditions described in Section 7.	
<b>Conditions to avoid.</b>	Heat above 100°C (150°C for the LSH 20-150 cells and the battery packs assembled from them) or incinerate. Deform. Mutilate. Crush. Pierce. Disassemble Recharge. Short circuit. Expose over a long period to humid conditions.
<b>Materials to avoid</b>	Oxidising agents, alkalis, water. Avoid electrolyte contact with aluminum or zinc.
<b>Hazardous decomposition Products</b>	Hydrogen (H <sub>2</sub> ) as well as Lithium oxide (Li <sub>2</sub> O) and Lithium hydroxide (LiOH) dust is produced in case of reaction of <i>lithium metal</i> with water. Chlorine (Cl <sub>2</sub> ), Sulfur dioxide (SO <sub>2</sub> ) and Disulfur dichloride (S <sub>2</sub> Cl <sub>2</sub> ) are produced in case of thermal decomposition of <i>thionyl chloride</i> above 140°C. Hydrochloric acid (HCl) and Sulfur dioxide (SO <sub>2</sub> ) are produced in case of reaction of <i>Thionyl chloride</i> with water at room temperature. Hydrochloric acid (HCl) fumes, Lithium oxide, (Li <sub>2</sub> O), Lithium hydroxide (LiOH) and Aluminum hydroxide (Al(OH) <sub>3</sub> ) dust are produced in case of reaction of <i>Lithium tetrachloroaluminate (LiAlCl<sub>4</sub>)</i> with water.

11. Toxicological Information	
<b>Signs &amp; symptoms</b>	None, unless battery ruptures. In the event of exposure to internal contents, corrosive fumes will be very irritating to skin, eyes and mucous membranes. Overexposure can cause symptoms of non-fibrotic lung injury and membrane irritation.
<b>Inhalation</b>	Lung irritant.
<b>Skin contact</b>	Skin irritant
<b>Eye contact</b>	Eye irritant.
<b>Ingestion</b>	Tissue damage to throat and gastro-respiratory tract if swallowed.
<b>Medical conditions generally aggravated by exposure</b>	In the event of exposure to internal contents, eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur.

12. Ecological Information	
<b>Mammalian effects</b>	None known if used/disposed of correctly.
<b>Eco-toxicity</b>	None known if used/disposed of correctly.
<b>Bioaccumulation potential</b>	None known if used/disposed of correctly.
<b>Environmental fate</b>	None known if used/disposed of correctly.

13. Disposal Considerations	
Do not incinerate, or subject cells to temperatures in excess of 100°C. Such abuse can result in loss of seal, leakage, and/or cell explosion. Dispose of in accordance with appropriate local regulations.	



14. Transport Information	
<b>Label for conveyance</b>	For the single cell batteries and multi-cell battery packs that are non-restricted to transport (non-assigned to the Miscellaneous Class 9), use lithium batteries inside label. For the single cell batteries and multi-cell battery packs which are restricted to transport (assigned to Class 9), use Class 9 Miscellaneous Dangerous Goods and UN Identification Number labels. In all cases, refer to the product transport certificate issued by the Manufacturer.
<b>UN numbers</b>	UN3090 (shipment of cells and batteries <i>in bulk</i> ) UN 3091 (cells and batteries <i>contained in equipment or packed with it</i> )
<b>Shipping names</b>	Lithium Metal Batteries
<b>Hazard classification</b>	Depending on their lithium metal content, some single cells and small multi-cell battery packs may be non- assigned to Class 9 (Refer to Transport Certificate)
<b>Packing group</b>	II
<b>Specific dispositions</b>	IATA: A45, A88, A99, P968, P969, P970 IMDG: 188, 230, 310, P903 ADR/RID: 188, 230, 310, 636, P903, P903a
<b>IMDG Code</b>	3090 (Li Batteries) 3091 (Li Batteries contained in equipment or packed with it)
<b>CAS</b>	
<b>EmS No.</b>	F-A, S-I
<b>Marine pollutant</b>	No
<b>ADR Class</b>	Class9

15. Regulatory Information			
<b>Risk phrases</b>	Lithium (Li)	R14/15  R21 R22 R35 R41 R42/43	Reacts violently with water, liberating extremely flammable gases. Harmful in contact with skin. Harmful if swallowed. Causes burns. Risk of serious damage to eye. May cause sensitization by inhalation and skin contact.
	Thionyl chloride (SOCl <sub>2</sub> )	R14 R22 R35 R37 R41 R42/43	Reacts with water. Harmful if swallowed. Causes burns. Irritating to respiratory system. Risk of serious damage to eye. May cause sensitization by inhalation and skin contact.
	Aluminum chloride anhydrous (AlCl <sub>3</sub> )	R14 R22 R37 R41 R43	Reacts with water. Harmful if swallowed. Irritating to respiratory system. Risk of serious damage to eye. May cause sensitization by skin contact.
<b>Safety phrases</b>	Lithium (Li)	S2 S8 S45	Keep out of reach of children Keep away from moisture In case of incident, seek medical attention.
	Thionyl chloride (SOCl <sub>2</sub> )	S2 S8 S24 S26  S36 S37 S45	Keep out of reach of children. Keep away from moisture. Avoid contact with skin. In case of contact with eyes, rinse immediately with plenty of water. Wear suitable protective clothing. Wear suitable gloves. In case of incident, seek medical attention.

MSDS Li-SOCl<sub>2</sub>  
Rev. 8 October 2008



	Aluminum chloride anhydrous (AlCl <sub>3</sub> )	S2 S8 S22 S24 S26  S36	Keep out of reach of children. Keep away from moisture. Do not breathe dust. Avoid contact with skin. In case of contact with eyes, rinse immediately with plenty of water. Wear suitable protective clothing.
<b>UK regulatory references</b>	Classified under CHIP		

#### 16. Other Information

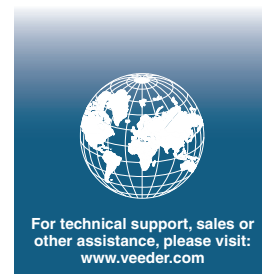
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Signature 

Alain Kerouanton  
Lithium Product Manager





# Vapor Recovery Monitoring

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Installation, Operation, and Maintenance Manual  
For use with Healy Vapor Recovery System  
*Software Version 1.2.0*

---

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## **Inspection of Materials**

Visually inspect all components for defects or damage prior to installation. If any defects or damage is found, do not use the product and contact FFS for further assistance.

## **Return Shipping Charges**

FFS will not accept shipments of returned products without a Return Goods Authorization (RGA) number. RGAs are obtained by contacting FFS's Technical Service Division — NO RGAs will be given without the unit's serial number(s). Returned goods remain the property of the buyer until replaced or repaired.

## **Contacting Franklin Fueling Systems (FFS)**

Please feel free to contact us by mail at:

Franklin Fueling Systems  
3760 Marsh Rd.  
Madison, WI 53718 USA

Or contact us by phone, fax, or email:

**Tel:** 1 608 838 8786

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**Tel:** US & Canada 1 800 225 9787

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# Contents


<b>Notice</b> .....	2
Trademarks .....	2
Inspection of Materials.....	2
Return Shipping Charges.....	2
Contacting Franklin Fueling Systems (FFS) .....	2
<b>Important Safety Messages</b> .....	4
<b>Introduction</b> .....	5
Certified Contractor Requirements .....	5
Definitions and Acronyms .....	5
Related Documents .....	5
<b>Product Description</b> .....	6
Vapor Recovery Monitoring.....	6
VRM System Specification .....	8
<b>Installation &amp; Startup</b> .....	9
TS-550/5000/EMS Console Installation.....	9
TS-VFM Installation .....	9
TS-VPS Installation.....	9
Dispenser Hook Signals.....	10
Dispenser Power Control .....	10
Dispenser Interface Module.....	11
Ullage Volume Input.....	11
<b>Setup and Programming</b> .....	12
Startup .....	12
System Status.....	12
Programming the Console for Vapor Recovery Monitoring.....	13
Data Transfer Units .....	13
Dispenser Hooks Mapping.....	13
Vapor Flow Meter Select.....	13
Vapor Pressure Sensor Select.....	13
Remote ATG Serial Port Settings.....	13
Relay Mapping .....	14
Dispenser Interface .....	14
Vapor Recovery Monitoring Setup .....	15
Managing Rules.....	16
Setting Up Email Notification .....	17
<b>System Operation</b> .....	18
Run-Time Status .....	18
Vapor Recovery Web Pages.....	18
<b>Alarms, Warnings, and Failures</b> .....	22
System Alarms .....	22
Vapor Recovery Alarms .....	22
<b>Reports &amp; Printing</b> .....	25
Creating Reports .....	25
Printing Reports .....	26
Printing VRM Report examples .....	27
<b>Maintenance</b> .....	28
General Inspection.....	28
<b>Diagnostics</b> .....	29
Pressure and Transaction Log Files .....	29
Pressure Log Files.....	29
Transaction Log files.....	30
Steps to Download Log Files .....	31
<b>INCON VRM Startup Checklist</b> .....	32
<b>Appendix A: Alarm Codes</b> .....	33





## Important Safety Messages

INCON equipment is designed to be installed in association with volatile hydrocarbon liquids such as gasoline and diesel fuel. Installing or working on this equipment means working in an environment in which these highly flammable liquids may be present. Working in such a hazardous environment presents a risk of severe injury or death if these instructions and standard industry practices are not followed. Read and follow all instructions thoroughly before installing or working on this, or any other related, equipment.


As you read this guide, please be aware of the following symbols and their meanings:


**Warning**  This symbol identifies a warning. A warning sign will appear in the text of this document when a potentially hazardous situation may arise if the instructions that follow are not adhered to closely. A potentially hazardous situation may involve the possibility of severe bodily harm or even death.


**Caution**  This is a caution symbol. A caution sign will appear in the text of this document when a potentially hazardous environmental situation may arise if the instructions that follow are not adhered to closely. A potentially hazardous environmental situation may involve the leakage of fuel from equipment that could severely harm the environment.

**Danger**  This symbol identifies an electrical danger. An electrical danger sign will appear in the text of this document when a potentially hazardous situation involving large amounts of electricity may arise if the instructions that follow are not adhered to closely. A potentially hazardous situation may involve the possibility of electrocution, severe bodily harm, or even death.

---

**Warning**  **Follow all applicable codes governing the installation and servicing of this product and the entire system. Always lock out and tag electrical circuit breakers while installing or servicing this equipment and any related equipment. A potentially lethal electrical shock hazard and the possibility of an explosion or fire from a spark can result if the electrical circuit breakers are accidentally turned on during installation or servicing. Please refer to the *Installation and Owner's Manual* for this equipment, and the appropriate documentation for any other related equipment, for complete installation and safety information.**


**Warning**  **Follow all federal, state and local laws governing the installation of this product and its associated systems. When no other regulations apply, follow NFPA codes 30, 30A and 70 from the National Fire Protection Association. Failure to follow these codes could result in severe injury, death, serious property damage and/or environmental contamination.**

**Warning**  **Always secure the work area from moving vehicles. The equipment in this manual is usually mounted underground, so reduced visibility puts service personnel working on this equipment in danger from moving vehicles entering the work area. To help eliminate these unsafe conditions, secure the area by using a service truck to block access to the work environment, or by using any other reasonable means available to ensure the safety of service personnel.**

**Warning**  **When the console system is used to monitor tanks containing gasoline or other flammable substances, you may create an explosion hazard if you do not follow the requirements in this manual carefully.**

**Warning**  **All wiring must enter the console's enclosure through the designated knockouts. An explosion hazard may result if other openings are used.**

**Warning**  **All wiring from probes or sensors to the console must be run in conduit separate from all other wiring. Failure to do so will create an explosion hazard.**

**Warning**  **Substituting components could impair intrinsic safety. T5 series consoles are intrinsically safe for sensors installed in – Class I, Division 1, Group D – hazardous locations. Substitution of components could make the energy limiting circuitry in the system ineffective and could cause an explosion hazard. Repairs to a T5 series console or attached components should only be performed by a qualified, factory-trained technician.**

## **Introduction**

The purpose of this manual is to guide installers, operators, and store owners with setting up their INCON Vapor Recovery Monitoring (VRM) system. The VRM system has been tested and approved by the California Air Resource Board as an In-Station Diagnostics (ISD) system per CP-201. This manual introduces the user interface then proceeds to setup and lastly, maintaining your VRM system.

For installation of the TS-550, TS-5000, TS-EMS and its components please refer to the *TS-5xxx Series Installation Guide* (p/n 000-2150).

## **Certified Contractor Requirements**

Please read this entire manual carefully. Failure to follow the instructions in this manual may result in faulty operation, equipment damage, injury or death.

### **Contractor Certification Levels**

- LEVEL I - Automatic Tank Gauge Installer Certification Training
- LEVEL II - Automatic Tank Monitor Start-Up and Service/Warranty Certification Training
- LEVEL III - LLD Installer/Service/Warranty Certification Training
- LEVEL IV - TS-STC Operation/Repair Test
- LEVEL V - Vapor Recovery Monitoring Installation/Operation

**Certified Programmer/Service Person:** Only an INCON certified VRM Technician or service person is allowed to make setup changes, clear alarms, and access areas internal to the Console. A certified contractor needs to have completed training levels I, II, and V.

**Station Owner/Operator:** The station owner or operator of the console is only allowed to print reports and re-enable dispensers. Making setup changes, clearing alarms, and accessing areas internal to the console is strictly prohibited.

## **Definitions and Acronyms**

**A/L** – Air over Liquid ratio, this ratio is calculated at the end of the day for each fueling point.

**ATG** – Automatic Tank Gauge

**CARB** – California Air Resources Board

**DTU** - Data Transfer Unit. Device used to transmit VFM and VPS data over existing power lines

**EVR** – Enhanced Vapor Recovery

**GDF** – Gasoline Dispensing Facility

**ISD** – In-Station Diagnostics. This refers to the whole system as defined in CP-201.

**ISP** – Internet Service Provider

**LLD** – Line Leak Detector

**Modules** – These are the different plug-in cards within the T5 series console enclosure. They are the inputs and outputs for all the field wiring.

**Console** – The console is the physical box installed on the wall. The system console holds the entire electronic slide in modules and runs the general operating system. The VRM application is available in the TS-550/EMS/5000 models of the console.

**PLC** - Power Line Communication. This refers to the technology of transferring digital data over AC power lines

**TS-VFM** – Vapor Flow Meter

**TS-VPS** – Vapor Pressure Sensor

**TSA** – Tank Sentinel Anyware is the web-based interface to the console.

**VRM** – Vapor Recovery Monitoring is the application that runs on the console and performs In-Station Diagnostics.

## **Related Documents**

000-2144, *TS-VFM Installation Guide*

000-2143, *TS-VPS Installation Guide*

000-2150, *TS-5xxx Installation Guide for TS-5, TS-550, TS-5000, and TS-EMS*

000-2142, *TS-5xxx Programmer's Guide for TS-5, TS-550, TS-500, and TS-EMS*

000-2151, *TS-5xxx Operator's Guide*

CP-201, *Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities*

TP-201.3, *Determination of a 2" Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities*

TP-201.5, *Air to Liquid Volume Ratio*

## Product Description

### Vapor Recovery Monitoring

The Vapor Recovery Monitoring System (VRM) consists of the following components.

#### Vapor Recovery Monitoring Application

The Vapor Recovery application uses data from the Vapor Flow Meters (VFMs) and the Vapor Pressure Sensor (VPS) to perform assessments on the site's vapor recovery system. VRM is an optional application on the console and may be accompanied by Fuel Management System or Secondary Containment Monitoring.

#### Console

The Console consist of either the TS-550 or TS-5000 Fuel Management Systems or the TS-EMS, Environmental Monitoring System. The console options for ISD monitoring will always include the VRM application and at least one of each of the following components. (See Figure 1)

- AC Input Module
- Relay/10A Relay Module
- Probe Module
- 4-20mA Module
- Dispenser Interface Module
- Printer
- Touchscreen



#### Vapor Flow Meter

The Vapor Flow Meter (TS-VFM) is a volume measuring meter. When a mixture of air and gasoline vapors are returned from an automobile's gasoline tank to the underground storage tank during a dispense, the vapors are measured and analyzed. The console uses these VFMs as a way to assess how well the vapor collection process is working. The VFM is used to perform the following CP-201 assessments.

Assessment Type	Duration	EVR System	Threshold
Daily A/L	Daily	Vacuum Assist	Average A/L ratio exceeds 1.90 or less than 0.33
Weekly A/L	Calendar Week	Vacuum Assist	Average A/L ratio exceeds 1.32 or less than 0.81

There shall be one VFM per dispenser, and they wire into the Probe Module. Refer to document *Vapor Flow Meter Install Guide* (p/n 000-2144) for installation methods.

#### Vapor Pressure Sensor

The Vapor Pressure Sensor (TS-VPS) is a low vapor pressure transmitter. The primary purpose of the VPS is to continually measure the underground storage tank's vapor containment pressure. This vapor containment area includes the tank ullage area, and the vapor piping. The VRM continually samples the VPS and performs assessments for Over Pressurization and leakage in the vapor containment area. These assessments include:

Assessment Type	Duration	Threshold
Weekly Over-pressurization	Calendar Week	Pressure > 1.3" wcg for 5% of week
Monthly Over-Pressurization	Calendar Month	Pressure > 0.3" wcg for 25% of month
Weekly Leak Test	Calendar Week	Pressure Leak is greater than 2x TP-201.3

There is only one VPS per ISD installation. The VPS connects to the 4-20mA Module, refer to the *Vapor Pressure Sensor Install Guide* (p/n 000-2143). The pressure sensor shall be installed in the dispenser closest to the underground storage tanks.

## **AC Input Module**

In VRM Version 1.2.0, the use of dispenser AC Hook signals is not required. The AC Input Module may be used to monitor the dispenser hook signals. Dispenser hooks are the signals from the dispensers that are normally used to activate the submersible pumps. For the VRM application they are also used to signal the start and end of a transaction for gasoline products only. Vapor Recovery does not apply to Diesel and Kerosene products so the hook signals for these grades do not need to be monitored. Dispenser Hook Signals are to be wired to the AC-Input Module and the installation directions are in the *TS-5xxx Installation Guide* (p/n 000-2150).

## **Dispenser Interface Module**

The Dispenser Interface Module (TS-DIM) is used to acquire the volume of gasoline that was pumped during each transaction. Refer to the *TS-5xxx Installation Guide* (p/n 000-2150) for wiring the TS-DIM.

## **Ullage Volume**

The VRM System uses ullage volume for performing vapor containment leak detection. The console gathers ullage volume from internal inventory probes or an external ATG. When using an existing ATG for collecting ullage, then the ATG must have an available RS-232 port and have the ability to respond to TLS-250 or TLS-350 inventory command.

## **Relay/10A Relay Module**

Power to the dispensers will be controlled by the console in the event of a VRM Failure alarm. The dispenser power is to be controlled by the Relay Module per the installation directions in the *TS-5xxx Installation Guide* (p/n 000-2150). Electrical current through the Relay Module is not to exceed the maximum rated current listed on the module. If options in the dispensers will cause the current to exceed the rated current, including startup current, an external power relay will need to be used and it's coil controlled by the Relay Model. See the *TS-5xxx Installation Guide* (p/n 000-2150) for installation instructions for the Relay Module and 10A Relay Module.

## **DTU Module**

The DTU Module is an optional device used to transmit the signals of the VPS and VFM to the console. The DTU will provide the ability to communicate over existing dispenser power lines thus eliminating the need to install field cable. For installation instructions of the DTU, refer to the TS-DTU Dispenser Retrofit Manual (pn 000-2146) and the Console DTU Installation Instructions (pn 000-0080).

