Vapor Recovery Monitoring
Installation, Operation, and Maintenance Manual
For use with Healy Vapor Recovery System
Software Version 1.2.0
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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.

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## Contents

Notice ................................................................................................................................................. 2
  Trademarks ................................................................................................................................. 2
  Inspection of Materials .............................................................................................................. 2
  Return Shipping Charges .......................................................................................................... 2
  Contacting Franklin Fueling Systems (FFS) .............................................................................. 2

Important Safety Messages ........................................................................................................... 4

Introduction ..................................................................................................................................... 5
  Certified Contractor Requirements .............................................................................................. 5
  Definitions and Acronyms .......................................................................................................... 5
  Related Documents .................................................................................................................... 5

Product Description ....................................................................................................................... 6
  Vapor Recovery Monitoring ........................................................................................................ 6
  VRM System Specification ......................................................................................................... 8

Installation & Startup .................................................................................................................... 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

Setup and Programming ............................................................................................................... 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

System Operation ........................................................................................................................ 18
  Run-Time Status ....................................................................................................................... 18
  Vapor Recovery Web Pages ....................................................................................................... 18

Alarms, Warnings, and Failures ................................................................................................... 22
  System Alarms ......................................................................................................................... 22
  Vapor Recovery Alarms ............................................................................................................ 22

Reports & Printing ....................................................................................................................... 25
  Creating Reports ...................................................................................................................... 25
  Printing Reports ....................................................................................................................... 26
  Printing VRM Report examples .............................................................................................. 27

Maintenance ................................................................................................................................... 28
  General Inspection .................................................................................................................... 28

Diagnostics ................................................................................................................................... 29
  Pressure and Transaction Log Files ......................................................................................... 29
  Pressure Log Files .................................................................................................................... 29
  Transaction Log files ............................................................................................................... 30
  Steps to Download Log Files ................................................................................................. 31

INCON VRM Startup Checklist .................................................................................................... 32

Appendix A: Alarm Codes ........................................................................................................... 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.

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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 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.

Certified 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-STS 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
000-2151, 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 (VFM) 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 consists 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
- Dispenser Interface Module
- Relay/10A Relay Module
- Printer
- Probe Module
- Touchscreen
- 4-20mA Module

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 VFM as a way to assess how well the vapor collection process is working. The VFM is used to perform the following CP-201 assessments.

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Duration</th>
<th>EVR System</th>
<th>Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily A/L</td>
<td>Daily</td>
<td>Vacuum Assist</td>
<td>Average A/L ratio exceeds 1.90 or less than 0.33</td>
</tr>
<tr>
<td>Weekly A/L</td>
<td>Calendar Week</td>
<td>Vacuum Assist</td>
<td>Average A/L ratio exceeds 1.32 or less than 0.81</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Duration</th>
<th>Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Over-pressurization</td>
<td>Calendar Week</td>
<td>Pressure &gt; 1.3” wcg for 5% of week</td>
</tr>
<tr>
<td>Monthly Over-Pressurization</td>
<td>Calendar Month</td>
<td>Pressure &gt; 0.3” wcg for 25% of month</td>
</tr>
<tr>
<td>Weekly Leak Test</td>
<td>Calendar Week</td>
<td>Pressure Leak is greater than 2x TP-201.3</td>
</tr>
</tbody>
</table>

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 its coil controlled by the Relay Module. 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.
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.

Non-IS Modules (red)
- Controller Module (CM)
- Power Supply Module (PSM)
- Isolation Barrier

IS Modules (blue)
- TS-5000 (front view with cover removed)