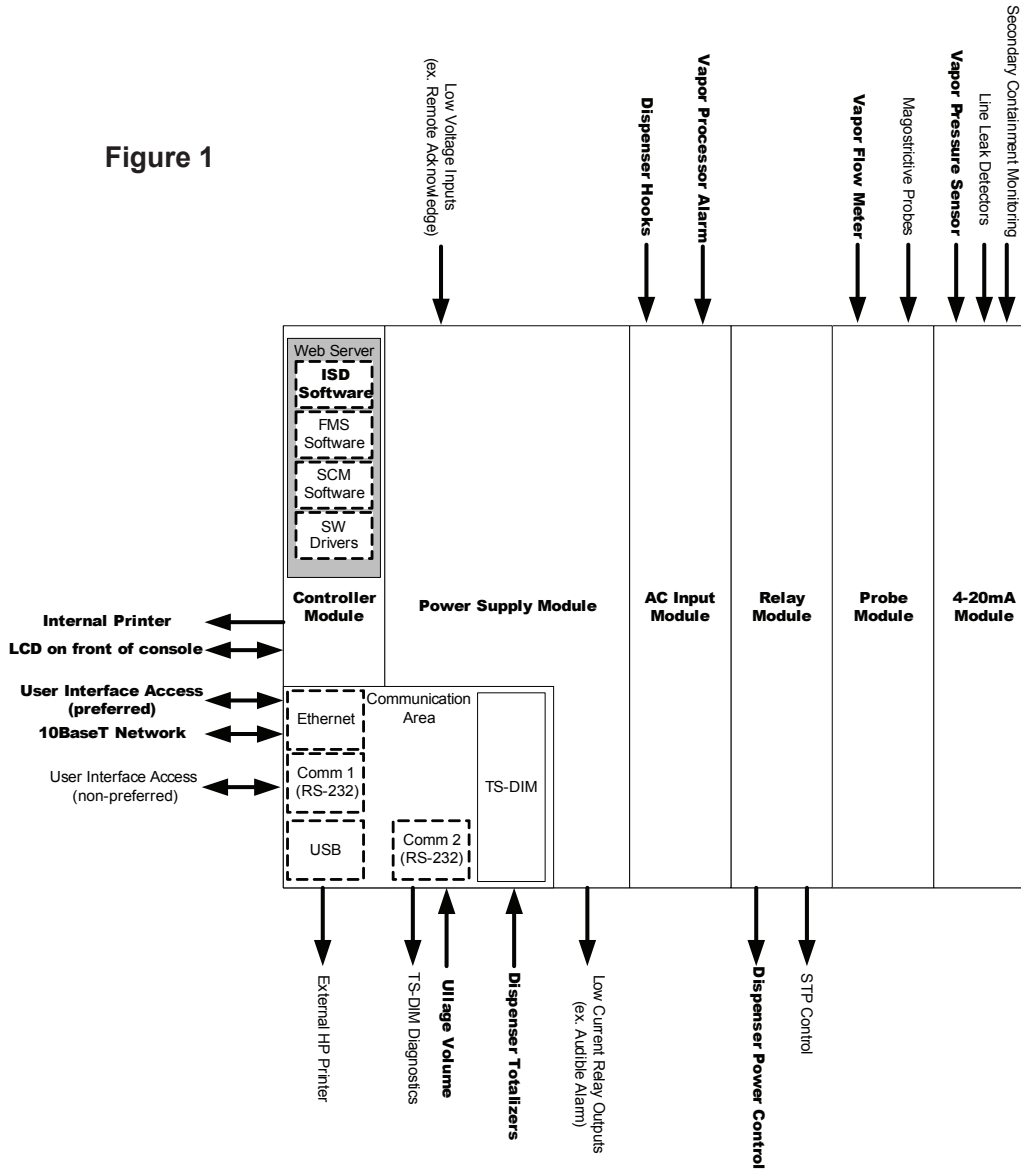
## **Alarms**

The user will be automatically notified of VRM or other system alarm conditions via the alarm LEDs and touchscreen display. An audible alarm will sound and the system can also be setup to print or E-mail alarms (Ethernet connection required). Dispenser power is controlled by the console and cannot be disabled.

# VRM System Specification

Refer to the Executive Order 202, Exhibit 2, for the most up to date system specifications. The required equipment to be installed for the INCON VRM system is discussed below. Figure 1 shows the different components and where they attach to the Console. All items in bold are items directly related to the VRM application.

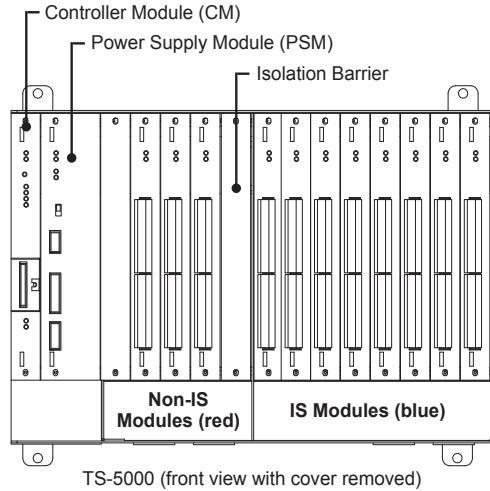
Figure 1



# Installation & Startup

## TS-550/5000/EMS Console Installation

The console will be shipped with all modules installed and tested. Refer to the *TS-5xxx Installation Guide* (p/n 000-2150) for mounting and wiring instructions.



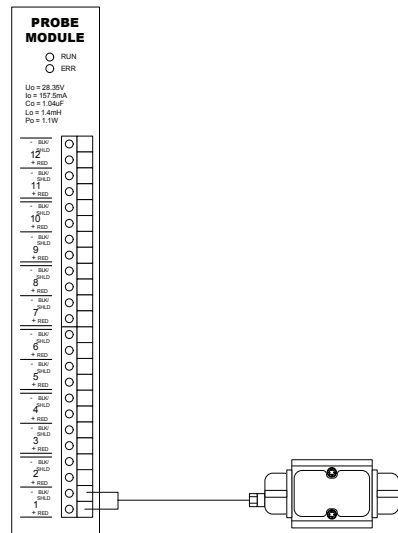
## TS-VFM Installation

### Field Installation

To mount the Vapor Flow Meter (VFM) in the dispenser and make the field wiring connections, follow the instructions in the *TS-VFM Install Guide* (p/n 000-2144).

### Console Wiring Connection

See Probe Module diagram at right. The VFM is wired to the Probe Module inside the Console. Wire the Red wire to the + terminal and the Black wire to the – terminal.



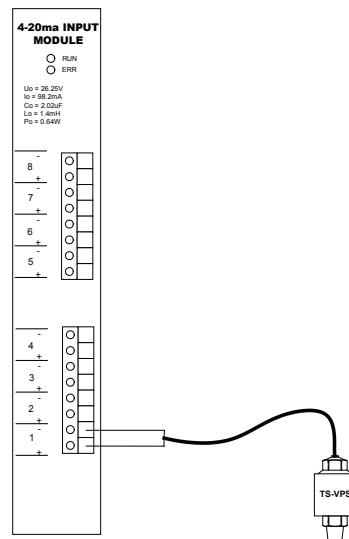
## TS-VPS Installation

### Field Installation

To mount the Vapor Pressure Sensor (VPS) and make the field wiring connections, follow the instructions in the *TS-VPS Install Guide* (p/n 000-2143). There will be only one pressure sensor per ISD System.

### Console Wiring

See diagram at right. The VPS is wired to the 4-20ma Module inside the Console. Wire the sensor's Black wire to the + terminal and the sensor's White wire to the - terminal.



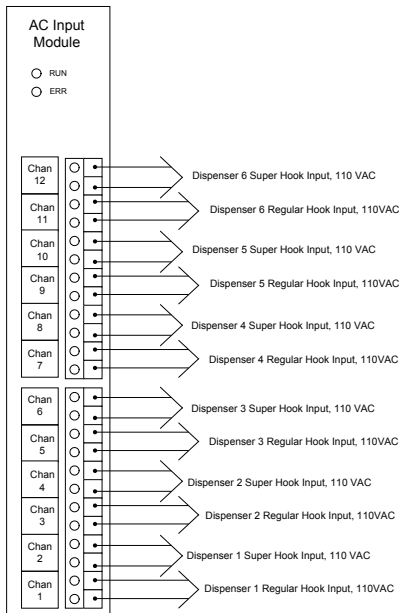
There are several different wiring schemes that may be encountered when connecting the AC Input Module and Relay Module. These are dependent upon the use of optional features like Dispenser Hook Isolation, Line Leak Detection (LLD) and Turbine Pump Interface that can affect the way these modules are wired. The description below assumes that this is strictly a VRM system that is sensing the dispenser hook signals from gasoline products only and not controlling the Submersible Turbine Pumps. For more information on the different wiring options see the *TS-5xxx Installation Guide* (p/n 000-2150) or contact Franklin Fueling Systems Technical Support at 1-800-984-6266.

## Dispenser Hook Signals

**Note:** Dispenser hook signals are required on installations prior to VRM versions 1.2.0.

The dispenser hook signals are sampled by the AC Input Module so that the VRM can monitor the start and end of gasoline sales transactions. Follow the instructions below to tap into the Dispenser Hook Signals with a parallel wire to the AC Input Module. This method will not take control of the Submersible Pumps.

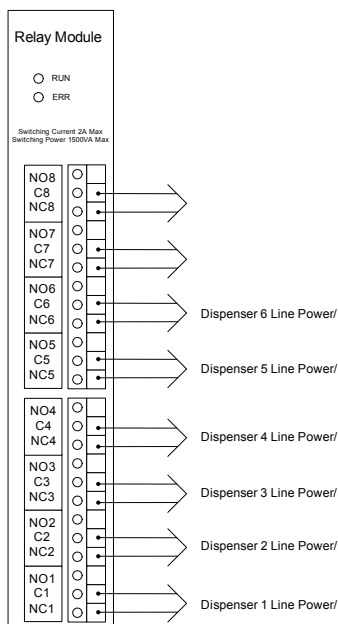
1. Locate the gasoline product only dispenser hook signals at a point where they are still separated by dispenser. This may be a dispenser hook isolation box or other method or they may just all be connected with a wire nut.
2. Separate them by dispenser number then by fueling grade.
3. Connect a wire in parallel from the line and neutral of each dispenser hook signal to the AC Input Module. All existing wiring should remain as is.
4. When wiring the Dispenser Hook signals to the AC Input Module, make dispenser 1 signals (all gasoline grades) go to the first set of terminals. For example, if there are two hooks per dispenser (Regular and Super) then wire Dispenser 1 to positions 1 & 2, then Dispenser 2 to positions 3 & 4.



## Dispenser Power Control

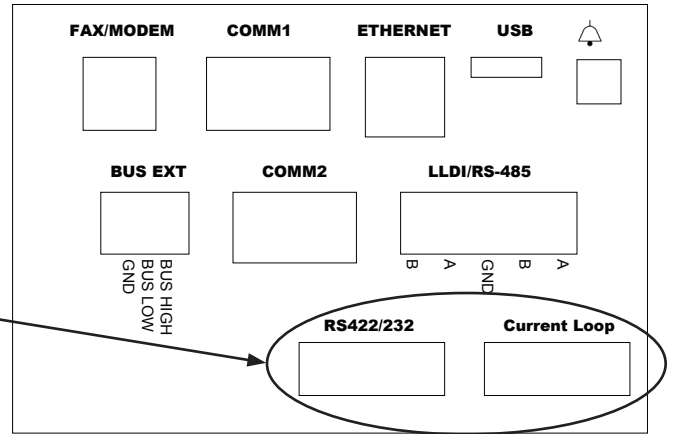
In order for the console to shutdown a dispenser or all the dispensers in response to an alarm condition, the dispenser power must be controlled by the Relay Module. Run the coil of the dispenser power relay through the a channel of the Relay Module.

The 10A Relay Module is rated for 10 amps of continuous current. If the dispenser power, including startup current, exceeds 10A then an external high powered relay must be installed to control the dispensers. It is a good practice to wire the dispenser power in a logical order such as Dispenser 1 to Relay Channel 1, Dispenser 2 to Relay Channel 2, etc.



## Dispenser Interface Module

The Dispenser Interface Module (DIM) is a device attached to the Power Supply Module. Connections to the DIM are located on the bottom left side of the Console using the appropriate cable kit based on the dispenser type.



## Ullage Volume Input

The console can gather ullage volume from either the internal inventory probes or from existing inventory probes through an External ATG.

### Using Internal Magnetostrictive Probes

To use internal magnetostrictive probes, you must have Fuel Management System (FMS) enabled in the registration. See the *TS-5xxx Programming Manual* for instructions for programming the FMS section. The FMS section must be programmed before the VRM section.

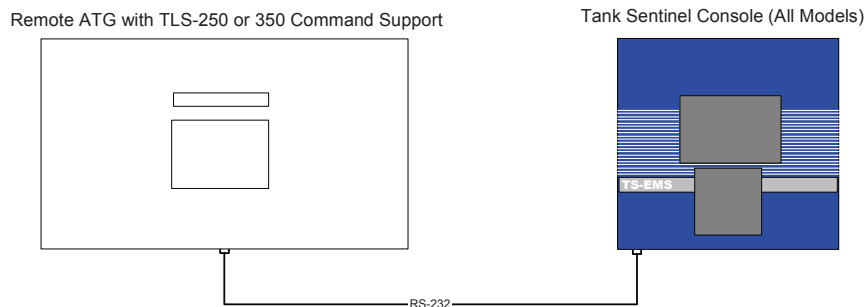
### Using an External ATG

There are certain requirements in order to retrieve ullage volume from an external ATG.

- Continuous access to a RS-232 connection
- Ability to respond to the following serial Command:
  - Command: **i201TT** - *In-Tank Inventory Report, TLS-350 command set*
  - Command: **10T** - *Inventory Report, TLS-250 command set*
- Serial Cable with the following specifications:
  - Cable must be a 'Null' Serial
  - DB9 Male (INCON Console) to either DB25 Male or DB9 Male (ATG)

Use the following steps to connect an External ATG to a Console:

1. Connect the DB9 female end of the cable to Comm 2 on the Console.
2. Connect the other end of the cable to the serial port of the External ATG.
3. Set the serial port parameters to match between the Console and the External ATG, see *TS-5xxx Setup Programming Guide*.
4. Validate there is no "External ATG Communication" alarm.



**Note:** A DB25 to DB9 Null Serial Cable may be purchased from INCON, PN 600-0099. See the *TS-5xxx Series Installation Manual* "Communication Ports" section for pinouts of Comm Port 2.



# Setup and Programming

## Startup

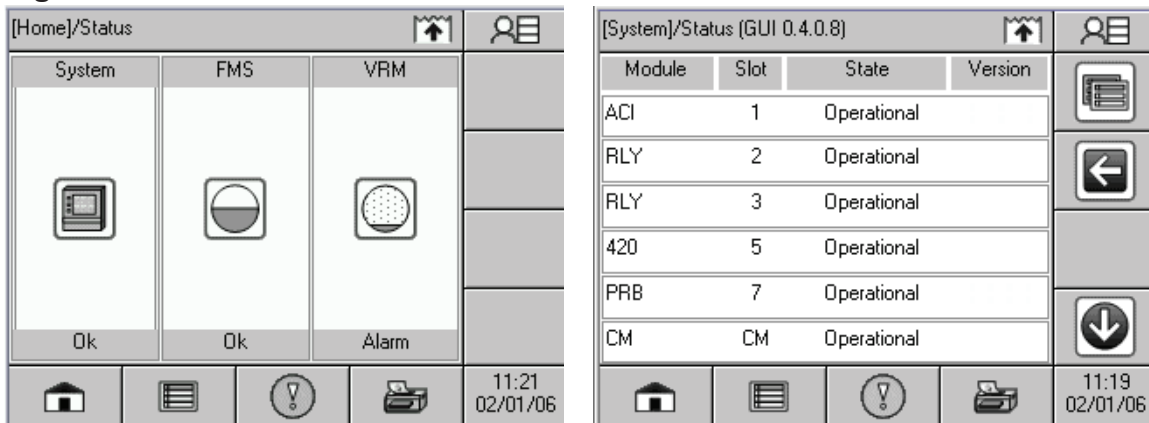
Upon completing the installation of the Vapor Recovery Monitoring (VRM) System and powering up the Console, programming the setup is the next step.

## System Status

The Console will arrive at the site with the VRM application already enabled. Upon first powering up the console you may see a screen that looks like the one in Figure 2a. The system with the screen in Figure 2a has the VRM application as well as the Fuel Management System (FMS) application enabled. These applications are set by a registration key at the time of purchase.

The first step before programming the VRM is to check to see if all the modules are powered up and operational. Select the **System** box which brings up the **System Status** page as shown in Figure 2b.

Figure 2a and 2b



Verify all the modules are present and operational. If all the modules are “Operational” then you may proceed to setup and programming. If not, refer to the Alarm Codes and Troubleshooting section of this manual.

## Programming the Console for Vapor Recovery Monitoring

The following programming instructions are specifically intended for the Vapor Recovery Monitoring (VRM) System. For additional programming refer to the *TS-5xxx Programming Manual* (p/n 000-2142). This manual covers both the hardware programming and the application programming. The method shown below is the same whether the user programs through the local touchscreen or a Web Browser. Inclusion of other options like the FMS application, Dispenser Hook Isolation and Line Leak Detection (LLD) will effect the programming of the VRM system. The *TS-5xxx Programming Manual* (p/n 000-2142) describes the proper programming and sequencing for the console setup. The following sections show how to program the setup as it relates to the VRM system. Contact Franklin Fueling Technical Support at 800-984-6266 for assistance with these applications.

## Data Transfer Units

This is an optional hardware interface to communicate the VPS and VFM and Dispenser Shutdown over existing dispenser AC power line. If a TS-DTU was installed then the following setup is required.

Group Name	Parameter Name	Parameter Value	Explanation
Remote Data Transfer Units	Network ID	1	Leave as default. In rare circumstances the network ID may need to change if another network is near.
Dispenser Configuration	Number of Units	1	Enter the number of DTU Modules at the dispensers. This does not include the console DTU.
TS-DTU 1	Unit ID	14-EEA8-FFFF-0000-1A	This is the unique ID located on the DTU label. The console uses this ID to know which modules to communicate with.

## Dispenser Hooks Mapping

Mapping the gasoline dispenser hooks signals correctly is important for the VRM to properly identify active fueling points. The dispenser hooks must be wired correctly as explained in the *TS-5xxx Installation Guide* (p/n 000-2150).

**Note:** Dispenser Hook Signals are only required on installations prior to VRM Version 1.2.0.

Group Name	Parameter Name	Parameter Value	Explanation
AC Input Modules	Number Gasoline Hooks per dispenser	0	Set to zero if not using dispenser hook signals, otherwise the number of gasoline hooks coming from each dispenser
Module #	Channels	(n)	Select number of gasoline dispenser hook signals available from each dispenser. The Vapor Recovery Monitor does not use any non-gasoline products.
Channel #	Name	Ex. Dispenser 1 Hook Regular	Unique name for the hook signal
	Enabled	Yes	Select "Yes"
	Active High	Yes	Set to "Yes"

## Vapor Flow Meter Select

The Vapor Flow Meter (VFM) select is located under the Probe Module. This is where we define the number of input channels and select the VFM. Go to the Probe Module setup and make the following changes. If the FMS application is also running, some of the channels will be designated for probes.

Group Name	Parameter Name	Parameter Value	Explanation
Probe Modules			
Module #	Channels	(n)	Select the number of flow meters/probes at the site
Channel #	Name	Ex. VFM Disp 1	Unique name for Vapor Flow Meter
	Enabled	Yes or No	Set to "Yes"
	Type	TS-VFM	Select Vapor Flow Meter type

## Vapor Pressure Sensor Select

The Vapor Pressure Sensor (VPS) Select is located under the 4-20mA module setup. This is where we define the input channel and select the VPS. Go to the 4-20mA Module setup and make the following changes. If Electronic Line Leak detection is being installed, some channels will be used for the LLD transducers.

Group Name	Parameter Name	Parameter Value	Explanation	
<b>4-20mA Input Modules</b>				
	Module #	Channels	(n)	Select "1" for the Vapor Pressure Sensor
	Channel #	Name	Ex. ISD Pressure Sensor	Unique name for VPS
		Enabled	Yes	Keep as "Yes"
		Service Type	Vapor Recovery Monitor	Select correct service type for application

## Remote ATG Serial Port Settings

If the Console will be getting ullage volume from a Remote ATG then the serial port must match that of the other tank gauge.

Group Name	Parameter Name	Parameter Value	Explanation	
<b>Power Supply Module</b>				
	COMM 2	Baud Rate	9600	Set to match External ATG
		Data Bits	8	Set to match External ATG
		Parity	None	Set to match External ATG
		Stop Bits	1	Set to match External ATG
		Response Timeout	8	Leave as default

## Relay Mapping

Relay mapping is necessary for proper shutdown of dispensers. The programming of the Relay Module will tell the VRM which Vapor Flow Meter will control which Dispenser. As you will see this is why we enter a unique name for each Flow Meter so we can easily identify the channel.

**Note:** By mapping the relay to the VFM in the following setup, we now enable the VRM to automatically shutdown dispensing upon ISD alarms.

Group Name	Parameter Name	Parameter Value	Explanation	
<b>Relay Module</b>				
	Module #	Channels	(n)	Select number of dispensers
	Channel #	Name	Dispenser 1 Power	Unique name for relay's purpose
		Enabled	Yes	set to "Yes"
		Type	Dispenser	
		Polarity	Normal	Set to Normal
		Logic	OR Logic	Set to OR
		Physically Wired As	Normally Closed	Set to Normally Closed
		Number of Inputs	1	Set to 1
	Input 1	Type	Probe Module	Select Probe Module
		Channel	VFM Disp 1	Select the VFM associated with this Dispenser

Additional relays may be used for other purposes such as submersible pump control or external alarms. See the *TS-5xxx Installation Guide* (p/n 000-2150) for more information.

## Dispenser Interface

The Dispenser Interface setup is where the Dispenser Interface Module is programmed. For this setup, you will need to know what kind of D-Box the Dispenser Interface module is connecting up to and what type of communication interface it is using. For more information on the installation and setup of the Dispenser Interface Module, see the TS-5xxx Installation Manual and TS-5xxx Setup and Programming Manual.