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 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.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Parameter Name</th>
<th>Parameter Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Data Transfer Units</td>
<td>Network ID</td>
<td>1</td>
<td>Leave as default. In rare circumstances the network ID may need to change if another network is near.</td>
</tr>
<tr>
<td>Dispenser Configuration</td>
<td>Number of Units</td>
<td>1</td>
<td>Enter the number of DTU Modules at the dispensers. This does not include the console DTU.</td>
</tr>
<tr>
<td>TS-DTU 1</td>
<td>Unit ID</td>
<td>14-EEA8-FFFF-0000-1A</td>
<td>This is the unique ID located on the DTU label. The console uses this ID to know which modules to communicate with.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Parameter Name</th>
<th>Parameter Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Input Modules</td>
<td>Number Gasoline Hooks per dispenser</td>
<td>0</td>
<td>Set to zero if not using dispenser hook signals, otherwise the number of gasoline hooks coming from each dispenser</td>
</tr>
<tr>
<td>Module #</td>
<td>Channels</td>
<td>(n)</td>
<td>Select number of gasoline dispenser hook signals available from each dispenser. The Vapor Recovery Monitor does not use any non-gasoline products.</td>
</tr>
<tr>
<td>Channel #</td>
<td>Name</td>
<td>Ex. Dispenser 1 Hook Regular</td>
<td>Unique name for the hook signal</td>
</tr>
<tr>
<td></td>
<td>Enabled</td>
<td>Yes</td>
<td>Select “Yes”</td>
</tr>
<tr>
<td></td>
<td>Active High</td>
<td>Yes</td>
<td>Set to “Yes”</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Parameter Name</th>
<th>Parameter Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe Modules</td>
<td>Channels</td>
<td>(n)</td>
<td>Select the number of flow meters/probes at the site</td>
</tr>
<tr>
<td>Channel #</td>
<td>Name</td>
<td>Ex. VFM Disp 1</td>
<td>Unique name for Vapor Flow Meter</td>
</tr>
<tr>
<td></td>
<td>Enabled</td>
<td>Yes or No</td>
<td>Set to “Yes”</td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>TS-VFM</td>
<td>Select Vapor Flow Meter type</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Parameter Name</th>
<th>Parameter Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-20mA Input Modules</td>
<td>Module #</td>
<td>Channels (n)</td>
<td>Select “1” for the Vapor Pressure Sensor</td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Ex. ISD Pressure Sensor</td>
<td>Unique name for VPS</td>
</tr>
<tr>
<td></td>
<td>Enabled</td>
<td>Yes</td>
<td>Keep as “Yes”</td>
</tr>
<tr>
<td></td>
<td>Service Type</td>
<td>Vapor Recovery Monitor</td>
<td>Select correct service type for application</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Parameter Name</th>
<th>Parameter Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply Module</td>
<td>COMM 2</td>
<td>Baud Rate</td>
<td>9600 Set to match External ATG</td>
</tr>
<tr>
<td></td>
<td>Data Bits</td>
<td>8</td>
<td>Set to match External ATG</td>
</tr>
<tr>
<td></td>
<td>Parity</td>
<td>None</td>
<td>Set to match External ATG</td>
</tr>
<tr>
<td></td>
<td>Stop Bits</td>
<td>1</td>
<td>Set to match External ATG</td>
</tr>
<tr>
<td></td>
<td>Response Timeout</td>
<td>8</td>
<td>Leave as default</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Parameter Name</th>
<th>Parameter Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay Module</td>
<td>Module #</td>
<td>Channels (n)</td>
<td>Select number of dispensers</td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Dispenser 1 Power</td>
<td>Unique name for relay’s purpose</td>
</tr>
<tr>
<td></td>
<td>Enabled</td>
<td>Yes</td>
<td>set to “Yes”</td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>Dispenser</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Polarity</td>
<td>Normal</td>
<td>Set to Normal</td>
</tr>
<tr>
<td></td>
<td>Logic</td>
<td>OR Logic</td>
<td>Set to OR</td>
</tr>
<tr>
<td></td>
<td>Physically Wired As</td>
<td>Normally Closed</td>
<td>Set to Normally Closed</td>
</tr>
<tr>
<td></td>
<td>Number of Inputs</td>
<td>1</td>
<td>Set to 1</td>
</tr>
<tr>
<td>Input 1</td>
<td>Type</td>
<td>Probe Module</td>
<td>Select Probe Module</td>
</tr>
<tr>
<td></td>
<td>Channel</td>
<td>VFM Disp 1</td>
<td>Select the VFM associated with this Dispenser</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Parameter Name</th>
<th>Parameter Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispenser Interface</td>
<td>Precision</td>
<td>3</td>
<td>Leave as default</td>
</tr>
<tr>
<td></td>
<td>Dispenser Volume</td>
<td>Gross</td>
<td>Leave as default</td>
</tr>
<tr>
<td>Grades</td>
<td>Number of Grades</td>
<td>3</td>
<td>Select number of different gasoline only grades at facility</td>
</tr>
<tr>
<td>Grade 1</td>
<td>Name</td>
<td>Regular Unleaded</td>
<td>Enter a Name for the Grade</td>
</tr>
<tr>
<td>Grade 2</td>
<td>Name</td>
<td>Premium Unleaded</td>
<td>Enter a Name for the Grade</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Name</td>
<td>Super Unleaded</td>
<td>Enter a Name for the Grade</td>
</tr>
<tr>
<td>DIM 1</td>
<td>Type</td>
<td>Wayne</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td>Current loop</td>
<td></td>
</tr>
<tr>
<td>Fueling Points</td>
<td>Number of Fueling Points</td>
<td>12</td>
<td>Enter the number of gasoline fueling points</td>
</tr>
<tr>
<td>Fueling Point 1</td>
<td>Number of Hoses</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Hose 1</td>
<td>QC Grade Association</td>
<td>Regular Unleaded</td>
<td>Select position of Grade</td>
</tr>
<tr>
<td>Hose 2</td>
<td>Grade Association</td>
<td>Premium Unleaded</td>
<td>Select position of Grade</td>
</tr>
<tr>
<td>Hose 3</td>
<td>Grade Association</td>
<td>Super Unleaded</td>
<td>Select position of Grade</td>
</tr>
<tr>
<td>Fueling Point 2</td>
<td>Number of Hoses</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Parameter Name</th>
<th>Parameter Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapor Recovery Monitor</td>
<td>Method Type</td>
<td>Balance or Assist</td>
<td>Select the type of EVR system installed.</td>
</tr>
<tr>
<td></td>
<td>Hour Assessment</td>
<td>0</td>
<td>Set time of VRM alarm action</td>
</tr>
<tr>
<td></td>
<td>Week Day Assessment</td>
<td>Sunday</td>
<td>Set Day of VRM alarm action</td>
</tr>
<tr>
<td>Dispenser Configuration</td>
<td>Dispenser Type</td>
<td>Wayne or Gilbarco</td>
<td>Select the dispenser model</td>
</tr>
<tr>
<td></td>
<td>Multihose Dispenser Site Number</td>
<td>No (1 to 48)</td>
<td>Equal to the number of flow meters installed</td>
</tr>
<tr>
<td></td>
<td>First Fueling Point</td>
<td>1</td>
<td>Select correct fueling points for dispenser number.</td>
</tr>
<tr>
<td></td>
<td>Second Fueling Point</td>
<td>2</td>
<td>Select correct fueling points for dispenser number.</td>
</tr>
<tr>
<td>Ullage Pressure Input</td>
<td>Sensor</td>
<td>Sensor name</td>
<td>Select the correct sensor name</td>
</tr>
<tr>
<td>Ullage Volume Input</td>
<td>Acquire Ullage Security Code</td>
<td>Internal, external</td>
<td>Select internal if using LL2 probes or external if connected to</td>
</tr>
<tr>
<td></td>
<td>Number of tanks</td>
<td>#</td>
<td>remote ATG.</td>
</tr>
<tr>
<td>Tank 1 Ullage</td>
<td>Enabled</td>
<td>Yes or No</td>
<td>Select Yes if part of EVR System</td>
</tr>
<tr>
<td>Tank 2 Ullage</td>
<td>Enabled</td>
<td>Yes or No</td>
<td>Select Yes if part of EVR System</td>
</tr>
<tr>
<td>Pressure Management System</td>
<td>Enabled</td>
<td>Yes or No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>Clean Air Separator</td>
<td>Select appropriate device</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Variable</th>
<th>+ or -</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule – Power On</td>
<td>+</td>
<td>Default Rule, Internal audible alarm output</td>
</tr>
<tr>
<td>Rule – Application Events</td>
<td>+</td>
<td>Default Rule, Internal audible alarm output</td>
</tr>
<tr>
<td>Rule – New Alarm Occurred</td>
<td>+</td>
<td>Default Rule, Internal audible alarm output</td>
</tr>
<tr>
<td>Rule – New Rule #1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td></td>
<td>Enter a name for the rule. Once entered, the name will appear next to the above Rule.</td>
</tr>
<tr>
<td>Enabled</td>
<td>+</td>
<td>Select whether the rule is to run or not</td>
</tr>
<tr>
<td>Events</td>
<td>-</td>
<td>Below is an example of a new rule to send an email for any new VRM alarms</td>
</tr>
<tr>
<td>Event Type</td>
<td></td>
<td>Select “New Alarm Occurred”</td>
</tr>
<tr>
<td>Event Category</td>
<td></td>
<td>Select VRM</td>
</tr>
<tr>
<td>Event Code</td>
<td></td>
<td>Select “Any”</td>
</tr>
<tr>
<td>Event Device</td>
<td></td>
<td>Select “Any”</td>
</tr>
<tr>
<td>Event State</td>
<td></td>
<td>Select “Active”</td>
</tr>
<tr>
<td>Actions</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Action Type</td>
<td>-</td>
<td>Select “E-Mail” (See next section for setting up email notification)</td>
</tr>
<tr>
<td>Action Address</td>
<td></td>
<td>Enter in your email address</td>
</tr>
<tr>
<td>Action Content</td>
<td></td>
<td>Select “Generated” to have the Console automatically produce the contents in the email. Otherwise you can have the email contain exactly what you specify.</td>
</tr>
<tr>
<td>Action Template</td>
<td></td>
<td>Select “HTML”. You can have either a text or HTML email.</td>
</tr>
</tbody>
</table>