Group Name	Parameter Name	Parameter Value	Explanation	
<b>Dispenser Interface</b>				
Precision	Volume Precision	3	Leave as default	
	Dispenser Volume	Gross	Leave as default	
Grades	Number of Grades	3	Select number of different gasoline only grades at facility	
	Grade 1	Name Include in Vapor recovery	Regular Unleaded Yes	Enter a Name for the Grade
	Grade 2	Name Include in Vapor recovery	Premium Unleaded Yes	Enter a Name for the Grade
	Grade 3	Name Include in Vapor recovery	Super Unleaded Yes	Enter a Name for the Grade
Dispenser Interface Modules				
DIM 1	Type	Wayne		
	Communication	Current loop		
Fueling Points	Number of Fueling Points	12	Enter the number of gasoline fueling points	
Fueling Point 1	Number of Hoses	3		
	Hose 1 QC	Grade Association	Regular Unleaded	Enter a Name for the Grade
Position		0	Select position of Grade	
Hose 2	Grade Association	Premium Unleaded	Enter a Name for the Grade	
	Position	1	Select position of Grade	
Hose 3	Grade Association	Super Unleaded	Enter a Name for the Grade	
	Position	2	Select position of Grade	
Fueling Point 2	Number of Hoses	3		

## Vapor Recovery Monitoring Setup

This is the final setup to get the Vapor Recovery Monitor (VRM) to work properly. This is where we select the type of vapor recovery system and call in the appropriate external sensors.

Group Name	Parameter Name	Parameter Value	Explanation	
<b>Vapor Recovery Monitor</b>				
	Method Type	Balance or Assist	Select the type of EVR system installed.	
	Hour Assessment	0	Set time of VRM alarm action	
	Week Day Assessment	Sunday	Set Day of VRM alarm action	
Dispenser Configuration	Dispenser Type	Wayne or Gilbarco	Select the dispenser model	
	Multihose Dispenser Site	No	Select yes or no	
	Number of Dispensers	0 (1 to 48)	Equal to the number of flow meters installed	
	Dispenser 1	Flow Meter	Unique Name	Select Meter by name from list of enabled meters
		First Fueling Point	1	Select correct fueling points for dispenser number.
	Second Fueling Point	2	Select correct fueling points for dispenser number.	
Ullage Pressure Input	Sensor	Sensor name	Select the correct sensor name	
Ullage Volume Input	Acquire Ullage	Internal, external	Select internal if using LL2 probes or external if connected to remote ATG.	
	Security Code	#		
	Number of tanks			
Tank 1 Ullage	Enabled	Yes or No	Select Yes if part of EVR System	
	Enabled	Yes or No	Select Yes if part of EVR System	
Pressure Management System	Enabled	Yes or No	Yes	
	Type	Clean Air Separator	Select appropriate device	

## Managing Rules

Alarms will be generated automatically and can be seen on the touchscreen display or the Alarm pages on the web browser. These alarms can be programmed to generate various outputs based on the Rules setup.

**Note:** VRM alarms will automatically disable dispensers and this feature cannot be turned off per CP-201 requirements.

Additional actions can be created by setting up Rules. Rules are the way to create actions and notifications based on specific events change. Events are the inputs to the rule, for example it can be a failed test or a sensor gone bad, but it can also be a simple test completion notification. Actions are the outputs for the Rules, for example you can program the console to send emails, trip relays, or sound alarms. The Rules are entirely flexible and allow stations owners to customize the alarm notification process.

There are three default rules enabled on the Console. These rules all have actions to sound the internal audible alarm. These rules can be disabled or can have their action changed. New Rules can be added for complete customization for notification. Below is an example of a new rule that emails a notification on any new VRM alarm. A more descriptive explanation on Rules can be found in the *TS-5xxx Programming Guide* (p/n 000-2142).

### Rules

Variable	+ or -	Explanation
<b>Rules</b>	+	
Rule – Power On »		Default Rule, Internal audible alarm output
Rule – Application Events »		Default Rule, Internal audible alarm output
Rule – New Alarm Occurred »		Default Rule, Internal audible alarm output
Rule – New Rule #1	-	
Name		Enter a name for the rule. Once entered, the name will appear next to the above Rule.
Enabled		Select whether the rule is to run or not
Events	+	By pressing the + sign, you can have one or multiple events
Event	-	Below is an example of a new rule to send an email for any new VRM alarms
Type		Select “New Alarm Occurred”
Category		Select VRM
Code		Select “Any”
Device		Select “Any”
State		Select “Active”
Actions	+	
Action	-	
Type		Select “E-Mail” (See next section for setting up email notification)
Address		Enter in your email address
Content		Select “Generated” to have the Console automatically produce the contents in the email. Otherwise you can have the email contain exactly what you specify.
Template		Select “HTML”. You can have either a text or HTML email.

## Setting Up E-mail Notification

The E-mail notification is a feature that allows store owners and managers to receive e-mails from their console. These e-mails include alarms, events and test results. In order for the system to send e-mails and text messages based on the Rules configurations, certain parameters need to be configured. These parameters will tell the console how to transmit e-mails to the outside.

### Email

Variable	Description
<b>"From" Address</b>	Unique e-mail address to identify the VRM console (e.g. Site@city.state)
<b>SMTP Host</b>	This is to be provided by network administrator or ISP
<b>SMTP Port</b>	Check with network administrator or ISP
<b>Enable Authentication</b>	Some e-mail providers require authentication in order to send e-mails. See Internet Service Provider
<b>Maximum Queue Size</b>	The number of e-mails that can be waiting to be sent
<b>Retry Timeout</b>	The number of seconds to wait between failed tries. Default is 3600 seconds or 1 hr.
<b>Watchdog Timeout</b>	This is the inactivity timeout.

# System Operation

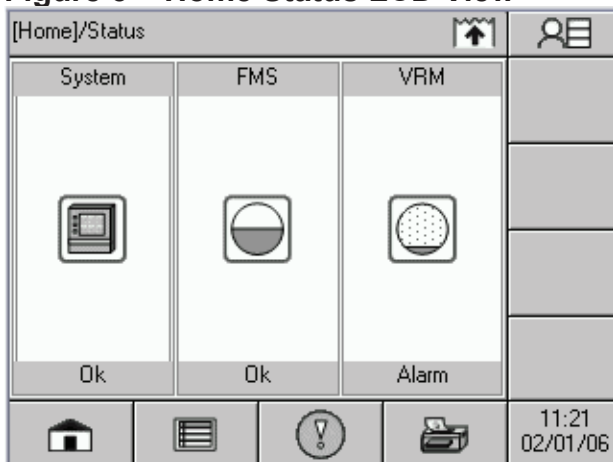
## Run-Time Status

The VRM application has several useful run-time menus to check status or to get current test status.

### Home»Status

The home-status page shows the current status of all applications running in the Console, see Figure 3. Depending on the applications that are running on the console, the Home-Status will display only the ones enabled. In Figure 3 below, we have FMS (Fuel Management System), and VRM (Vapor Recovery Monitoring). At anytime you can get to the Home Status menu by pressing the **Home Box**.

**Figure 3 – Home Status LCD View**



### System»Status

The System-status window shows the state, slot location, and module version number of each module inside the physical console.

### VRM»Status

The VRM-Status window gives the current status of each Vapor Flow Meter, pressure sensor, and other VRM related data. See Figure 5b.

## Vapor Recovery Web Pages

### VRM Status Page (Web Page View)

The **VRM»Status** page will show up to date status for each fueling point. The status is based on the previous days results. In the Current Status column a Pass ( ✓ ), Failure ( X ), Warning ( ! ), or Insufficient ( \* ) symbol will show up for each fueling point. The final assessment for each fueling point will occur at the end of the day and can be viewed in the ISD reports. The following describes the remaining information in the VRM status page. Refer to Figure 4 - VRM Status Page.

**Auto Refresh:** The LCD automatically refreshes the screen with the latest data. Using the web version, the VRM Status page has an optional Auto Refresh mode and can be enabled by selecting the "Auto Refresh" link in the upper right-hand corner. The default refresh rate is set to 30 seconds but can be changed to a faster or slower rate. To change the refresh rate go to the **Preferences** page.

**Dispenser:** This is the dispenser number as associated with the Point of Sale system.

**Dispenser Status:** Shows the activity of the dispenser, Idle (or inactive), Dispensing, or Shutdown. This status is linked to the dispenser hook signals only.

**TS-VFM:** Shows the state of the vapor flow meters and is only in the web-based view. There are four possible states:

Operational – The VFM has no alarms

Missing – The VRM has lost communication with the vapor flow meter. This may occur during an open circuit or the vapor flow meter is not installed on the port in which it was programmed for.

No Data – The VRM is unable to understand the input data. This may occur when a port is programmed for a flow meter but a magnostrictive probe is connected instead.

Error – The flow meter data was not sent correctly. This may occur when with excessive noise in the system or it is an indication that the flow meter is not functioning correctly.

**Fueling Point:** This is the assigned fueling point number from setup.

**Daily Status:** The daily status shows the last completed daily assessment for each fueling point/hose. One of four symbols will be displayed for each fueling point/hose.

**Weekly Status:** The weekly status shows the last completed weekly assessment for each fueling point/hose.

**Last A/L:** This value is the fueling point's last calculated A/L ratio result. The value is based only on a single transaction.

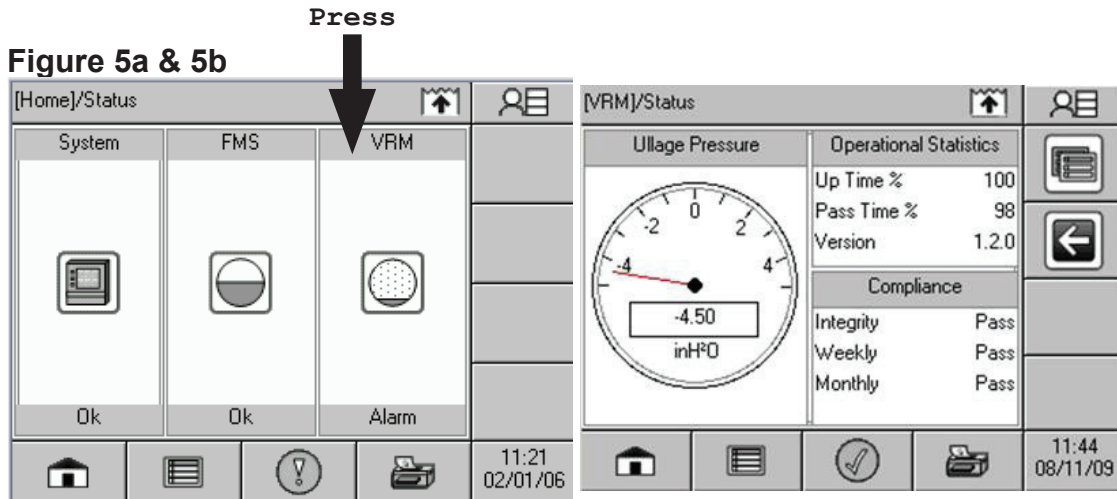
**Figure 4 - VRM Status Page**

Franklin Fueling Systems		VRM Status				
Home System VRM Setup Preferences						Auto Refresh
Status Alarms Control Reports						07/13/2009 12:13:49
Dispenser	Dispenser Status	TS-VFM	Fueling Point	Daily Status	Weekly Status	Last A/L
1	Idle	Operational	1	✓	✓	0.49
			2	✓	✓	1.01
2	Dispensing	Operational	3	✓	✓	0.55
			4	✓	✓	0.68
3	Idle	Operational	5	✓	✓	0.33
			6	✓	✓	0.31
4	Idle	Operational	7	✓	✓	0.55
			8	✓	✓	1.12
5	Idle	Operational	9	✓	✓	0.47
			10	*	✓	0.39
6	Idle	Operational	11	✓	✓	1.12
			12	*	✓	1.20
Common					Value	
Pressure Sensor					Operational	
Ullage Pressure					-7.86	
Weekly Ullage Pressure Leak Test					Pass	
Weekly Ullage Pressure Monitoring					Pass	
Monthly Ullage Pressure Monitoring					Pass	
Operation Time %					100	
Pass Time %					100	
Readiness State					Ready	
Algorithm Version					1.2.0	
Collection Method					Assist	
pass ✓ fail ✗ warning ! insufficient * disabled ✖						




## VRM Status (LCD View)

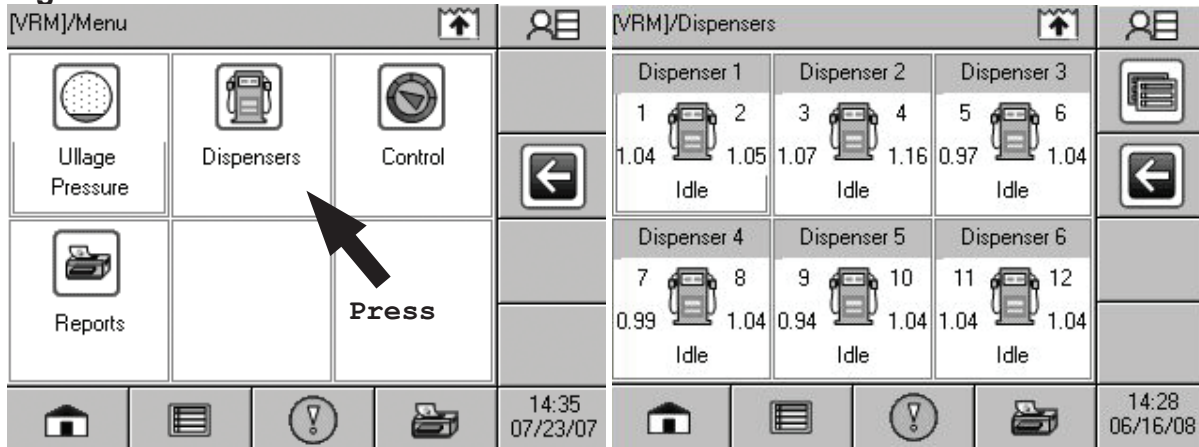
The LCD view provides the same information as the web page but is broken into two different screens. The VRM-Status on the LCD will show the real time information for the ullage pressure and last run pressure test results as shown in Figure 5a & 5b. The VRM-Dispenser is the second screen which shows current status of the dispensers as shown in Figure 6a & 6b.



## VRM»Dispensers (LCD View)

By pressing the Application Menu button  in the upper right-hand corner of the **VRM»Status** screen it will bring you to a page of several submenus for VRM. The Status box is the same page as shown in Figure 5b. The Dispensers page will bring up a new page that looks like the one in Figure 6b.

## Figure 6a & 6b



## VRM»Alarms Page (LCD View)

The **VRM»Alarms** page shows all current alarms for the Vapor Recovery Monitor. When an alarm clears it will be removed from this page but will be kept in memory. The Alarm History report will provide information on previous alarms.

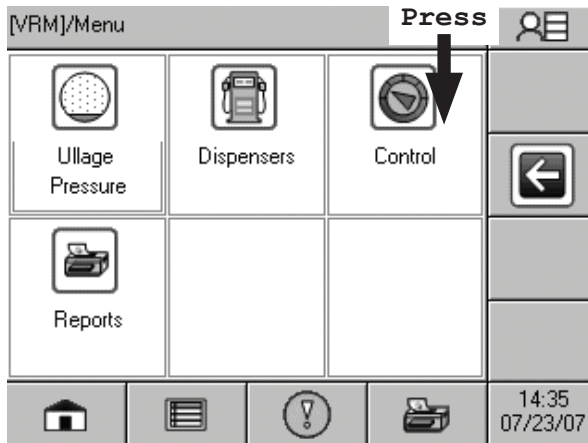


Press

Status	Alarm Description	Timestamp
V	FP 12 Warning	10/18/05 00:18
R	Daily Vapor Collection	
M		
V	FP 9 Warning	10/18/05 00:18
R	Daily Vapor Collection	
M		
V	FP 8 Warning	10/18/05 00:18
R	Daily Vapor Collection	
M		

## VRM»Control (LCD View)


The VRM control page is setup to run manual test and calibrate the pressure sensor. These features are described later in this manual.



Press

# Alarms, Warnings, and Failures

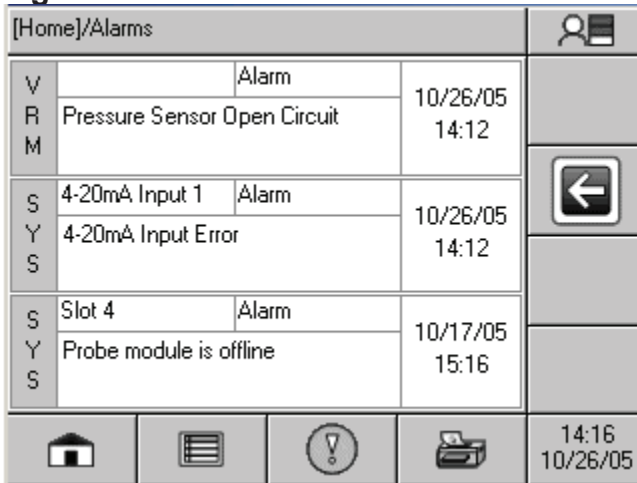
Alarms, warnings, and failures are designed to alert you with specific details when a problem occurs so that you can take appropriate corrective action. System alarms, VRM alarms, VRM warnings, and VRM Failures will always notify the user in certain ways, other notification options are programmable.







Figure 7 shows an example of two System Alarms, and one VRM alarm. All active alarms can be viewed from the LCD by pressing the Alarm button, , at the bottom of the LCD. Once the alarm goes inactive it will disappear from the **Home/Alarm** page but will remain stored in memory. Any outputs that are programmed to activate based on alarms will go active. These outputs can be customized to activate based on specific alarms or all alarms in the Rules setup.

## System Alarms

System alarms are non-application related alarms. These alarms are usually related to hardware such as an internal module is offline or a printer problem.

Figure 7



[Home]/Alarms				
V R M	Alarm	10/26/05 14:12		
Pressure Sensor Open Circuit				
S Y S	Alarm	10/26/05 14:12		
4-20mA Input 1				
4-20mA Input Error				
S Y S	Alarm	10/17/05 15:16		
Slot 4				
Probe module is offline				
				14:16 10/26/05

## VRM Alarms

Vapor Recovery alarms are hardware problems related to the Vapor Recovery Monitoring application. VRM alarms will be generated immediately with a flashing RED LED. A VRM alarm will not cause a dispenser(s) shutdown.

## VRM Warnings and Failures

VRM Warnings and Failures are monitoring alarms related only to the Vapor Recovery Monitoring application. These Warnings and Failures are directly related to the CP-201 ISD requirement to monitor collection and containment of the vapor recovery system. A VRM warning will occur when either a fueling collection point or the entire vapor containment does not meet the operating thresholds. A warning is the first sign of a vapor recovery problem. A VRM failure will follow the warning if the specific problem with the vapor recovery component does not get fixed within the monitoring time period. This failure will cause either a single or site shutdown, depending on the type. The following provides more detail on the specific warning and failure types.

### Vapor Collection Warning and Failure

Vapor collection warning and failures (A/L) generally occur due to poor or no vapor being returned to the underground storage tank during fueling transactions. The VRM system makes both a daily and weekly assessment on the quantity of the vapor collection. If the collection is below the lower failure limit or above the higher failure limit, then the VRM will go into alarm.

Upon a Vapor Collection Warning condition, it is highly recommended to get the fueling point(s) serviced as soon as possible. If a fueling point goes untreated, then the VRM will issue a failure alarm and shut down the affected dispenser. If this condition occurs, the entire dispenser should be placed out of service until a Franklin Fueling Systems certified technician can troubleshoot the problem. All other dispenser will remain in operation. See Appendix A for the Alarm Code description and possible solution, or the *Vapor Recovery Monitoring Troubleshooting and Diagnostics Guide* available on the Franklin Fueling Systems Web site: [www.franklinfueling.com](http://www.franklinfueling.com).

## Vapor Pressure Containment Warnings and Failures


A Weekly or Monthly Ullage Pressure warning or failure occurs when the vapor pressure exceeds the operating threshold. The VRM system makes both a weekly and monthly assessment on the amount of time the vapor containment pressure exceeds a threshold over a specific period of time. If the containment pressure rises above the overpressure limits for either the weekly or monthly thresholds, then the VRM will issue a warning. A second consecutive period of exceeding the overpressure threshold will result in a failure alarm and a shutdown of all dispensers.


A Weekly Ullage Pressure Leak Test warning or failure is an indication that the containment space (vapor space) is leaking vapors beyond the allowable limit. This assessment is performed on a weekly basis. If a vapor containment is leaking, the VRM will issue a warning at the end of the first week and if it is not fixed by the end of the second week then all dispenser will become disabled.

See Appendix A for the Alarm Code description and possible solution, or the *Vapor Recovery Monitoring Troubleshooting and Diagnostics Guide* available on the Franklin Fueling Systems Web site: [www.franklinfueling.com](http://www.franklinfueling.com).

## Re-enabling Dispenser(s)

Dispensers can be re-enabled by the following method. Note that this procedure does not clear any warnings or failures, it only re-enables dispensing.

**Warning**  **The Failed fueling point requires immediate attention and should be bagged so it is not used until the problem has been fixed by a certified Service Technician. Continuous use of a failed Fueling Point will result in another shutdown.**

**Warning**  **Refer to local districts before putting a shutdown dispenser back into operation.**

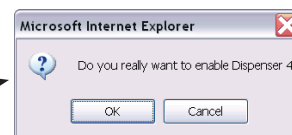
### From the LCD:

1. Go to the **VRM»Dispensers** menu (see Figure 5a & 5b and Figure 6a & 6b).
2. Press the dispenser showing “Shutdown”.
3. Press “Yes” on the confirmation box.

### From the Web Browser:

1. Go to the **VRM»Status** page.
2. Press the red “Shutdown” for each dispenser showing shutdown.
3. Press “Yes” to enable the dispenser or all dispensers.