**Note:** VRM alarms will automatically disable dispensers and this feature cannot be turned off per CP-201 requirements.
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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>“From” Address</td>
<td>Unique e-mail address to identify the VRM console (e.g. <a href="mailto:Site@city.state">Site@city.state</a>)</td>
</tr>
<tr>
<td>SMTP Host</td>
<td>This is to be provided by network administrator or ISP</td>
</tr>
<tr>
<td>SMTP Port</td>
<td>Check with network administrator or ISP</td>
</tr>
<tr>
<td>Enable Authentication</td>
<td>Some e-mail providers require authentication in order to send e-mails.</td>
</tr>
<tr>
<td></td>
<td>See Internet Service Provider</td>
</tr>
<tr>
<td>Maximum Queue Size</td>
<td>The number of e-mails that can be waiting to be sent</td>
</tr>
<tr>
<td>Retry Timeout</td>
<td>The number of seconds to wait between failed tries. Default is 3600 seconds or 1 hr.</td>
</tr>
<tr>
<td>Watchdog Timeout</td>
<td>This is the inactivity timeout.</td>
</tr>
</tbody>
</table>
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 magnetostrictive 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**
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.

Figure 5a & 5b

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.

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.
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

<table>
<thead>
<tr>
<th>[Home]/Alarms</th>
<th>V R M</th>
<th>Alarm</th>
<th>Pressure Sensor Open Circuit</th>
<th>10/26/05 14:12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S Y S</td>
<td>4-20mA Input 1</td>
<td>Alarm</td>
<td>10/26/05 14:12</td>
</tr>
<tr>
<td></td>
<td>S Y S</td>
<td>4-20mA Input Error</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S Y S</td>
<td>Slot 4</td>
<td>Alarm</td>
<td>10/17/05 15:16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Probe module is offline</td>
<td></td>
</tr>
</tbody>
</table>

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.
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.


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.

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.

75th and 95th Percentile Ullage Pressure
The VRM records and stores the 75th and 95th 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 web browser's tool bar.

**Printing from the Local LCD**
To print from the local LCD to the internal printer, press the print button ![print_icon] 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

<table>
<thead>
<tr>
<th>Date</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/26/2008</td>
<td>Operation [%] 100%</td>
</tr>
<tr>
<td></td>
<td>Pass [%] 100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Operation Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vapor Collect Method Assist</td>
</tr>
<tr>
<td></td>
<td>A/L Low 0.95</td>
</tr>
<tr>
<td></td>
<td>A/L High 1.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Monitoring Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dly Vapor Coll. A/L</td>
</tr>
<tr>
<td></td>
<td>Low 0.33</td>
</tr>
<tr>
<td></td>
<td>High 1.90</td>
</tr>
<tr>
<td></td>
<td>Wkly Vapor Coll. A/L</td>
</tr>
<tr>
<td></td>
<td>Low 0.81</td>
</tr>
<tr>
<td></td>
<td>High 1.32</td>
</tr>
<tr>
<td></td>
<td>Wkly Ullage Press. Mon.</td>
</tr>
<tr>
<td></td>
<td>High 1.30</td>
</tr>
<tr>
<td></td>
<td>Mthy Ullage Press. Mon.</td>
</tr>
<tr>
<td></td>
<td>High 0.30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Warning Alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/09/2005</td>
<td>Occurred 00:05:00</td>
</tr>
<tr>
<td>12/10/2005</td>
<td>Cleared 02:15:00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Failure Alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/27/2005</td>
<td>Occurred 00:00:05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/20/2005</td>
<td>Weekly Ullage Pressure Leak</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>VRM Daily Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/26/2008</td>
<td>From: {date}</td>
</tr>
<tr>
<td></td>
<td>To: {date}</td>
</tr>
<tr>
<td></td>
<td>Pressure: inH2O</td>
</tr>
<tr>
<td></td>
<td>ISD Version: 1.2.0</td>
</tr>
<tr>
<td></td>
<td>ISD Up Time 100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>VRM Monthly Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/20/2005</td>
<td>From: {date}</td>
</tr>
<tr>
<td></td>
<td>To: {date}</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Statistics December 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operation [%] 100%</td>
</tr>
<tr>
<td></td>
<td>Pass [%] 100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<td></td>
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<tr>
<td></td>
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</tbody>
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<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>12/20/2005</td>
<td>Weekly Ullage Pressure Leak</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS-PRB</td>
<td>12 Input Probe Module</td>
</tr>
<tr>
<td>TS-420IB8</td>
<td>8 Input 4-20ma Module</td>
</tr>
<tr>
<td>TS-RLY</td>
<td>8 Channel Relay Module</td>
</tr>
<tr>
<td>TS-ACI</td>
<td>12 Channel AC Input Module</td>
</tr>
<tr>
<td>TSSP-CM</td>
<td>Control Module</td>
</tr>
<tr>
<td>TSSP-PS</td>
<td>Power Supply Module</td>
</tr>
<tr>
<td>TSSP-LCD</td>
<td>LCD Display</td>
</tr>
<tr>
<td>TSSP-IFB5X</td>
<td>TS-550/EMS Interface Board</td>
</tr>
<tr>
<td>TSSP-IPPTR</td>
<td>Impact Printer Assembly</td>
</tr>
<tr>
<td>TSSP-T550MB</td>
<td>TS-550/EMS Motherboard</td>
</tr>
<tr>
<td>TSSP-T5000MB</td>
<td>TS-5000 Motherboard</td>
</tr>
<tr>
<td>TS-VFM</td>
<td>Vapor Flow Meter</td>
</tr>
<tr>
<td>TS-VPS</td>
<td>Vapor Pressure Sensor</td>
</tr>
<tr>
<td>TS-DIMIB</td>
<td>Internal Dispenser Interface Module</td>
</tr>
<tr>
<td>TSP-ENCD</td>
<td>Flow Meter Encoder Replacement</td>
</tr>
<tr>
<td>TS-BAT</td>
<td>3V Lithium Battery</td>
</tr>
<tr>
<td>TSSP-F4</td>
<td>Fuse, 3A (Relay and Power Supply)</td>
</tr>
<tr>
<td>TSSP-ISBS</td>
<td>I.S. Barrier Shield</td>
</tr>
<tr>
<td>TS-TP5000</td>
<td>TS-EMS/550/5000 Impact Printer Paper</td>
</tr>
<tr>
<td>TS-INKRB</td>
<td>TS-EMS/550/5000 Inker Ribbon</td>
</tr>
<tr>
<td>TSSP-TRMBLK</td>
<td>Package of 10 Terminal Blocks</td>
</tr>
<tr>
<td>TSSP-TMPTR</td>
<td>Thermal Printer</td>
</tr>
<tr>
<td>TS-TP2</td>
<td>Paper for the Thermal Printer (1 box of 5)</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE_LOCAL</td>
<td>This column is the date the pressure sample was recorded.</td>
</tr>
<tr>
<td>TIME_LOCAL</td>
<td>This column is the time the pressure sample was recorded.</td>
</tr>
<tr>
<td>QUIET_TIME</td>
<td>This value indicate if there was active dispensing at the time of the sample. A &quot;1&quot; indicates at least one fueling point is dispensing and a &quot;0&quot; indicates no fueling points are dispensing.</td>
</tr>
<tr>
<td>PRESSURE</td>
<td>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.</td>
</tr>
<tr>
<td>ULLAGE</td>
<td>The ullage is the amount of vapor space in the vapor containment area. The units are in gallons.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATE_LOCAL</th>
<th>TIME_LOCAL</th>
<th>QUIET_TIME</th>
<th>PRESSURE</th>
<th>ULLAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/16/2009</td>
<td>20:05:00</td>
<td>0</td>
<td>-6.92</td>
<td>19545</td>
</tr>
<tr>
<td>8/16/2009</td>
<td>20:06:00</td>
<td>0</td>
<td>-6.92</td>
<td>19545</td>
</tr>
<tr>
<td>8/16/2009</td>
<td>20:07:00</td>
<td>0</td>
<td>-6.90</td>
<td>19546</td>
</tr>
<tr>
<td>8/16/2009</td>
<td>20:08:00</td>
<td>0</td>
<td>-6.90</td>
<td>19546</td>
</tr>
<tr>
<td>8/16/2009</td>
<td>20:09:00</td>
<td>0</td>
<td>-6.88</td>
<td>19548</td>
</tr>
<tr>
<td>8/16/2009</td>
<td>20:10:00</td>
<td>0</td>
<td>-6.84</td>
<td>19546</td>
</tr>
<tr>
<td>8/16/2009</td>
<td>20:11:00</td>
<td>0</td>
<td>-6.84</td>
<td>19546</td>
</tr>
<tr>
<td>8/16/2009</td>
<td>20:12:00</td>
<td>0</td>
<td>-6.82</td>
<td>19546</td>
</tr>
<tr>
<td>8/16/2009</td>
<td>20:13:00</td>
<td>0</td>
<td>-6.82</td>
<td>19546</td>
</tr>
</tbody>
</table>
**Transaction Log Files**