Franklin Fueling Systems			VRM
Home System FMS VRM Setup Preferences			
Status Alarms Control Reports			
Dispenser	Dispenser Status	TS-VFM	
1	Idle	Operational	
2	Idle	Operational	
3	Idle	Operational	
4	Shutdown	Operational	
5	Idle	Operational	
6	Idle	Operational	
Common			
Pressure Sensor			
Ullage Pressure			



**Note:** If a dispenser shutdown was caused by poor vapor collection, you will only be able to enable one dispenser at a time. If the shutdown was caused by a pressure failure, you will be able to enable all dispensers at the same time by pressing any dispenser.

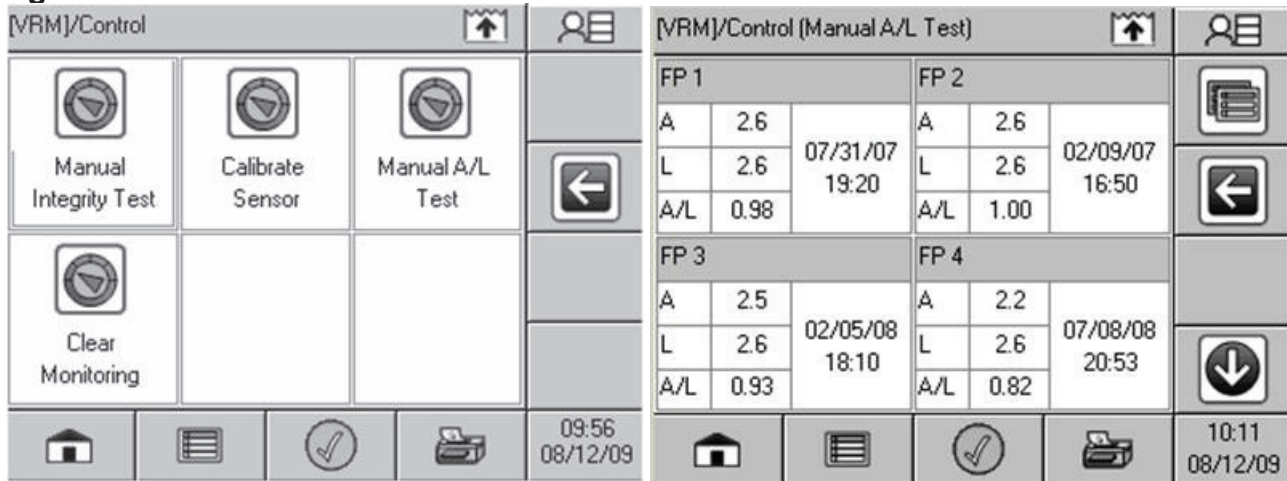
## Clearing Alarms

Vapor Flow and Vapor Pressure alarms can be cleared by running the respective manual test or by waiting until the next assessment period has passed.

### Clearing Vapor Collection (A/L) Alarms

Once a certified technician has fixed the cause of the vapor flow problem, the alarm can be cleared by two methods: running a manual test or letting the fueling point go through a full day of transactions. The manual A/L test is much faster and will allow the technician to clear the alarm before leaving the site. To run a manual test, go to **VRM»Control** then select “**Manual A/L Test**”. Now select the fueling point(s) that are in alarm and on the next dispense, if there is an A/L passes then the alarm will clear. See Figure 8a & 8b.

**Figure 8a & 8b**



**Note:** The manual A/L test should be done on either a known non-ORVR vehicle or test container that will return air/vapor mixture back to the UST. If the A/L does not meet the required threshold then the fueling point will remain in alarm.

### Clearing Pressure Related Alarms

A technician will also have two methods of clearing pressure related alarms by either letting the system go through its normal assessment period or manually clearing pressure alarms.

To clear a Pressure Related Alarms, do the following:

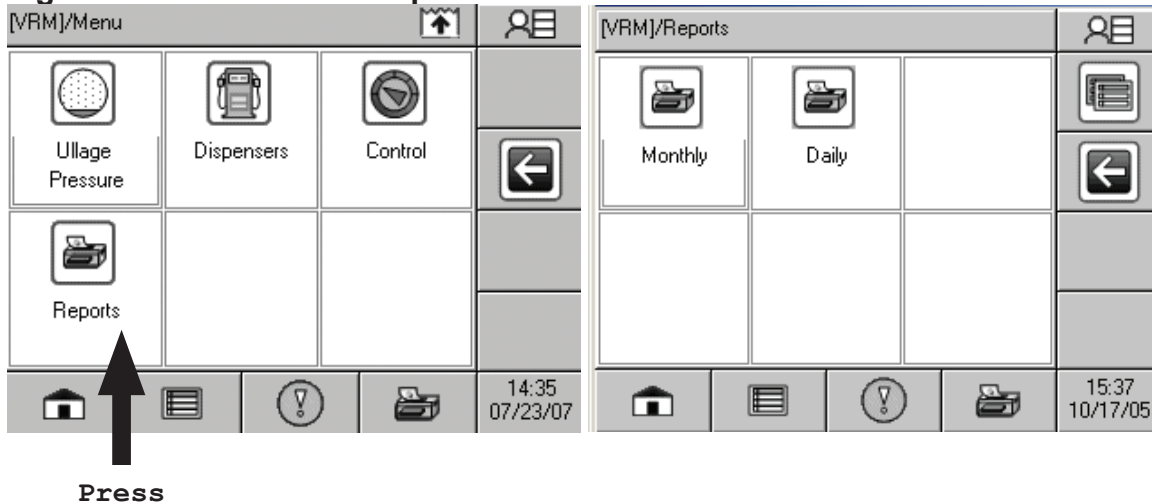
1. Go to the **VRM»Control** Page and select “**Clear Monitoring**”.
2. Enter in your Franklin Fueling Systems technician ID number.
3. Enter in the administrator password.
4. All the Pressure Monitoring Alarms shall clear.

# Reports & Printing

## Creating Reports

Reports can be generated and printed based on the last 30 days, by month, or by year. The console stores ISD history for two years.

Figure 9a and 9b - VRM Reports LCD View



### Alarm Reports

Alarm reports can be generated either from the **System»Reports** page or the **VRM»Alarms** web page. The **System»Reports** page will generate both the system alarms and application alarms while the **VRM»Alarms** will only generate VRM related application alarms.

### VRM Reports

There are two different VRM reports that can be generated, a Daily Report and a Monthly Report. The Daily Report generates a list of results for each day on a rolling 30 day basis. The information included in the report is:

#### Daily Report

##### ISD Up-Time

The ISD up-time is the percentage that the ISD System is running the VRM application. It calculates the up-time based on actual run-time during a 24-hour period. It is stated in CP-201 that the ISD system must be running 95% of the time on an annual basis.

##### Highest and Lowest Ullage Pressure

The highest and lowest ullage pressure is the highest and lowest average hourly pressure for each day.

##### 75<sup>th</sup> and 95<sup>th</sup> Percentile Ullage Pressure

The VRM records and stores the 75<sup>th</sup> and 95<sup>th</sup> highest ullage pressure for each day.

##### Fueling Point Assessments

This shows the daily status of each fueling point. There are four assessments that each fueling point can be classified into; pass, failure, warning, or insufficient data.

## Monthly Report

### ISD Operation Time, %

The ISD operation time is the cumulative operation time of the VRM application. It is stated in CP-201 that the ISD system must be running 95% of the time on an annual basis.

### EVR Operating Requirements

The EVR operating requirements list what EVR components are installed at the site and what each component should be operating at if applicable.

### EVR Pass Time, %

The EVR pass time is the percentage of time the entire EVR system is not in an Alarm state.

### ISD Monitoring Requirements

The ISD monitoring requirements are the limits in which alarms are triggered by.

### Warning, Failures

This is a list of current and past warnings and failures that relate to VRM.

### Event Log


The event log shows a description of any shutdowns and the action to re enable any fueling points.

## Printing Reports

### **Printing from a Web Browser**

Printing reports can be done directly from the web browser. Once a report is generated it can simply be printed by going to the **File>Print** on the on the web browser's tool bar.

### **Printing from the Local LCD**

To print from the local LCD to the internal printer, press the print button  and it will navigate you to the print menu. From the print menu, you can choose the type of report you want to print.

Printed VRM Report Examples

```

{Site Name}
{ID Line 1}
{ID Line 2}
{ID Line 3}
{ID Line 4}
{ID Line 5}
12/26/2008      11:25:39

VRM Daily Report
From: {date}
To:   {date}

Pressure: inH2O
ISD Version: 1.2.0
ISD Up Time 100%

12/26/2008
ISD Up Time      100.00
ISD Pass Time    0.00
Pressure Max     0.26
Pressure Min     -2.53
Pressure 75th   -0.77
Pressure 95th   -0.11

FP1      P0.98
FP2      P1.03
FP3      P1.03
FP4      P1.05
FP5      P0.98
FP6      P1.01
FP7      P1.01
FP8      P1.05
FP9      P0.97
FP10     P1.02
FP11     P1.03
FP12     P1.05

12/25/2008
ISD Up Time      100.00
ISD Pass Time    0.00
Pressure Max     0.22
Pressure Min     -2.67
Pressure 75th   -0.90
Pressure 95th   -0.21
FP1      P0.98
FP2      P1.03
FP3      P1.03
FP4      P1.05
FP5      P0.98
FP6      P1.01
FP7      P1.01
FP8      P1.05
FP9      P0.97
FP10     P1.02
FP11     P1.03
FP12     P1.05
    
```

```

{Site Name}
{ID Line 1}
{ID Line 2}
{ID Line 3}
{ID Line 4}
{ID Line 5}
12/20/2005      11:25:39

VRM Monthly Report
From: {date}
To:   {date}

Statistics
December 2005
Operation [%]
100
Pass [%]
100

Operation Requirements
Vapor Collect Method
Assist
A/L Low
0.95
A/L High
1.15

Monitoring Requirements
Dry Vapor Coll. A/L
Low
0.33
High
1.90

Wkly Vapor Coll. A/L
Low
0.81
High
1.32

Wkly Ullage Press. Mon.
High
1.30

Mthy Ullage Press. Mon.
High
0.30

Warning Alarms
Occurred
12/09/2005      00:05:00
Cleared
12/10/2005      02:15:00
Daily Vapor Collection
Fueling Point 10

Failure Alarms
11/27/2005      00:00:05
Weekly Ullage Pressure Leak

Events
Occurred
12/20/2005      07:07:14
    
```



# **Maintenance**

## **General Inspection**

Maintenance is not required on the ISD equipment. All ISD Vapor Flow Meters and Vapor Pressure Sensors are checked every day for proper operability. The Console also does a self-check on all the internal modules as well on a daily basis.

If the Console identifies a problem with any components or Vapor Recovery Sensors, they will need to be diagnosed. See the replacement part numbers for the failed component and contact Technical Service.

## **Console and Vapor Recovery Equipment Replacement Parts**

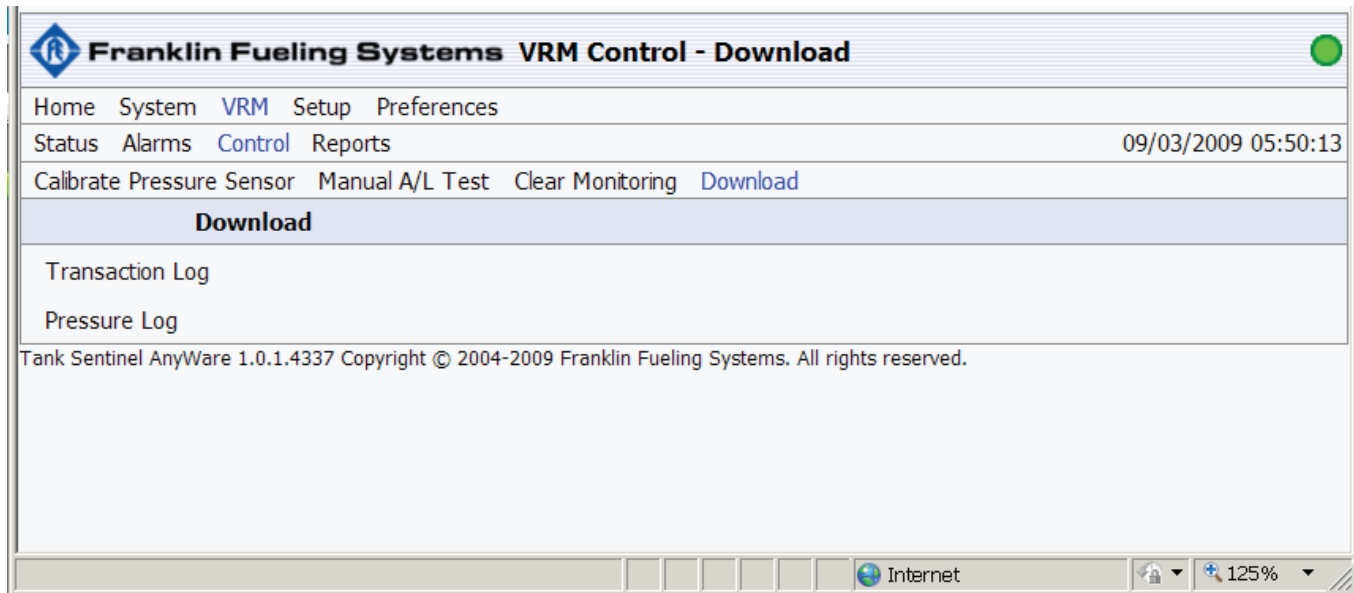
<b>Part Number</b>	<b>Description</b>
TS-PRB	12 Input Probe Module
TS-420IB8	8 Input 4-20ma Module
TS-RLY	8 Channel Relay Module
TS-ACI	12 Channel AC Input Module
TSSP-CM	Control Module
TSSP-PS	Power Supply Module
TSSP-LCD	LCD Display
TSSP-IFB5X	TS-550/EMS Interface Board
TSSP-IPPTR	Impact Printer Assembly
TSSP-T550MB	TS-550/EMS Motherboard
TSSP-T5000MB	TS-5000 Motherboard
TS-VFM	Vapor Flow Meter
TS-VPS	Vapor Pressure Sensor
TS-DIMIB	Internal Dispenser Interface Module
TSP-ENCD	Flow Meter Encoder Replacement
TSSP-BAT	3V Lithium Battery
TSSP-F4	Fuse, 3A (Relay and Power Supply)
TSSP-ISBS	I.S. Barrier Shield
TS-TP5000	TS-EMS/550/5000 Impact Printer Paper
TS-INKRB	TS-EMS/550/5000 Inker Ribbon
TSSP-TRMBLK	Package of 10 Terminal Blocks
TSSP-TMPTR	Thermal Printer
TS-TP2	Paper for the Thermal Printer (1 box of 5)

# Diagnostics

## Pressure and Transaction Log Files

The console records pressure and transaction data on a continuous rolling basis. There are two .csv (comma separated values) files that can be downloaded from the VRM download page. These files are Microsoft Excel compatible and can be used as a diagnostics tool to help troubleshoot sites.

**Note:** This feature is only available in VRM Version 1.2.0 or higher.



## Pressure Log Files

The pressure log file contains 2 weeks of pressure samples in one minute increments. Below is an explanation of the columns in the pressure log file.

Term	Description
<b>DATE_LOCAL</b>	This column is the date the pressure sample was recorded.
<b>TIME_LOCAL</b>	This column is the time the pressure sample was recorded.
<b>QUIET_TIME</b>	This value indicate if there was active dispensing at the time of the sample. A "1" indicates at least one fueling point is dispensing and a "0" indicates no fueling points are dispensing.
<b>PRESSURE</b>	This is the pressure sample recorded by the console. The Vapor Pressure Sensor has a range between -8 Inches WC and +8 Inches WC. The pressure value may reach as far as 9 Inches WC, this is ok.
<b>ULLAGE</b>	The ullage is the amount of vapor space in the vapor containment area. The units are in gallons.

	A	B	C	D	E	F
1	DATE_LOCAL	TIME_LOCAL	QUIET_TIME	PRESSURE	ULLAGE	
2	8/15/2009	20:05:00	0	-8.92	19645	
3	8/15/2009	20:06:00	0	-8.92	19645	
4	8/15/2009	20:07:00	0	-8.90	19646	
5	8/15/2009	20:08:00	0	-8.90	19646	
6	8/15/2009	20:09:00	0	-8.88	19646	
7	8/15/2009	20:10:00	0	-8.84	19646	
8	8/15/2009	20:11:00	0	-8.84	19646	
9	8/15/2009	20:12:00	0	-8.84	19646	
10	8/15/2009	20:13:00	0	-8.82	19646	

## Transaction Log Files

The transaction log file records and stores 1000 transactions per fueling point.

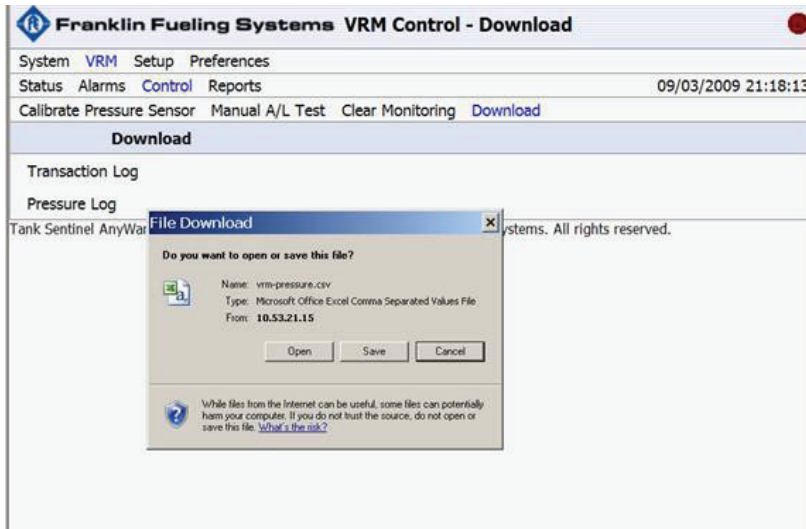
Term	Description
<b>HOSE</b>	This column indicates the hose or fueling point number the transaction occurred on. The value shown is a combination of fueling point number and hose number. The right two digits indicate the hose number and the left digits indicate the fueling point number. For uni-hose dispensers, the right two digits can be ignored. You will see a 100 for fueling point 1, 200 for fueling point 2, etc. For multi-hose dispensers, you will see values such as 101 indicating fueling point 1 hose 1 or 703 indicating fueling point 7 hose 3.
<b>DATE_LOCAL</b>	This column is the date at the beginning of the transaction.
<b>TIME_LOCAL</b>	This column is the time at the beginning of the transaction. The time is a local reference to the console.
<b>AIR_VOLUME</b>	This column is the air or vapor returned through the ISD flow meter. The units are in gallons.
<b>LIQUID_VOLUME</b>	This is the amount of gasoline that was dispensed during the transaction. The units are in gallons.
<b>RATIO</b>	This is the A/L ratio of the transaction.
<b>TYPE</b>	This is the classification of the transaction. Only v_VrmValidAoL type transactions are used as part of the daily and weekly average: <b>v_VrmValidAoL</b> is a single transaction that was either less than 0.15 or greater than 0.50. <b>v_VrmORVRPotential</b> is a single transaction that was between 0.15 and 0.50. <b>v_VrmMultipleTransactions</b> is when both sides of a dispenser were active at the same time. <b>v_VrmDispenseVolumeZero</b> occurs when no liquid volume is dispensed. This may occur when a transaction is aborted before pumping any fuel. <b>v_VrmSmallFuelVolume</b> occurs when less than 1 gallon of gasoline is dispensed. <b>v_VrmTransactionLost</b> occurs when the console does not receive the volume of gasoline dispensed from the dispenser or a new transaction occurs too quickly. <b>v_VrmReferenceTest</b> is assigned to a transaction when the transaction is being run as part of a Manual A/L. This is usually done when clearing vapor collection alarms.

Below is an example of a transaction log file.

	A	B	C	D	E	F	G
1	HOSE	DATE_LOCAL	TIME_LOCAL	AIR_VOLUME	LIQUID_VOLUME	RATIO	TYPE
2	101	8/15/2009	20:16:13	6.43	6.46	1.00	v_VrmValidAoL
3	301	8/15/2009	20:18:28	3.88	17.82	0.22	v_VrmORVRPotential
4	703	8/15/2009	20:19:41	3.71	3.45	1.08	v_VrmValidAoL
5	802	8/15/2009	20:21:31	1.57	5.17	0.30	v_VrmORVRPotential
6	401	8/15/2009	20:21:52	0.52	3.23	0.16	v_VrmORVRPotential
7	201	8/15/2009	20:23:28	2.68	4.68	0.57	v_VrmValidAoL
8	101	8/15/2009	20:25:47	12.42	13.53	0.92	v_VrmValidAoL
9	701	8/15/2009	20:25:53	2.22	6.45	0.34	v_VrmORVRPotential
10	101	8/15/2009	20:30:22	10.77	12.91	0.83	v_VrmValidAoL
11	201	8/15/2009	20:32:58	3.95	10.63	0.37	v_VrmORVRPotential
12	501	8/15/2009	20:34:02	16.53	20.12	0.82	v_VrmValidAoL
13	401	8/15/2009	20:34:28	2.62	14.04	0.19	v_VrmMultipleTransactions

## Steps to download log files

1. Navigate to the VRM>Control>Download web page.
2. Click on either the Transaction Log file or Pressure Log file.
3. A message box will appear asking if you want to Open, Save, or Cancel. If you choose to save, you will be prompted to save it to a directory of your choice. The file may take up to five minutes to completely download.



4. Once downloaded, the file can be opened by double clicking on it. The file is best viewed when Microsoft Excel is installed on the PC.

START-UP/NEW INSTALLATION FORM  
INCON VAPOR RECOVERY MONITORING (VRM) SYSTEM

DATE \_\_\_\_\_

## INCON VRM Startup Checklist

Service Company Name	Telephone Number
Service Technician	INCON Tech Cert #
Station Address	City
Phase I EVR Equipment Manufacturer	Phase II EVR Equipment Manufacturer

Dispenser Equipment Checklist		YES	NO	Initials
1	Franklin Fueling Systems, . Healy Phase II EVR System including ISD System installed according to CARB E.O. VR-202?			
2	Is the Vapor Pressure Sensor test port installed in the correct direction? When the ball valve is closed it should isolate the Vapor Pressure Sensor from the containment area. See Figure 11 of the procedure. If it is not then it must be configured such that the pressure sensor is isolated when the valve is closed.			
3	Is the Pressure Sensor in the Open position with the plug in the test port? See Figure 11 of the procedure.			
4	Was Oil and gasoline compatible PTFE Tape used on the threads for the Vapor Flow Meter rather than pipe dope?			
5	Was a pressure decay test run per TP201.3?			
6	Was the Dispenser Vapor Line Integrity Test run to check for leaks in the dispensing equipment?			

Tank Sentinel Equipment Checklist		YES	NO	Initials
7	Was the dispenser maximum load current measured and recorded? Be sure the proper size Relay Module is used. Use the 10A Relay Module if the current exceeds 2 Amps.			
8	Were the Gasoline Dispenser Hook Signals wired individually to the AC Input Module with dispenser 1 wired to the first set of channels? Verify all non-gasoline hook signals are installed after the last gasoline hook signal.			
9	Has the Administrator Password been set?			
10	Was the External ATG alarm able to be generated and cleared?			

# Appendix A: Alarm Codes

Device	Description	Category	Type	Definition	Possible Cause and Solution
Fueling Point [n]	Daily Vapor Collection or Weekly Vapor Collection <sup>1</sup>	VRM	Warning or Alarm	This Vapor Recovery alarm occurs when the vapors being return to the UST are blocked. The alarm will occur either at the end of the day or the end of the week depending on the type of vapor recovery system is installed.	May be caused by leaking hanging hardware, blocked hoses or vapor recovery lines, jammed flow meter. Run Exhibit 5 of VR-202 to verify a blockage. Check for leaks by viewing the vanes through the site glass on the VFM.
	Weekly or Monthly Ullage Pressure <sup>1</sup>	VRM	Warning or Alarm	This vapor recovery alarm occurs when the UST ullage pressure exceeds the alarm threshold for the time period specified in the alarm.	Look for problems using one or more of the following VR-202 procedures/ tests: Dispenser Integrity Test B-3m (i.e. "Plumbing Tightness test), Exhibit 4, Exhibit 5, Exhibit 9 (pressure sensor only) or flow rate verification per section 1.2.3.
	Weekly Ullage Pressure Leak Test <sup>1</sup>	VRM	Warning or Alarm	This vapor recovery alarm occurs when the Vapor Recovery Monitor determines a leak greater than the allowable.	May occur when there's an excessive leak in the vapor recovery containment area. Perform a pressure decay test per TP-201.3.
Channel [n]	Missing	VRM	Alarm	A flow meter is not connected or there is an open in the wiring. This will only occur for a flow meter channel that is programmed to have a flow meter.	Check the connection. Measure the voltage of the terminals, which should be approximately 18Vdc.
Channel [n]	Error	VRM	Alarm	The Vapor Recovery Monitor does not understand the data transmission.	This may happen when a channel is programmed for a magnostriptive probe but has a vapor flow meter connected instead.
	Pressure Sensor Open Circuit	VRM	Alarm	The pressure sensor is not connected to the Vapor Recovery Monitor.	Usually due to a bad connection or a broken wire. In some cases the sensor may not be working. First check the connections inside the dispenser junction box then at the Console terminal block. Second, measure the voltage at the terminal blocks and verify the voltage. See page 17.
	External TS-DIM Connection Down	VRM	Alarm	No communication between the TS-DIM and the Console.	Occurs with bad connection, TS-DIM does not have power, TS-DIM is not working. Check the wiring between the TS-DIM and the Console. Check the jumper settings in the TS-DIM, see installation manual.
	TS-DIM Read Data Error	VRM	Alarm	Bad communication to the Console.	Most likely a baud rate problem. Check the baud rate in the Console as well as the jumper settings in the TS-DIM.
	External ATG Connection Down	VRM	Alarm	No communication or bad communication between the ATG and the Console.	Check the comm. Port settings in both the ATG and the Console. These comm. Port settings should match. Make sure there is a straight serial cable between the ATG and the Console.
Printer	Check Thermal Printer	System	Warning	Printer is out of paper, or the printer door is open.	Make sure the printer has paper, and the printer door is closed completely.
	Printer Head Temperature	System	Warning	Print head high temperature (65°C) persists for at least 2 minutes.	Printer will resume printing and the alarm will clear after a short cool-down period. Keep the console area cool and ventilated. If the alarm does not clear, contact FFS Technical Support.
	Printer Paper Jam	System	Warning	Indicates that paper is jammed in the printer	Carefully lift printer cover to inspect and remove jammed paper.

Device	Description	Category	Type	Definition	Possible Cause and Solution
Slot [n]	[i] Module is offline, where <i>i</i> is the module number	System	Alarm	Occurs when a module is not communicating with the controller.	If RED LED is on or Green LED is blinking try cycling power.
	[i] Module number mismatch, where <i>i</i> is the module number	System	Alarm	Occurs when the number of modules does not match the programmed number of modules.	Check the setup at <b>System Configuration»Modules Expected</b> to see if the correct numbers are programmed.
	System Bus Error	System	Alarm	The communication bus is not working properly.	Check to see if a particular module has a red Error LED. If so try to trouble shoot the bad module. Also try removing the bad module and see if the alarm goes away.
TS-DTUn	Remote DTU is Offline	System	Alarm	A remote DTU is not communicating to the console DTU.	Wrong ID Number Dispenser Powered Off Not installed correctly Not on same phase voltage as console DTU
	Console DTU number mismatch	System	Alarm	The console DTU is not communicating with the console.	Bad bus connection Not powered
	DTU FFS Interference	System	Alarm	Two networks have the same Network ID	Change Network ID



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# TS-VFM

## Installation Guide

This install guide provides necessary installation instructions for the mounting of the INCON Vapor Flow Meter inside a dispenser or inside a dispenser sump. Information regarding the cabling and the connection to the Tank Sentinel Console is found in the *Tank Sentinel Installation Guide* (p/n 000-2150). All documentation relating to operability, maintenance, and testing of the Vapor Flow Meter is found in the *Vapor Recovery Monitor Operator's Guide* (p/n 000-2058).

**Important: See the Vapor Recovery Install/Operators Manual or Tank Sentinel Installation Manual for Important Safety Messages.**

### Required Tools

- Pipe joint tape (Oil and gasoline compatible PTFE Tape)
- Pipe Wrench
- Small screwdriver (terminal block connection)
- Slip joint pliers (crimping splice connector)

### Related Documents

- 000-2058 : *Vapor Recovery Monitor Operators Guide*
- 000-2150 : *Tank Sentinel Installation Guide - TS-5XXX Series*
- 000-2142 : *Tank Sentinel Programming Guide - TS-5XXX Series*
- 000-2151 : *Tank Sentinel Operator's Guide - TS-5XXX Series*

### Preparation

Only use approved pipe joint tape (Oil and gasoline compatible PTFE Tape) for joints connecting to the Vapor Flow Meter. The use of non hardening, "pipe-dope," thread sealant is strictly prohibited and will void the warranty.

1. Perform a site inspection. Determine how the Vapor Flow Meter will be installed. The preferred installation method for this product is to install above the vapor shear valve. If there is not enough room between the vapor shear valve and the vapor pump, installation below the shear valve may be needed.
2. If the Vapor Recovery equipment is going to be installed on an existing service station, verify that there is a run of intrinsically safe conduit going back to the console. Vapor Flow Meter wiring can share the same space with other intrinsically safe cables, but cannot be run with non-intrinsically safe cables.
3. Make sure that all contractor-supplied piping materials are compatible with California fuels and meet all local codes.

### Parts List and Materials Needed

**Table 1 - Above Shear Valve**

Item Description	Supplied By	Quantity
Vapor Flow Meter, TS-VFM	INCON	1
Sensor Installation Kit, 020-1509	INCON	1
Weatherproof Junction Box	Contractor	1
1.5" to 1" reducing bushing	Contractor	1
1.5" to ___" reducing bushing*	Contractor	1
1" pipe nipple	Contractor	1
___" pipe nipple*	Contractor	1
Pipe Union	Contractor	1

**Table 2 - Below Shear Valve**

Item Description	Supplied By	Quantity
Vapor Flow Meter, TS-VFM	INCON	1
Sensor Installation Kit, 020-1509	INCON	1
Weatherproof Junction Box	Contractor	1
1.5" pipe nipple	Contractor	2
1.5" pipe union	Contractor	1

\* - piping size is dependent on vapor piping size inside the dispenser. Typically the connection to a Healy VP1000 is a ½" NPT. Thus, the bushing size will be 1.5" to 0.5".

### Installation Steps

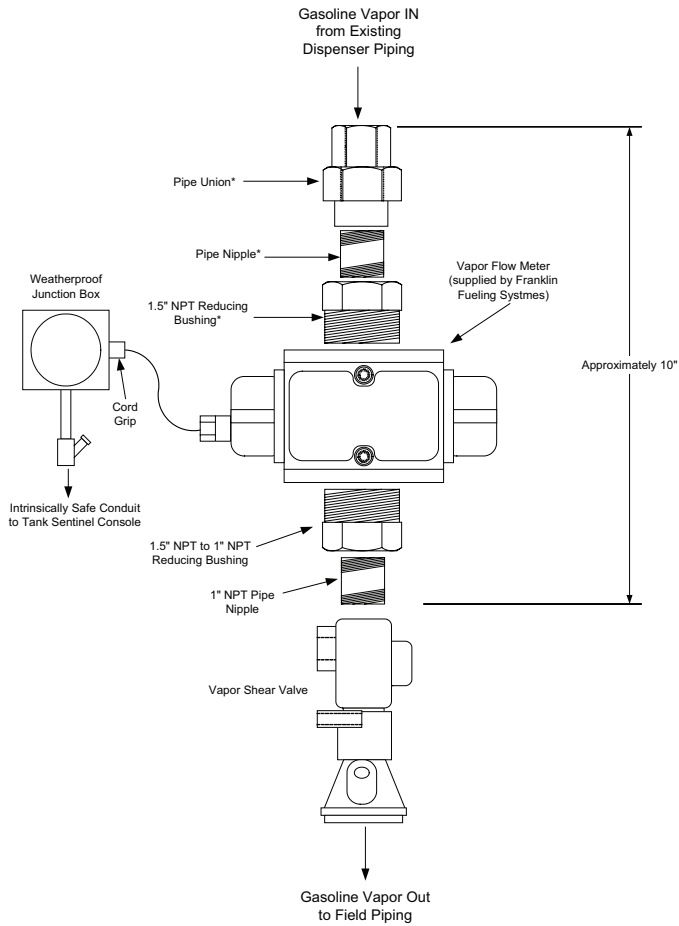
#### Above Shear Valve

1. Lock and tag out power to the dispenser and the console before attempting any work on the dispenser.
2. Refer to Figure 1 for reference.
3. Do not remove the protective caps on the Vapor Flow Meter until you are ready to thread the nipples into the Flow Meter.
4. Begin by connecting the two 1.5" to 1" reducing bushings to the Vapor Flow Meter's body. Be sure to use only Oil and gasoline compatible PTFE tape when sealing these threads. Take special precaution not to let any foreign material fall inside of the Vapor Flow Meter.
5. Next, start assembling the hardware from the bottom up. Connect a short, 1" NPT threaded nipple to the top of the vapor shear valve and to the 1.5" to 1" reducing bushing on the flow meter.
6. Connect another 1" pipe nipple to the top reducing bushing followed by a 1" pipe union. The existing dispenser piping can now connect to the top of the union.
7. If there is not already a watertight junction box for the intrinsically safe cables, then install one as described earlier in Tools Required.
8. Pull the black Vapor Flow Meter cable through the supplied cable grip and into the junction box. Using the supplied crimp connectors, splice the flow meter cable to the field cable. The color codes on the black flow meter cable are: **Red = +** (plus) and **Black = -** (minus)

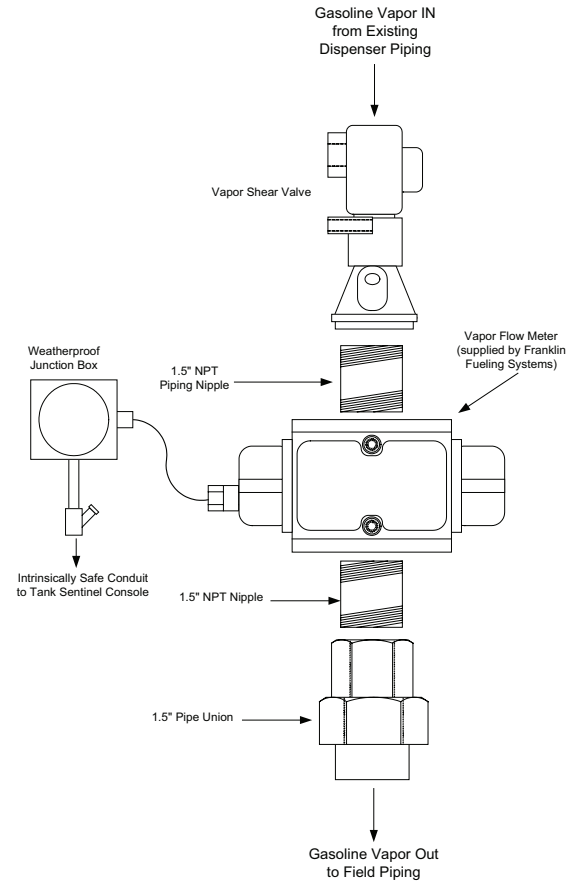
#### Below Shear Valve

1. Lock and tag out power to the dispenser and the console before attempting any work on the dispenser.
2. Refer to Figure 2 for reference.
3. Do not remove the protective caps on the Vapor Flow Meter until you are ready to thread the nipples into the Flow Meter.
4. Begin by connecting two 1.5" NPT pipe nipples to the Vapor Flow Meter's body. Be sure to use only Oil and gasoline compatible PTFE tape when sealing these threads. Take special precaution not to let any foreign material fall inside of the Vapor Flow Meter.
5. Next, prepare the piping inside of the dispenser sump to connect to the Vapor Flow Meter. If flexible piping is currently installed, make sure, when adding the Vapor Flow Meter, that there are no bend radii that are too sharp, kinks, or traps. The contractor may need to replace the existing flexible piping with a shorter length in order to avoid potential flow restrictions.
6. Add the Vapor Flow Meter between the existing piping in the sump and the bottom of the vapor shear valve. In most cases the vapor shear valve will need to be temporarily removed in order to assist with making the connection. Add a union to either the top of the shear valve or below the shear valve.
7. If there is not already a watertight junction box for the intrinsic safe cables, then install one as described earlier in Tools Required.
8. Pull the black Vapor Flow Meter cable through the supplied cable grip and into the junction box. Using the supplied crimp connectors, splice the flow meter cable to the field cable. The color codes on the black flow meter cable are: **Red = +** (plus) and **Black = -** (minus)

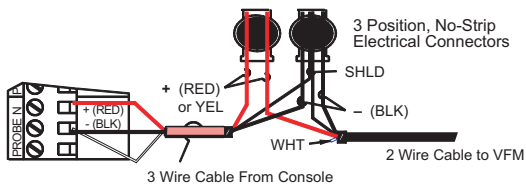




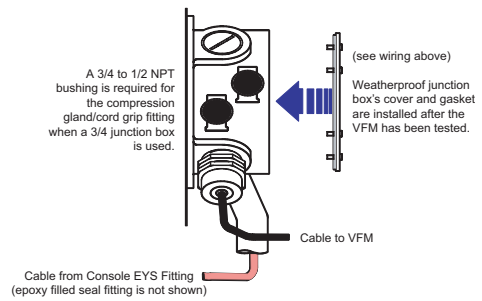
**Figure 1**  
Flow Meter Above Shear Valve



**Figure 2**  
Flow Meter Below Shear Valve



To splice: Insert stripped wires and use a slip-joint pliers to seat the black piece.



Cable from Console EYS Fitting (epoxy filled seal fitting is not shown)



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# TS-VPS

## Installation Guide

This install guide provides necessary installation instructions for the mounting of the INCON Vapor Pressure Sensor inside a dispenser, inside a dispenser sump, or on the top of a tank riser. Information regarding the cabling and the connection to the Tank Sentinel Console is found in the *Tank Sentinel Installation Guide*, (p/n 000-2150). All documentation relating to operability, maintenance, and testing of the Vapor Pressure Sensor is found in the *Vapor Recovery Monitor Operator's Guide* (p/n 000-2058).

**Important: See the Vapor Recovery Install/Operators Manual or Tank Sentinel Installation Manual for Important Safety Messages.**

### Required Tools

- Pipe joint tape (Oil and gasoline compatible PTFE Tape)
- Adjustable Wrench
- Small screwdriver (terminal block connection)
- Slip joint pliers (crimping splice connector)

### Related Documents

- 000-2058 : *Vapor Recovery Monitor Operators Guide*
- 000-2150 : *Tank Sentinel Installation Guide - TS-5XXX Series*
- 000-2142 : *Tank Sentinel Programming Guide - TS-5XXX Series*
- 000-2151 : *Tank Sentinel Operator's Guide - TS-5XXX Series*

### Preparation

1. Perform a site inspection. Determine how the Vapor Pressure Sensor will be installed. The preferred installation method for this product is to come off the horizontal 1" port of the vapor shear valve. If this is not possible, then a piping tee may need to be installed below the Vapor Flow Meter.
2. If the Vapor Recovery equipment is going to be installed on an existing service station, verify that there is a run of intrinsically safe conduit going back to the console. Vapor Flow Meter wiring can share the same space with other intrinsically safe cables, but cannot be run with non-intrinsically safe cables.
3. Make sure that all contractor-supplied piping materials are compatible with California fuels and meet all local codes.

### Parts List and Materials Needed

**Table 1 - Off Shear Valve**

Item Description	Supplied By	Quantity
Vapor Pressure Sensor, TS-VPS	INCON	1
Sensor Installation Kit, 020-1509	INCON	1
Weatherproof Junction Box	Contractor	1
1" to 0.5" reducing bushing	Contractor	1

**Table 2 - Below Shear Valve**

Item Description	Supplied By	Quantity
Vapor Pressure Sensor, TS-VPS	INCON	1
Sensor Installation Kit, 020-1509	INCON	1
Weatherproof Junction Box	Contractor	1
1" to 0.5" reducing bushing	Contractor	1
1.5" Piping Tee	Contractor	1

### Installation Steps

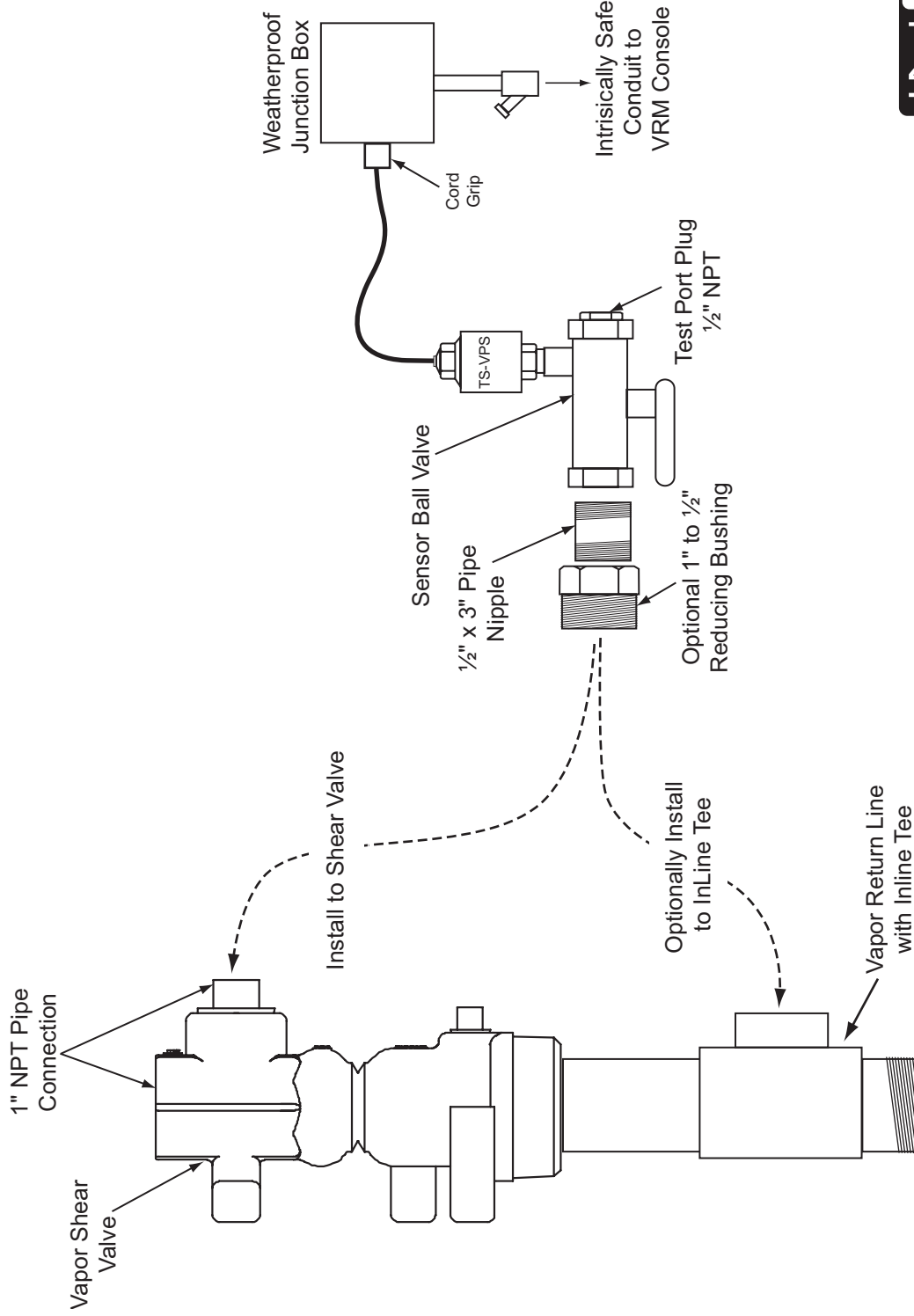
#### Installation Steps Off the Vapor Shear Valve

1. Lock and tag out power to the dispenser and the console before attempting any work on the dispenser.
2. Refer to Figure 1 for reference.
3. Begin by removing the 1" plug from the vapor shear valve and installing a 1" to ½" reducing bushing.
4. If there is not already a watertight junction box for the intrinsically safe cables, then install one as described earlier in Tools Required.
5. Pull the black Vapor Pressure Sensor cable through the supplied cable grip and into the junction box. Using the supplied crimp connectors, splice the flow meter cable to the field cable. The color codes on the black Vapor Pressure Sensor are: Black = + (plus) and White = - (minus).