The transaction log file records and stores 1000 transactions per fueling point.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOSE</td>
<td>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.</td>
</tr>
<tr>
<td>DATE_LOCAL</td>
<td>This column is the date at the beginning of the transaction.</td>
</tr>
<tr>
<td>TIME_LOCAL</td>
<td>This column is the time at the beginning of the transaction. The time is a local reference to the console.</td>
</tr>
<tr>
<td>AIR_VOLUME</td>
<td>This column is the air or vapor returned through the ISD flow meter. The units are in gallons.</td>
</tr>
<tr>
<td>LIQUID_VOLUME</td>
<td>This is the amount of gasoline that was dispensed during the transaction. The units are in gallons.</td>
</tr>
<tr>
<td>RATIO</td>
<td>This is the A/L ratio of the transaction.</td>
</tr>
<tr>
<td>TYPE</td>
<td>This is the classification of the transaction. Only v_VRMValidAoL type transactions are used as part of the daily and weekly average: v_VrmValidAoL is a single transaction that was either less than 0.15 or greater than 0.50. v_VrmORVRPotential is a single transaction that was between 0.15 and 0.50. v_VrmMultipleTransactions is when both sides of a dispenser were active at the same time. v_VrmDispenseVolumeZero occurs when no liquid volume is dispensed. This may occur when a transaction is aborted before pumping any fuel. v_VrmSmallFuelVolume occurs when less than 1 gallon of gasoline is dispensed. v_VrmTransactionLost occurs when the console does not receive the volume of gasoline dispensed from the dispenser or a new transaction occurs too quickly. v_VrmReferenceTest 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.</td>
</tr>
</tbody>
</table>

Below is an example of a transaction log file.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOSE</td>
<td>DATE_LOCAL</td>
<td>TIME_LOCAL</td>
<td>AIR_VOLUME</td>
<td>LIQUID_VOLUME</td>
<td>RATIO</td>
<td>TYPE</td>
</tr>
<tr>
<td>2</td>
<td>101</td>
<td>8/16/2008</td>
<td>20:16:13</td>
<td>6.43</td>
<td>6.46</td>
<td>1.00 v_VrmValidAoL</td>
</tr>
<tr>
<td>3</td>
<td>301</td>
<td>8/16/2008</td>
<td>20:10:20</td>
<td>3.98</td>
<td>17.62</td>
<td>0.22 v_VrmORVRPotential</td>
</tr>
<tr>
<td>4</td>
<td>703</td>
<td>8/16/2008</td>
<td>20:19:41</td>
<td>3.71</td>
<td>3.46</td>
<td>1.08 v_VrmValidAoL</td>
</tr>
<tr>
<td>5</td>
<td>902</td>
<td>8/16/2008</td>
<td>20:13:31</td>
<td>1.57</td>
<td>5.17</td>
<td>0.31 v_VrmORVRPotential</td>
</tr>
<tr>
<td>6</td>
<td>401</td>
<td>8/16/2008</td>
<td>20:21:52</td>
<td>0.52</td>
<td>3.23</td>
<td>0.16 v_VrmORVRPotential</td>
</tr>
<tr>
<td>7</td>
<td>201</td>
<td>8/16/2008</td>
<td>20:23:28</td>
<td>2.68</td>
<td>4.68</td>
<td>0.57 v_VrmValidAoL</td>
</tr>
<tr>
<td>8</td>
<td>101</td>
<td>8/16/2008</td>
<td>20:26:47</td>
<td>12.42</td>
<td>13.63</td>
<td>0.92 v_VrmValidAoL</td>
</tr>
<tr>
<td>9</td>
<td>201</td>
<td>8/16/2008</td>
<td>20:35:23</td>
<td>2.22</td>
<td>6.45</td>
<td>0.34 v_VrmORVRPotential</td>
</tr>
<tr>
<td>10</td>
<td>301</td>
<td>8/16/2008</td>
<td>20:30:22</td>
<td>10.77</td>
<td>12.91</td>
<td>0.69 v_VrmValidAoL</td>
</tr>
<tr>
<td>11</td>
<td>201</td>
<td>8/16/2008</td>
<td>20:32:56</td>
<td>3.95</td>
<td>10.63</td>
<td>0.57 v_VrmORVRPotential</td>
</tr>
<tr>
<td>12</td>
<td>501</td>
<td>8/16/2008</td>
<td>20:24:02</td>
<td>16.53</td>
<td>20.12</td>
<td>0.62 v_VrmValidAoL</td>
</tr>
<tr>
<td>13</td>
<td>401</td>
<td>8/16/2008</td>
<td>20:34:26</td>
<td>2.62</td>
<td>14.04</td>
<td>0.18 v_VrmMultipleTransactions</td>
</tr>
</tbody>
</table>
Steps to download log files

1. Navigate to the VRM>Control>Download web page.
2. Click on the 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**

<table>
<thead>
<tr>
<th>Service Company Name</th>
<th>Telephone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Technician</td>
<td>INCON Tech Cert #</td>
</tr>
<tr>
<td>Station Address</td>
<td>City</td>
</tr>
<tr>
<td>Phase I EVR Equipment Manufacturer</td>
<td>Phase II EVR Equipment Manufacturer</td>
</tr>
</tbody>
</table>