#### Installation Steps Below the Vapor Shear Valve

1. Lock and tag out power to the dispenser and the console before attempting any work on the dispenser.
2. Refer to Figure 1 for reference.
3. Install a 1.5" piping tee below the Vapor Shear Valve.
4. Install an appropriate bushing sized to get to the supplied ½" piping nipple.
5. If there is not already a watertight junction box for the intrinsically safe cables, then install one as described earlier in Tools Required.
6. Pull the black Vapor Pressure Sensor cable through the supplied cable grip and into the junction box. Using the supplied crimp connectors, splice the flow meter cable to the field cable. The color codes on the black Vapor Pressure Sensor are: Black = + (plus) and White = - (minus).

**Figure 1**



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**PERMEATOR AT-150 Operating and Installation Manual  
California Air Resources Board (CARB) CP-201 Configuration  
Certified Under Executive Orders VR-201-Z and VR-202-Z**

**Table of Contents**

**Introduction**

**PERMEATOR Systems**

**System Components**

**PERMEATOR System Operation**

**System Applications**

**Component Selection and Location**

**AT-150 Control Panel**

**PERMEATOR Main Cabinet**

**Mounting Locations**

**Installation of PERMEATOR**

**Location**

**Piping**

**Electrical**

**Installation of AT-150 Control Panel**

**Location**

**Conduit**

**Electrical**

**Communication to ISD System**

**Vapor Piping Requirements and Installation**

**Overall requirements**

**Slope**

**Between dispensers and storage tanks**

**Between storage tanks and PERMEATOR**

**Commissioning and Start-up of PERMEATOR on site**

**Pressure Integrity Testing**

**Liquid leak integrity testing**

**Vapor to Liquid (V/L) Test**

**Pressure control set-points**

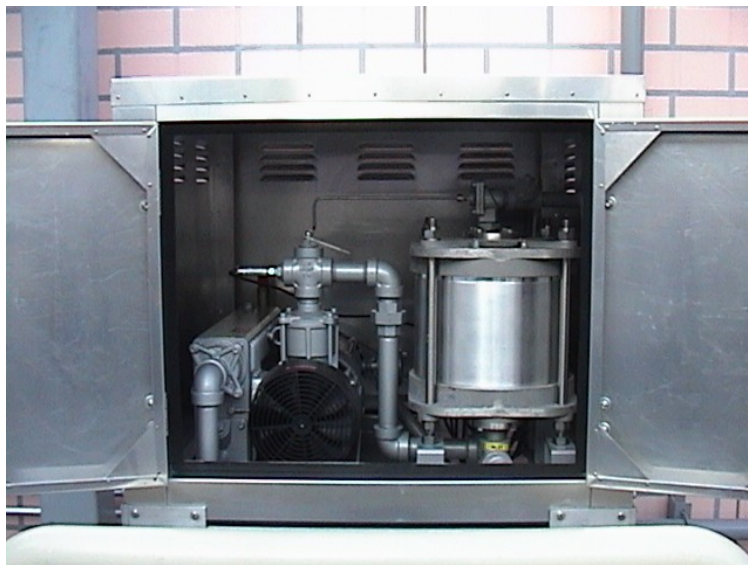
**Vacuum Pump Motor Rotation**

**PERMEATOR System Details**

- Piping**
- Vehicle vapor recovery system**
- Site inspection**
- Main Cabinet**
- Control Cabinet**
- Instructions to End-user's**

**Appendix**

- Quick Start Guide**
- Electrical Details**
- Troubleshooting**
  - Controller and Software**
  - Oil Level Limit Switch**
  - Motor Overload/ Control Panel**

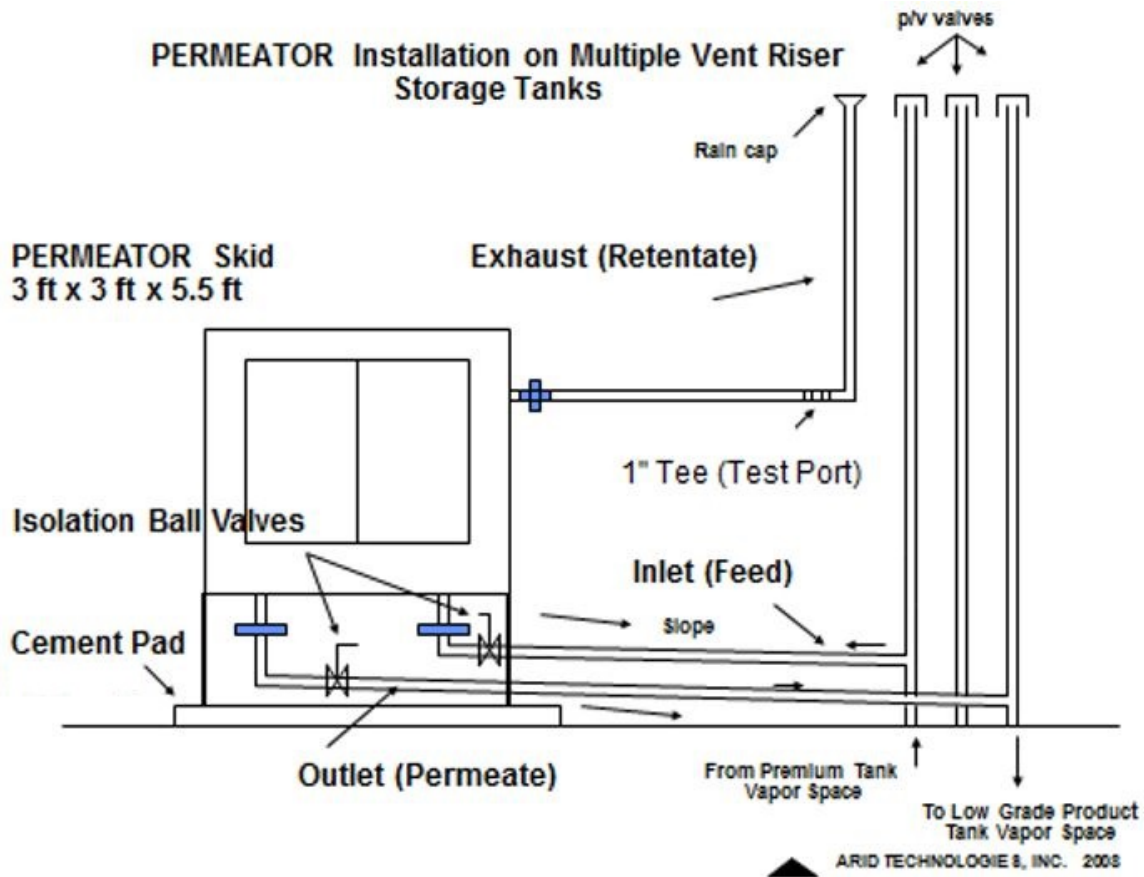


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## Introduction

The PERMEATOR System is a membrane based vapor recovery system which is installed on manifold storage tank vent lines to reduce on-going evaporative losses from refueling and transfer operations, as well as atmospheric pressure variations (Please refer to Figure 1). PERMEATOR simply separates hydrocarbon vapors from air; exhausts the cleaned air to atmosphere and returns the enriched hydrocarbon vapors to the storage tank headspace. This simple process virtually eliminates evaporative losses and the subsequent harmful emissions of ozone precursors to the environment. By using the rich vapors to “blanket” the storage tank liquid, the fundamental mechanism of evaporation loss is defeated.

PERMEATOR is designed with extremely high quality, robust components to provide consistent, efficient operation over many years. The membrane technology used has a proven performance record in numerous tank farms and refineries. The standard warranty on PERMEATOR is 36 months, covering parts.



In California, the PERMEATOR AT-150 is certified for installation on the Assist Phase (Stage) II Enhanced Vapor Recovery (EVR) System, Executive Order VR-202 series. In addition to reducing evaporative losses in the interval between tanker deliveries, the PERMEATOR also reduces losses during Phase (Stage) I cargo tank deliveries and losses caused by atmospheric pressure variations. Thus, emissions are reduced and gasoline is saved.

## System Components

The primary components included with purchase of PERMEATOR systems are as follows:

**AT-150 Control Panel** – The function of the control panel is to monitor storage tank pressure continuously and to actuate PERMEATOR in response to increased pressures. Also, the control panel houses a programmable logic controller (plc) which displays measured tank pressure (inches H<sub>2</sub>O, gauge), an hour meter (to log cumulative run time of the unit), a main power switch, a manual/automatic operation switch and indicator lights to provide on-going diagnostics of system operation (Please refer to Figure 2). The indicator lights are used to show control voltage, vacuum pump oil level fault, and vacuum pump ON, respectively from left to right. The switch, E has three settings; manual operation, off and automatic operation, left, center, and right, respectively.

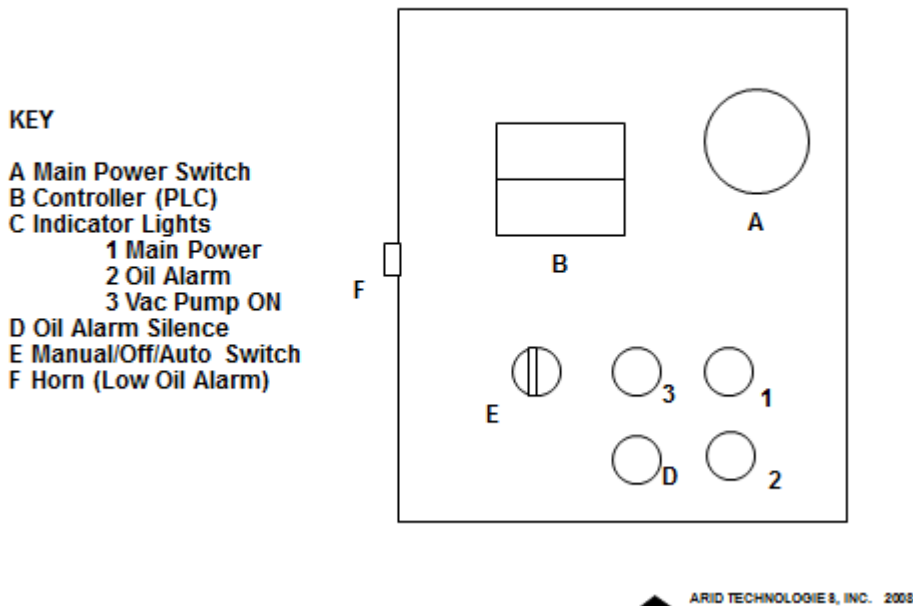
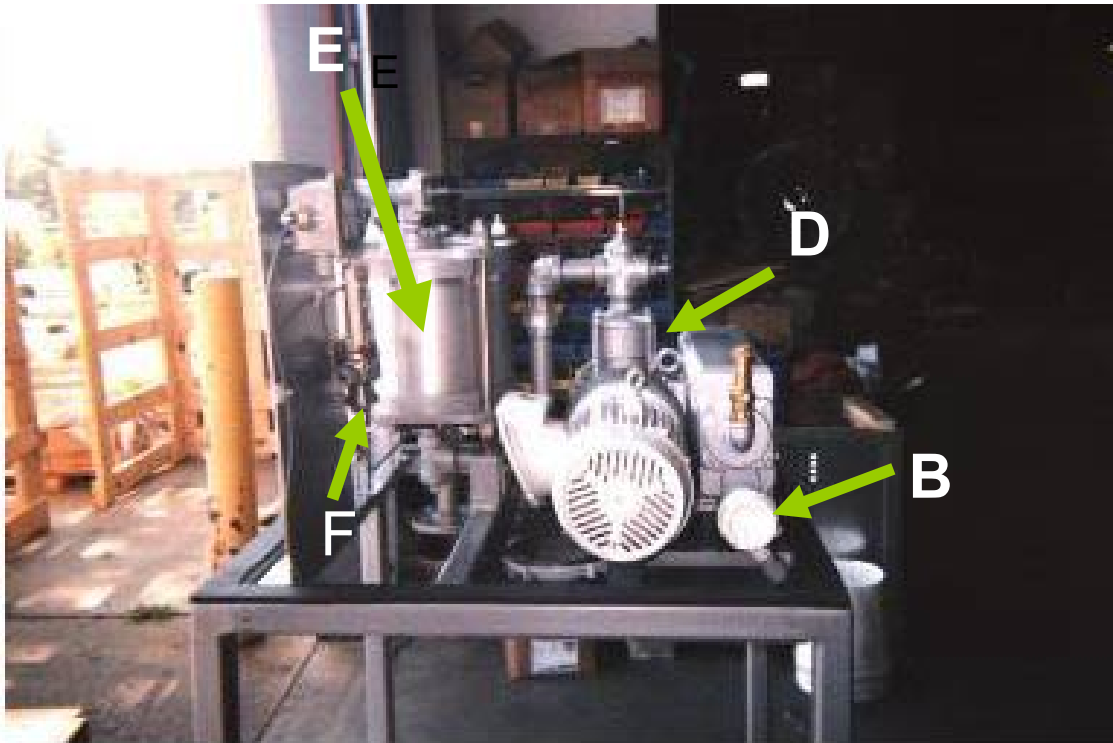


Figure 2

Optional features of the AT-150 Control panel include data logging, modem access and downloading capability to local or remotely located computers.

**Membrane module** houses the selectively permeable membranes used to separate hydrocarbon vapors from air. The module is a cylindrical structure containing baffle plates to ensure good contact between hydrocarbon vapors and the membrane material. The membrane is shown as “E” in Figure 3.



PERMEATOR, internal view  
Figure 3

**The vacuum pump, D** removes hydrocarbons which have passed through or permeated the membrane to ensure a constant driving force for continuous separation. Our vacuum pump uses a rotary vane design which incorporates a shock-resistant design, integral flame arrestors on inlet and discharge and anti-static materials to prevent static discharge. The pump is housed in the main cabinet as seen above.

**The pressure sensor/transmitter, F** is used to continuously monitor the combined ullage pressure in the gasoline storage tanks. The pressure information is sent to the plc located in the control panel. Based on pressure actuation set-points, the vacuum pump is started and stopped.

**Note:** This pressure sensor is different from the pressure sensor installed as part of an In-Station Diagnostic (ISD) system so there can be slight variations in readings when comparing the two sensors depending on Permeator On/Off condition and other dynamics (temperature, atmospheric pressure, etc.).

**The oil level sensor, B,** is used to continuously monitor oil level in the vacuum pump. If the oil level falls below a minimum threshold value, a light is illuminated on the panel to indicate a fault, the horn sounds and the power to the vacuum pump motor is interrupted



## CARB Approved IOM 12 - ARID Permeator AT-150 - VR-201-Z / VR-202-Z

until the oil level is brought back up. The oil level horn alarm is silenced by pushing the alarm silence button on the front of the control panel.

**The main cabinet** houses all components except the electrical control panel, which is mounted in a zone free area. The main cabinet can be mounted at grade, or above or below ground. The electrical components in the main cabinet are rated for operation in hazardous locations Class I, Groups C & D (UL, TUV, PTB and BASEEFA approvals). The main cabinet dimensions are Width: 3 ft., Depth: 3 ft., Height: 5 ft and the weight is approximately 750 pounds, uncrated.

Other items required for operation of PERMEATOR include the following:

**Pressure vacuum vent valves** (P/V valves) which are installed on the manifold storage tank vent lines. These valves are designed to prevent high vacuum or high pressure conditions in the storage tanks and to increase the recovery efficiency of Phase (Stage) I cargo tank delivery operations. Typical pressure settings in USA are +3 inches water column (407" water equals 1 atmosphere) pressure threshold and -8 inches water column vacuum threshold. Only P/V valves certified on CARB Phase (Stage) I EVR Executive Orders are permitted for installations in California. Exhibit 2 of the VR-202 series Executive Order (starting with Revision Y) shows typical installation options for P/V valve installation.

**Mounting stand** required to place PERMEATOR at grade. A suitable concrete support pad is poured and cured and the stand is secured to this pad with bolts. This stand is included with PERMEATOR and does not have to be supplied by the installation contractor.

For incorporation of PERMEATOR into an integrated vehicle vapor recovery and storage tank pressure management system, additional items are required for the "front-end" vapor recovery system. These components, typically referred to as "hanging hardware", such as nozzles, vacuum pumps, hoses, and breakaways are provided by existing Phase (Stage) II vapor recovery system suppliers listed on the VR-202 series Executive Order (any Revision level).

**PERMEATOR System Operation (Please reference Figure 4)**

1. Air and hydrocarbon vapors fill the space left in a storage tank when liquid gasoline is transferred to an automobile.
2. The pressure in the storage tank headspace increases as liquid gasoline in the storage tank evaporates to increase the hydrocarbon concentration in the the headspace. A pressure switch connected to the ullage actuates the PERMEATOR system.
3. The air/hydrocarbon mixture expelled from the storage tank vent line is directed to a membrane module where a vacuum pump creates a differential pressure that causes the hydrocarbon molecules to preferentially permeate, or pass through, the membrane.
4. The hydrocarbon-rich permeate stream is returned to the storage tank while the air-rich non-permeate stream is vented to the atmosphere. (Note: The purity of the exiting air stream that has been depleted of hydrocarbons is determined by feed flow rate, membrane area and the pressure ratio between the feed and permeate streams.)
5. As tank pressure decreases to a pre-set level, the pressure switch automatically deactivates the *PERMEATOR* system.
6. The above sequence is repeated when the storage tank pressure exceeds a pre-set maximum level.

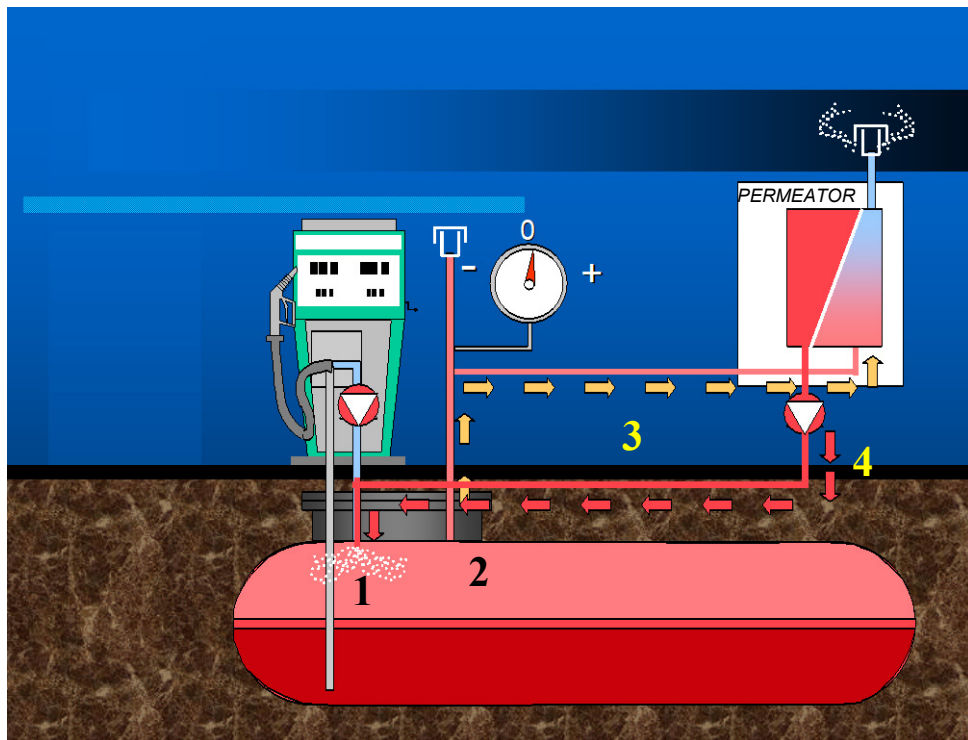


Figure 4

## **System Applications**

The PERMEATOR AT-150 is designed to accommodate a wide range of refueling station throughputs. Individual fueling points are not a factor in sizing PERMEATOR. Exhibit 2 of the VR-202 series Executive Order (starting with Revision Y) outlines installation parameters that must be followed for correct implementation of the PERMEATOR AT-150 at California GDF installations.

A standard purchased AT-150 unit includes the following hardware:

Main cabinet housing membrane module, vacuum pump, pressure sensor/transmitter, oil level sensor, vacuum sensor/transmitter and interconnection piping. The flanged connections provided are DN50, or 2” on each of the three connection points for Feed, Exhaust and Return lines.

Electrical control cabinet including plc, cumulative run time meter, manual/auto/off switch, indicator lights, and main power switch

Optional equipment:

Upgrade kit for data logging of critical parameters such as tank pressure and run time readings and to allow electrical control panel to communicate with computers.

## **Component Selection and Location**

AT-150 Control Panel operates and monitors the PERMEATOR system operation. Any anomalies of system operation will cause indicator lights to signal refueling station operating personnel that something is wrong. The panel is factory wired and assembled. Field wiring tasks include connecting 3 phase power from the site (L1, L2, L3 and Ground) and sensor input wires from the pressure and vacuum sensors/transmitters and the oil level sensor. The electrical panel is designed for use in a ZONE FREE area, mounted indoors. The electrical panel is typically mounted within the station kiosk adjacent to existing electrical panels and switching gear.

The panel should be mounted so that the panel meter is vertical (please refer to Figure 2). Prior to connecting site power to the unit, sensor input wires should be connected in accordance with detailed instructions provided within the electrical panel (Please reference the “Quick Start Guide” found in the Appendix). Also, once these connections are made, a current loop test must be carried out and correctly verified before attaching main power supply leads and switching main power switch on.

Mounting of PERMEATOR is quickly and easily accomplished at or slightly above grade. First, a suitable concrete support pad is poured and cured. This pad should be level, because the oil level sensor will not function properly if the pad is not flat and level. In California, if the PERMEATOR is replacing an existing Franklin Fueling Systems (Healy) vertical or horizontal Clean Air Separator (CAS), that concrete mounting pad is suitable for installation of the PERMEATOR provided that installation distances called out in Exhibit 2 are met. If the existing CAS mounting pad is not in a location that permits usage and a new pad needs to be poured, the specifications in

## CARB Approved IOM 12 - ARID Permeator AT-150 - VR-201-Z / VR-202-Z

drawing number 9900-9945 in the Healy CAS portion of the CARB-Approved Installation, Operation and Maintenance (IOM) Manual is suitable for construction details to produce a new concrete pad suitable for installation of the PERMEATOR. Next, the PERMEATOR mounting stand is attached to the concrete pad with appropriate sized bolts and the use of a small hoist. Once secured in place, the aluminum lid is removed and the piping and electrical conduits and connections can be made. Since the main cabinet is rated for service in Class I, Division 1, Group C & D hazardous environments, this allows for the unit to be located in relatively close proximity to the manifold vent lines to avoid long piping runs. After all piping and wiring connections are completed, then the PERMEATOR aluminum lid can be attached and fastened in place. The doors are equipped with a lock and key. Site personnel should be aware of the storage spot for the key.

Typically, a protective barrier (bollards) or fence is constructed to keep PERMEATOR out of view and to discourage vandalism. (In Luxembourg and Shikoku, Japan the units are mounted right on the island, adjacent to the dispensers). Contractors should check with local Fire and Safety authorities prior to installation to ensure that the location chosen meets all applicable Fire Marshal codes and regulations.

### **Piping Layout and Installation**

ARID's PERMEATOR system requires three piping connections; one for feed flow from the combined storage tank vapor spaces to the membrane module, a second connection for returning rich vapors from the permeate side of the membrane to the vapor space of one of the low grade tanks, and a third connection for venting air discharged from the retentate side of the membrane to atmosphere. The PERMEATOR can be connected to existing piping configurations in various ways.

Installation is easily accomplished in accordance with Figure 5. Other variations are possible and are outlined in Exhibit 2 of the VR-202 series of Executive Order (starting with Revision Y). Field experience shows that elevating the PERMEATOR approximately 3 feet above grade provides adequate slope in the interconnection piping to avoid liquid accumulation in either the feed or permeate lines. The pipe sizes used should be the same size as existing vent piping – typically 2" nominal ID minimum for US installations. All three piping ports on PERMEATOR are equipped with flanges to ease field connections.

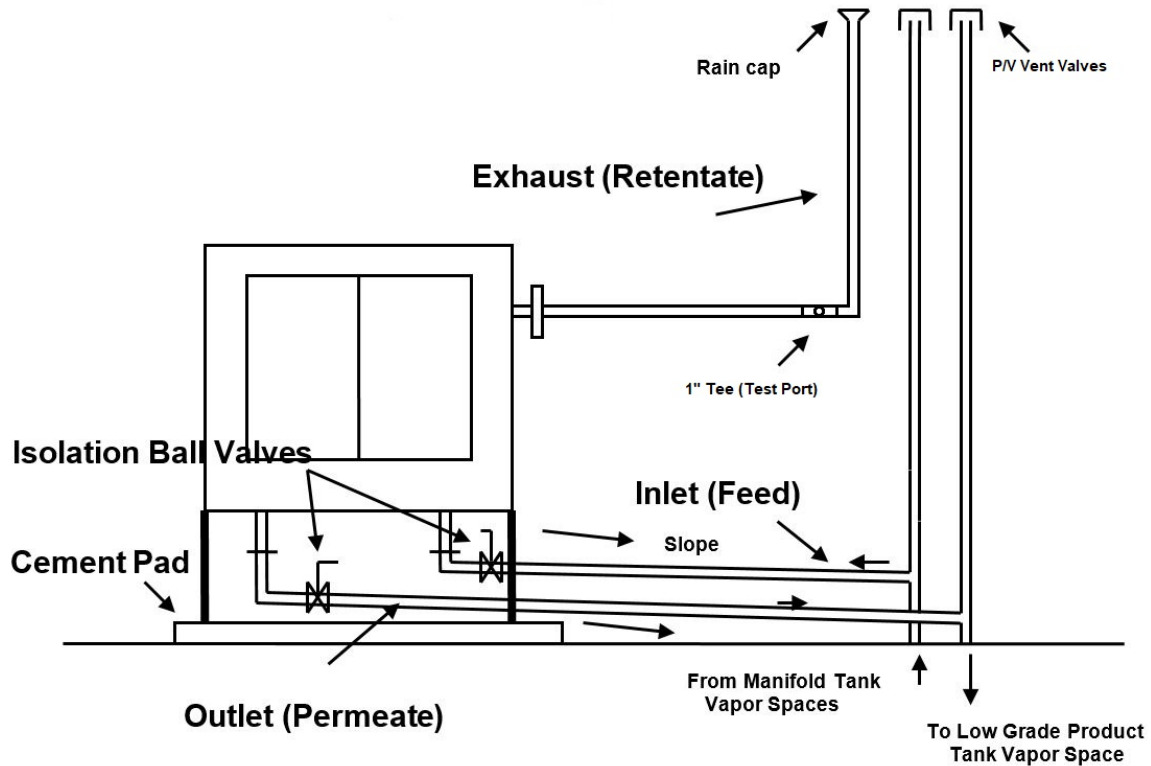


Figure 5

Figure 5 shows a schematic of a typical installation. In Figure 5, the PERMEATOR system is located on a stand slightly above grade and installed at a site having storage tanks which have individual vent lines running into UST tanks that are manifold across the top of the tanks. This integration allows PERMEATOR Feed and Return piping to be connected to separate above ground lines, with no excavation required at the site.

The piping diameter and wall thickness for all three connections; Feed, Permeate return and Retentate exhaust should be at least the same specification of the existing vent piping employed above grade at the site (corrosion resistant steel). The piping contractor should ensure that pipe threads are clean cut and coated with UL listed pipe joint sealing compound and tightened to the appropriate torque to eliminate chance of leakage. The typical piping diameter for these lines is 2 inch. The PERMEATOR unit is factory supplied with DN50 (2 inch) flanges for connection to the three conduits. All piping should be sloped back towards the tank at a minimum of 1/8 inch per foot of pipe run. After the piping is installed, the system should undergo the CARB leak decay test, TP-201.3 to ensure that there are no leaks in the UST system.

### **Installation of the AT-150 Control Panel**

PERMEATOR comes complete with a separate electrical control panel. This panel must be located in a zone free area and includes an hour meter to register cumulative running time of the unit and a pressure indicator/controller. The panel also contains a main power On/Off switch, and a power supply for the pressure, vacuum and oil level sensors. Also, a galvanic isolation barrier is used to ensure that no ignition sources can be passed from the control panel to the main PERMEATOR skid, located in the hazardous area. The vacuum pump is equipped with a 2.0 HP motor that operates on 208V/3-phase/60 Hz power. The steady-state load is estimated as follows for this motor:

---

*Watts = (1.73) x V x I x PF, where 1.73 = square root of 3, V = volts, I = amps, and PF = power factor.*

*Assuming power of 1.5 KW, PF = 0.8, I = 5.2 amps.*

Operating expenses are calculated as follows:

1.5 kW x 7.2 hours/day (@30% duty cycle) = 10.8 kWh/day

10.8 kWh/day x \$0.10/kwh = \$1.08/day @ 30% duty cycle

\$1.08/day x 30 days/mo. = \$32.40/month

The system requires a 20 Amp service rating on the circuit breaker and connecting wiring used at the site. Motor wiring is typically 12 or 14 gauge, depending on run length, local codes and electrician recommendation. The 24 v dc signal cables should be 18 gauge, depending on run length, local codes and electrician recommendations.

The detailed installation manual found in the electrical control box provides a wiring diagram and instructions for qualified electricians to connect the power supply to the electrical panel. The manual also provides further instructions for completing the control loop and power output wiring from the panel to the junction box housed within the PERMEATOR cabinet.

The panel should be located in a Zone Free, non-hazardous area located indoors. This area should also be easily accessible to technicians and site operating personnel. The panel is pre-wired at the factory and field tasks include only the connection of 3-phase power from the site and sensor and control inputs from components housed within the Main cabinet and previously connected to the junction box located within the Main cabinet.

### **Installation of Communications for AT-150 Control Panel to the Veeder-Root In-Station Diagnostic (ISD) System**

Integration of the ARID PERMEATOR Control panel to the Veeder-Root TLS/ISD panel requires linking two connections: one for any alarm and the other connection for On/Off actuation of the PERMEATOR. The On/Off actuation is linked to a normally open (N/O) contact on the motor starter; when the starter coil is pulled in, the contact becomes closed and the change of state is registered by the Veeder-Root TLS/ISD panel. It may be necessary for the Certified Permeator Technician (CPT) to consult with a certified Veeder-Root technician to ensure proper communication between the PERMEATOR and the ISD system.

### **Commissioning and Start-up of PERMEATOR on site**

Start-up testing for a GDF that has the Permeator AT-150 installed on it must be tested in accordance with the test procedures outlined in the CARB Executive Order VR-202 series (starting with Revision Y). These tests are listed below:

TP-201.3 (Leak Decay)

Exhibit 8 (Items to Consider when Conducting TP-201.3)

TP-201.4 (Dynamic Back Pressure – if applicable) **See Note Below**

Exhibit 5 (V/L of Model 900 Nozzle)

Exhibit 9 (Veeder-Root ISD Operability Test)

Exhibit 11 (Liquid Condensate Trap Compliance – if applicable)

Exhibit 14 (Dispenser Integrity)

Exhibit 15 (Permeator Compliance)

**Note:** TP-201.4, Dynamic Back Pressure (July 3, 2002), is primarily conducted at new GDF installations prior to backfill. If required by the District, it shall be conducted in accordance with the conditions listed in item 1 of the Vapor Recovery Piping Configurations Section of Exhibit 2. Districts have the authority to require conducting of Exhibit 5, Vapor to Liquid Volume Ratio, in lieu of TP-201.4, provided that at least two gallons of product are introduced into the system through each dispenser riser prior to conducting the test.

### **Liquid Leak Integrity Testing**

EPA approved and third-party tested liquid leak technologies should be applied to new and existing sites before the PERMEATOR system is started up and commissioned. The application of such protocols will ensure that the liquid piping and tankage is leak free. The choice of a test protocol lies with the local installation contractor.

### **Pressure Control Set Points**

In automatic control mode, the vacuum pump is actuated when the upper control limit (P hi) of  $0.30 \pm 0.06$ " W.C. is reached by the measured variable – the underground storage tank pressure. On the plc (B, Figure 2), the Motor status box on the lower right side will indicate ON. At the same time, the minimum run timer will ensure operation for at least the factory pre-set minimum run time. If the tank pressure is reduced to the Lower Control Limit (P lo) of  $0.20 \pm 0.06$ " W.C. before the minimum run time period has elapsed, the vacuum pump will continue to operate. At any time after this 40-minute interval, when the storage tank pressure reaches the low pressure set point, the vacuum pump will shut off.

**Note:** If the tank pressure drops below zero (negative pressure) at any point during the 40-minute run interval (as measured by the PERMEATOR pressure sensor), the PERMEATOR will shut off to limit electricity usage and unnecessary run time for the system.

## CARB Approved IOM 12 - ARID Permeator AT-150 - VR-201-Z / VR-202-Z

Configuration of the Set-points is done at the Factory. The CPT should verify at Control Panel installation and power up that the P hi and P lo set points are properly configured.

The vacuum pump will remain off until the underground storage tank pressure again increases to the P hi, and the above cycle repeats. The tightness of the station is continuously monitored by both the Veeder-Root ISD System installed at the GDF and ARID's own pressure sensor/transmitter. If pressure vs. time plots exceeding the P hi set point are consistently observed, the PERMEATOR unit is not operating properly. Also, if the pressure plots do not show rapid pressure reduction once the unit is actuated at the P hi threshold, the vapor feed path may be restricted.

### **Vacuum Pump Motor Rotation**

Having made the appropriate tests and connections, it is very important to test the direction of the rotation of the vacuum pump. This is done by quickly switching the unit on and off (E, Figure 2) and observing the rotation of the vacuum pump motor. If the motor is spinning in the direction indicated by the arrow on the housing of the vacuum pump --clockwise, everything is fine. If the direction is opposite the arrow, it must be changed immediately to avoid damaging the vacuum pump. The direction is changed by switching two of the leads within the L1, L2, L3 power strip in the electrical control cabinet or switching two wires within the electrical junction box mounted to the motor housing in the main cabinet. A quick means of determining proper rotation is to place a piece of paper in close proximity to the vacuum pump cooling fan cage. If the paper is sucked into the fan cage, the motor rotation is correct.

### **PERMEATOR System Details**

#### **Piping**

Piping should incorporate minimum of 2" diameter corrosion resistant steel for all vapor carrying conduits. For installations at grade or slightly above ground level, please ensure that PERMEATOR connections are made in accordance with manifold or non-manifold storage tanks. Please note that a CPT should be present during installation to ensure proper practices are being carried out (Key factors are feed and return tanks properly identified, manifold vents, isolation ball valves, and pressure vacuum valve installation). Before operating the system in unattended mode and initiating start-up of the unit, a CPT should ensure that the PERMEATOR connections are properly made for Feed, Return and Exhaust lines and that the unit and piping are adequately mounted and secured in place. The isolation ball valves must be opened to allow feed flow to the unit and permeate return flow from the unit and vapor carrying piping should meet minimum slope requirements. The station vent piping should be leak tight and use at least one p/v valve listed as CARB approved for Feed connection(s) and Return connection.

TP 201.2 back pressure and TP 201.3 pressure decay test results should conform to acceptable standards published by CARB.



## **Vehicle Vapor Recovery System – Phase (Stage) II System**

For AT-150 installations, the front-end vapor recovery hanging hardware is supplied and tested by others. Only Phase (Stage) II hanging hardware listed for use on the Assist Phase II EVR Executive Order VR-202 Series is permitted in California.

### **Electrical Control Panel**

The electrical control panel should be checked for proper wiring, accessibility and indoor location. Explosion proof conduit, junction boxes and seals should be used within the classified area.

System should be cycled between P hi and P lo to ensure proper operation. Run time meter should be referenced with detailed pressure vs. time data to verify proper system response.

### **Instructions to Site Operating Personnel**

Station employees should receive instructions on checking panel plc, run time meter and indicator lights. They should be able to interpret the diagnostics and reference a Frequently Asked Question sheet which explains the impact of the system diagnostics. If the unit is stopped and cannot be restarted by following prescribed instructions, the station personnel should be instructed to call ARID or a local representative for technical support. The station personnel should also know how to use the main power interrupt feature on the electrical control panel as well. Station management should also be instructed to relay proper filling and balancing procedures to tanker truck drivers. By following proper procedures, the pressure integrity of the station vapor connections will be maintained. The closed system will allow PERMEATOR to be properly actuated and provide both economic and environmental benefits to the end-user. A copy of this manual should be kept on file at the station site.

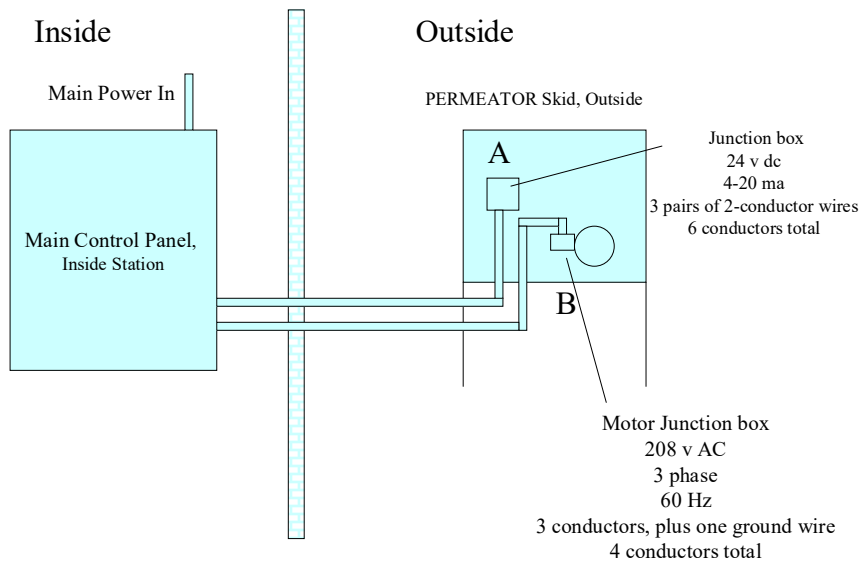
### Inspection Checklist

- △ Open PERMEATOR unit cabinet (A key is needed to first unlock the cabinet).
- △ Visually look for any accumulated oil in the oil spill pan.
- △ Physically inspect fittings to ensure that they are more than hand-tight.
- △ Sniff for presence of hydrocarbon vapors from the piping to ensure leak tightness.
- △ Listen and feel for any noises or vibrations that may indicate vacuum pump motor bearings may be worn.
- △ Close cabinet and lock the doors.
- △ Visually inspect p/v valve(s) and the raincap on the PERMEATOR clean air exhaust. Ensure no obstructions. Look or smell for presence of vapors exiting the p/v valve or clean air exhaust of the PERMEATOR.
- △ Locate the electrical control panel installed inside the station (Typically located near the electrical submersible turbine pump controls located in the back room of the station).
- △ Ensure that the green “Power ON” light is illuminated.
- △ Note the cumulative run time of the PERMEATOR unit. This time is expressed in hours, and is located in the lower right hand corner of the illuminated display screen.
- △ Compare the present run time with the run-time recorded on a previous visit.
- △ Note the current tank pressure as indicated on the plc display screen.
- △ Compare the current pressure to the P hi setting on the plc display screen. If the current pressure is greater than the P hi setting, ensure that PERMEATOR is “ON”.
- △ PERMEATOR “ON” is indicated by the light green vacuum pump “ON” light illuminating.
- △ If equipped with a laptop and ARID’s proprietary software, insert the RS232 Serial connection plug (exiting the control panel) into the appropriate port on the back of your computer.
- △ Contact the data logger within the control panel, and download operating parameters.
- △ Plot the operating parameters and visually check on run time frequency, oil level status, vacuum pump pressure, storage tank pressure variations and max/min storage tank pressures.