### Dispenser Equipment Checklist

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Franklin Fueling Systems, Healy Phase II EVR System including ISD System installed according to CARB E.O. VR-202?</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Is the Pressure Sensor in the Open position with the plug in the test port? See Figure 11 of the procedure.</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Was Oil and gasoline compatible PTFE Tape used on the threads for the Vapor Flow Meter rather than pipe dope?</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Was a pressure decay test run per TP201.3?</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Was the Dispenser Vapor Line Integrity Test run to check for leaks in the dispensing equipment?</td>
</tr>
</tbody>
</table>

### Tank Sentinel Equipment Checklist

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>9</strong></td>
<td>Has the Administrator Password been set?</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>Was the External ATG alarm able to be generated and cleared?</td>
</tr>
<tr>
<td>Device</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>Fueling Point ([n])</td>
<td>Daily Vapor Collection or Weekly Vapor Collection ¹</td>
</tr>
<tr>
<td>Weekly Ullage Pressure ¹</td>
<td>VRM</td>
</tr>
<tr>
<td>Weekly Ullage Pressure Leak Test ¹</td>
<td>VRM</td>
</tr>
<tr>
<td>Channel ([n])</td>
<td>Missing</td>
</tr>
<tr>
<td>Channel ([n])</td>
<td>Error</td>
</tr>
<tr>
<td>Pressure Sensor Open Circuit</td>
<td>VRM</td>
</tr>
<tr>
<td>External TS-DIM Connection Down</td>
<td>VRM</td>
</tr>
<tr>
<td>TS-DIM Read Data Error</td>
<td>VRM</td>
</tr>
<tr>
<td>External ATG Connection Down</td>
<td>VRM</td>
</tr>
<tr>
<td>Printer</td>
<td>Check Thermal Printer</td>
</tr>
<tr>
<td>Printer</td>
<td>Printer Head Temperature</td>
</tr>
<tr>
<td>Printer</td>
<td>Printer Paper Jam</td>
</tr>
<tr>
<td>Device</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Slot [n]</td>
<td>[i] Module is offline, where i is the module number</td>
</tr>
<tr>
<td>TS-DTUn</td>
<td>Remote DTU is Offline</td>
</tr>
<tr>
<td></td>
<td>Console DTU number mismatch</td>
</tr>
<tr>
<td>DTU FFS</td>
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©2009 FFS 000-2058 Rev. E
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).


### 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

### 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

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Supplied By</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapor Flow Meter, TS-VFM</td>
<td>INCON</td>
<td>1</td>
</tr>
<tr>
<td>Sensor Installation Kit, 020-1509</td>
<td>INCON</td>
<td>1</td>
</tr>
<tr>
<td>Weatherproof Junction Box</td>
<td>Contractor</td>
<td>1</td>
</tr>
<tr>
<td>1.5” to 1” reducing bushing</td>
<td>Contractor</td>
<td>1</td>
</tr>
<tr>
<td>1” pipe nipple</td>
<td>Contractor</td>
<td>1</td>
</tr>
<tr>
<td>Pipe Union</td>
<td>Contractor</td>
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#### Table 2 - Below Shear Valve

<table>
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<tr>
<th>Item Description</th>
<th>Supplied By</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Vapor Flow Meter, TS-VFM</td>
<td>INCON</td>
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<td>Sensor Installation Kit, 020-1509</td>
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<tr>
<td>Weatherproof Junction Box</td>
<td>Contractor</td>
<td>1</td>
</tr>
<tr>
<td>1.5” pipe nipple</td>
<td>Contractor</td>
<td>1</td>
</tr>
<tr>
<td>1.5” pipe union</td>
<td>Contractor</td>
<td>1</td>
</tr>
</tbody>
</table>

* - 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 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)
Gasoline Vapor IN from Existing Dispenser Piping

Pipe Union

Pipe Nipple

Vapor Flow Meter (supplied by Franklin Fueling Systems)

Intrinsically Safe Conduit to Tank Sentinel Console

Weatherproof Junction Box

1.5" NPT Reducing Bushing

1.5" NPT Pipe Nipple

Vapor Shear Valve

Gasoline Vapor Out to Field Piping

Figure 1
Flow Meter Above Shear