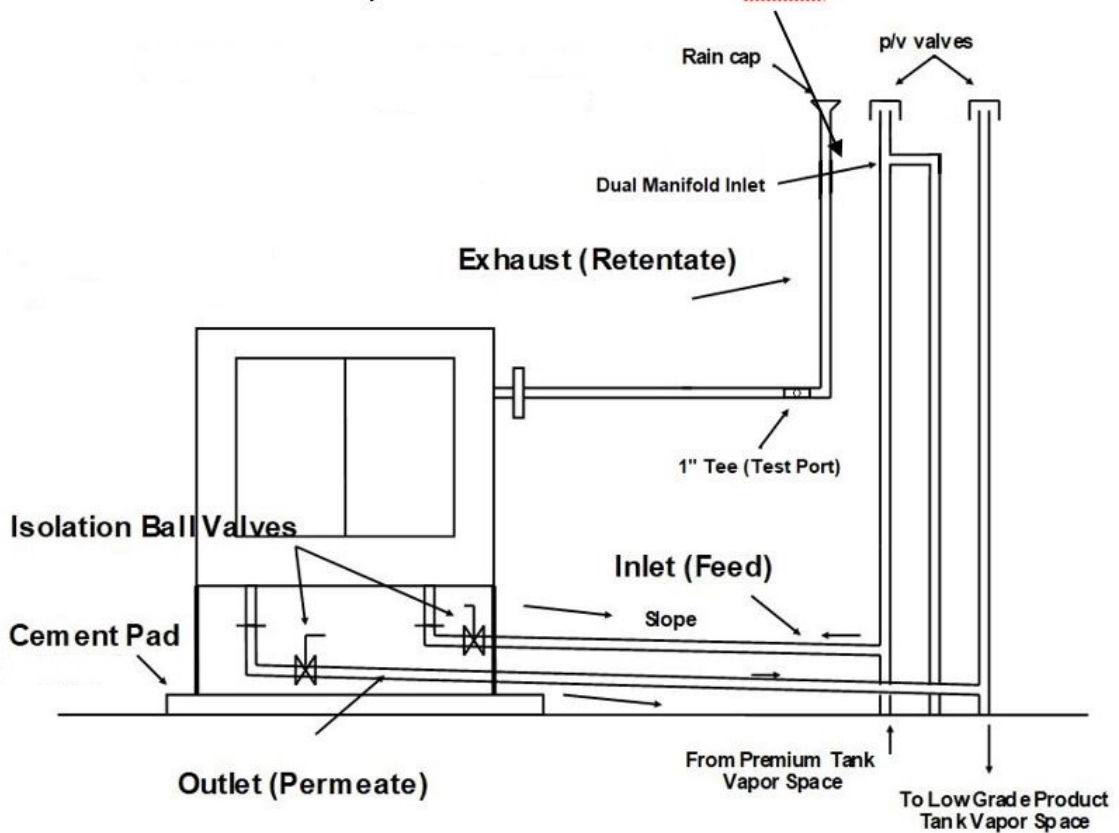
**Appendix**

Quick Start Guide

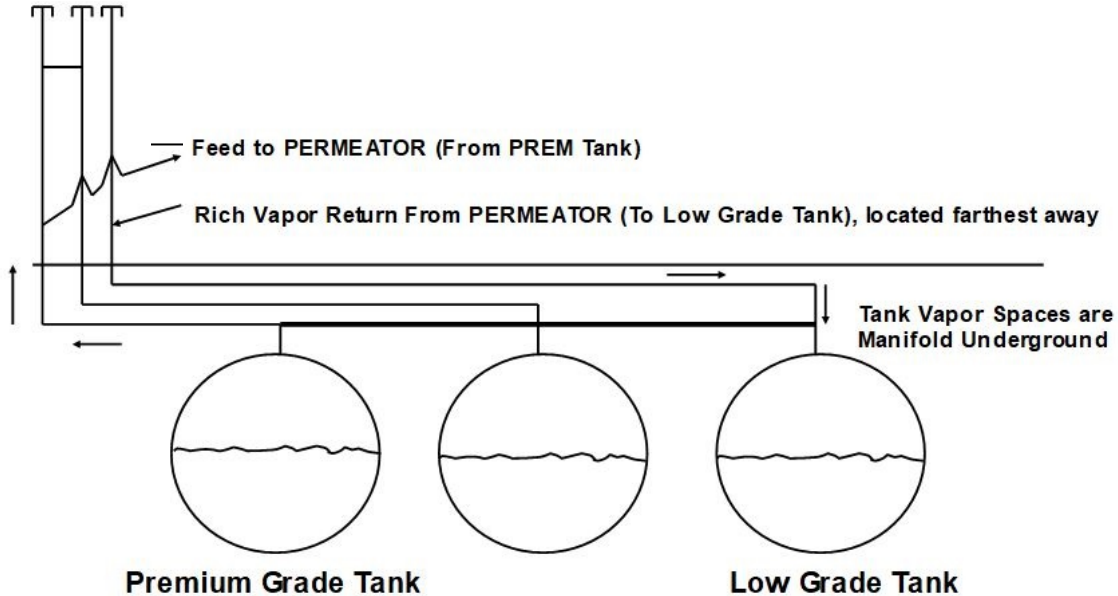
Overall Installation Schematic



Dual Inlet Option, Manifold Middle & Prem Tanks



### Overall Tank Detail



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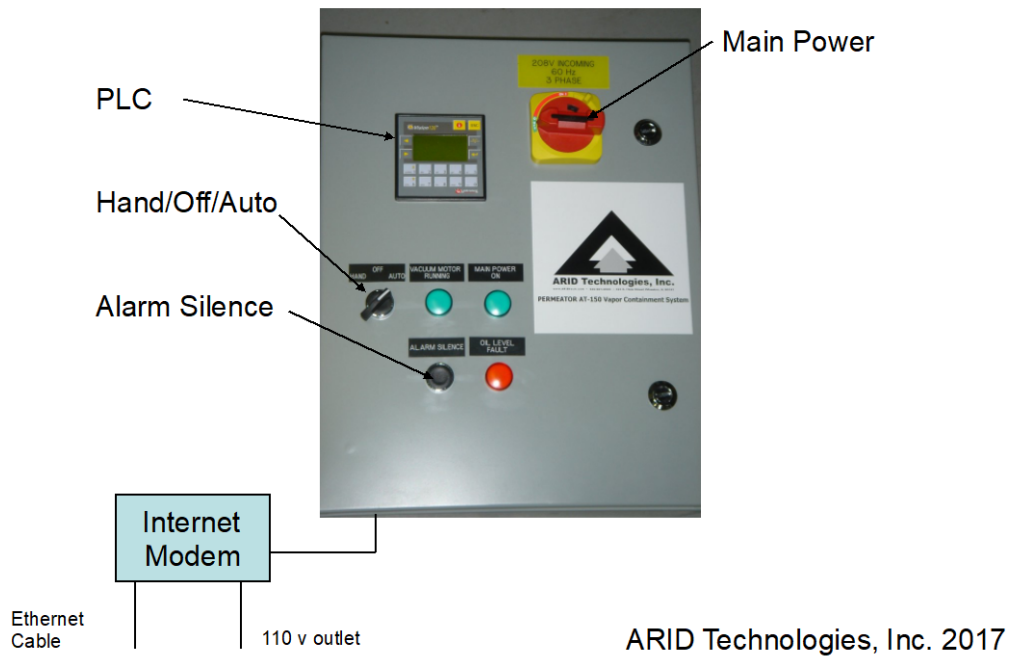
### PERMEATOR Installation

- Mounting of PERMEATOR with four (4) lugs into cement slab
- PERMEATOR must be perfectly level (Oil level limit switch)
- ¾ inch conduit for power wires (208 v, 3 phase, 60 Hz)
- 1 inch conduit for communication wires (24 v dc)
- P/V valves are 2 or 3 inch NPT threads – vent pipes should be threaded accordingly.
- After all piping and electrical conduit connections are made, a pressure decay test must be conducted before start-up and commissioning of PERMEATOR. Pressure decay test uses nitrogen gas and starting pressure of 2 inches H<sub>2</sub>O, gauge. (Reference CARB procedure TP-201.3)
- If data logging option is chosen, internet jack is located in close proximity to control panel

### Electrical Details

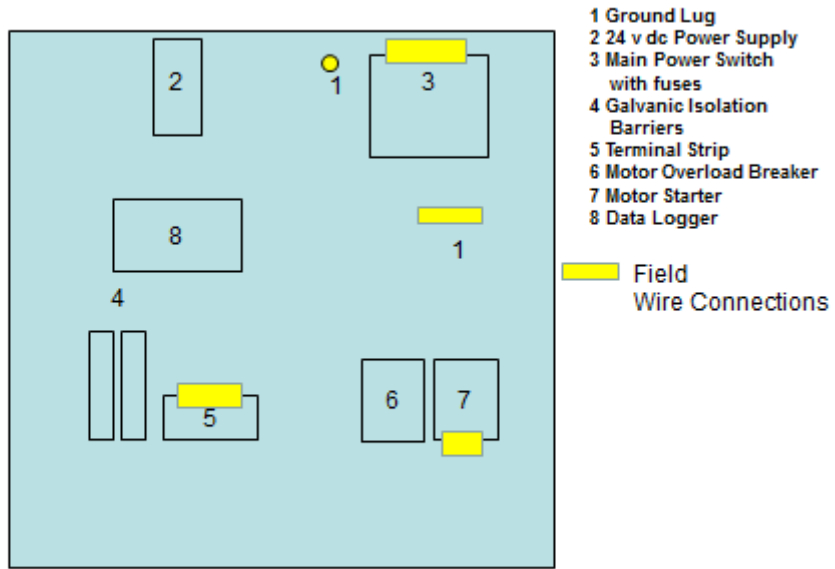
#### ELECTRICAL DETAILS: PERMEATOR AT-150

Control Panel Mounted Inside Station



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Control Panel: Main Component Outline



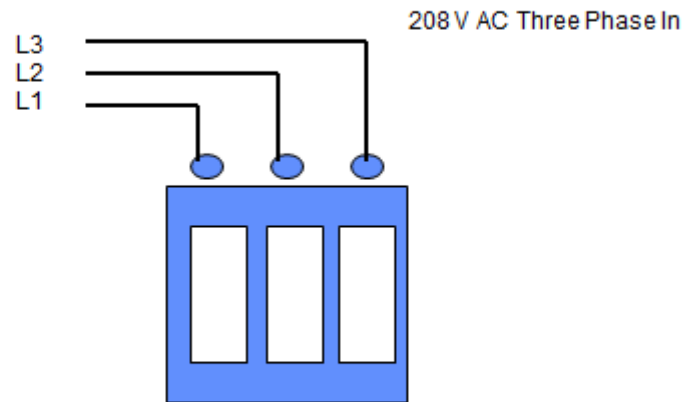
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Power Supply (2) and Incoming Power Fuses (3)



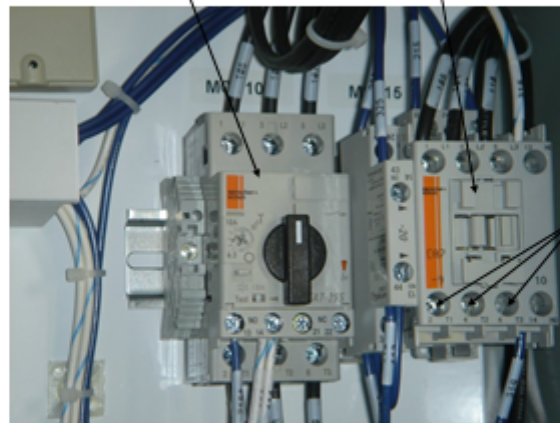
▲ ARID Technologies, Inc. 2007

Close-up of 3, Main Power Switch



▲ ARID Technologies, Inc. 2007

Motor Overload Breaker (6) and Motor Starter (7)

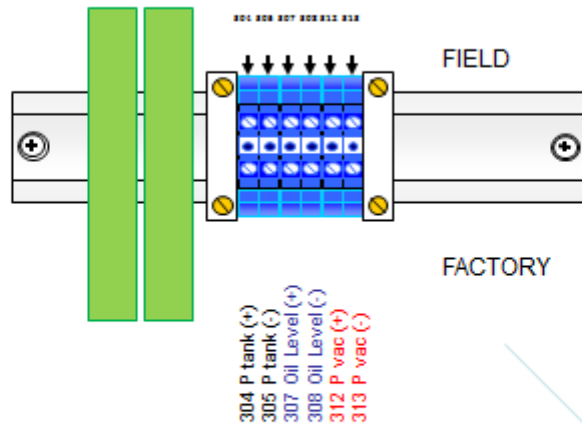
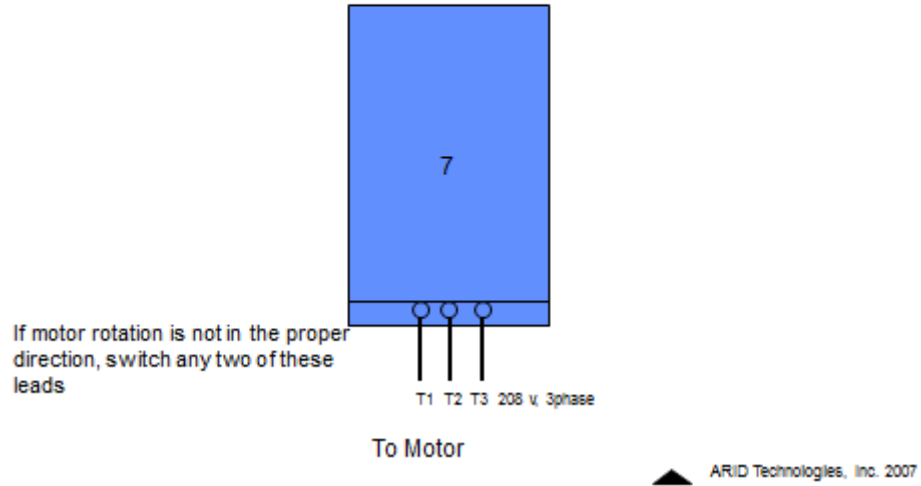


3 motor leads  
are landed  
On this device

**Overload Breaker:** Normal position is 12 o'clock  
Tripped position is 9 o'clock, re-set by setting  
back to 12 o'clock

▲ ARID Technologies, Inc. 2007

Close-up of 7, Motor Starter



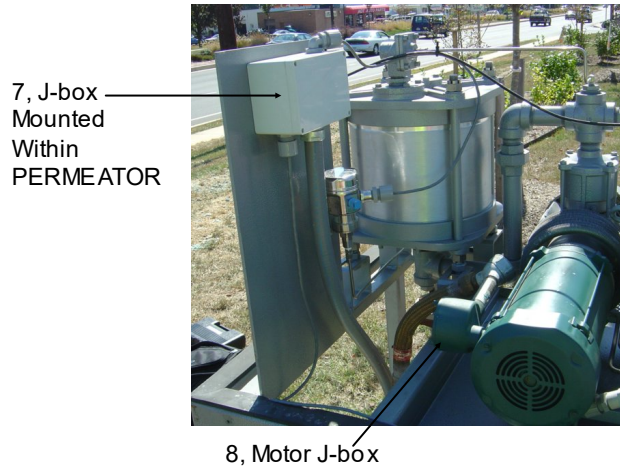
Close-up View of 5, Terminal Strip Within Control Panel (Control Signals)

ARID Technologies, Inc. 2006



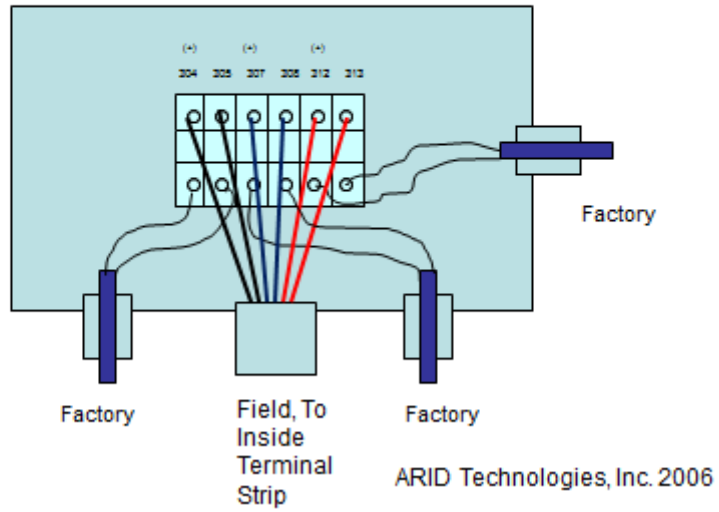
# CARB Approved IOM 12 - ARID Permeator AT-150 - VR-201-Z / VR-202-Z

## PERMEATOR Skid, Outside



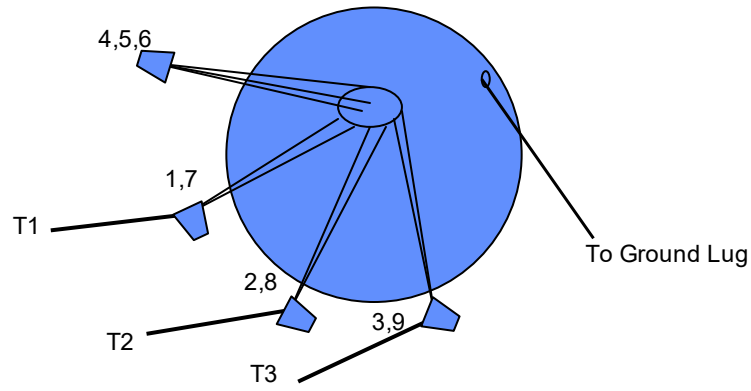
▲ ARID TECHNOLOGIES, INC. 2006

## Close-up of 9, Outside J-box & Terminal Strip



Close-up of 8, Motor J box

NEMA; Dual Voltage: Wye Connection- 9 Leads



ARID TECHNOLOGIES, INC. 2006

## Troubleshooting

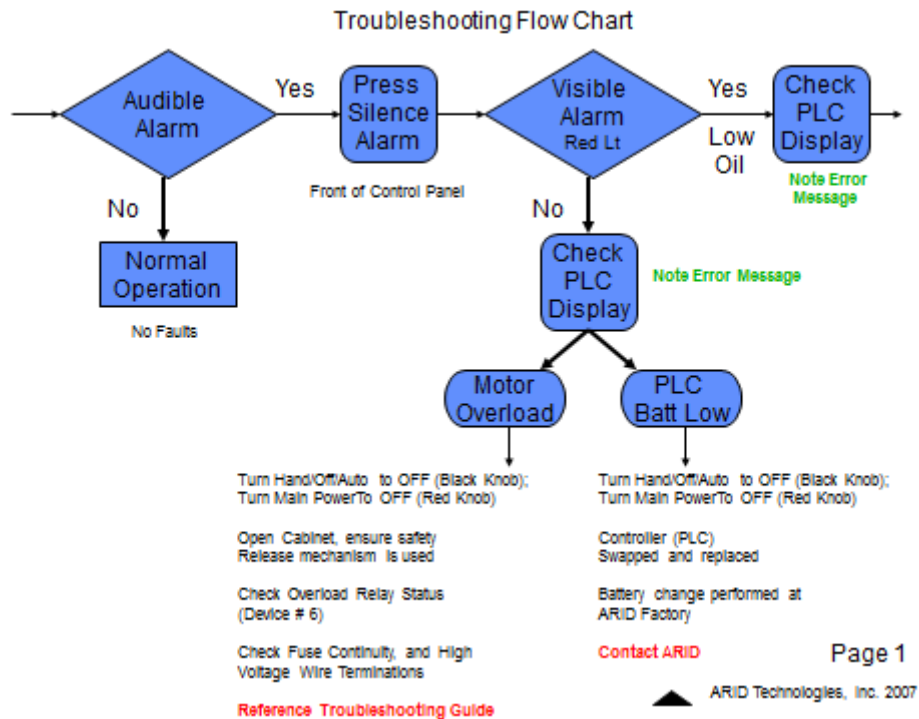
Low Oil Level Alarm:

**NOTE:** ARID uses a specially formulated oil (Part Number AT-11) which has certain properties specifically engineered for the PERMEATOR AT-150. The use of other oils is not authorized.

1. Ensure that oil is added until a small amount of oil just begins to overflow from the port 5B located on the exhaust box. Please reference the attached drawing of the vacuum pump exhaust box. Add oil from port 5, located on the top of the vacuum pump exhaust box.
2. If alarm persists after oil is added, change the setting of the MIN/MAX limit switch located within the Oil Level Sensor (This switch is found by unscrewing the white cap on the oil level sensor). After changing the setting, did the oil level alarm light go off? If yes, use the new setting. If no, oil level sensor or field wiring is faulty.

CARB Approved IOM 12 - ARID Permeator AT-150 - VR-201-Z / VR-202-Z

3. To ensure that P tank and Oil Level sensor wires are not interchanged, please verify that oil level sensor wires (2 lead wires) are connected to the proper terminals. Please reference the attached diagram as well as the detailed schematic of the main control panel wiring. Please be sure to observe proper polarity by connecting (+) to (+) and (-) to (-).
4. To ensure that the signal is carried properly by the wires from the sensor located outside to the main control panel mounted inside the station, please carry-out an electrical continuity check. If continuity is established, the integrity of the signal cable is verified. If electrical continuity is not established, then the cable which connects the PERMEATOR to the main control panel should be replaced or repaired.
5. If oil is added to suitable level, and if MIN/MAX switch does not change state of oil level alarm, and if P tank and Oil Level sensor wires are not interchanged, and if electrical continuity is established for the signal cable, and if oil alarm persists, then the oil level sensor must be replaced. Contact ARID or a CPT.



Troubleshooting Flow Chart

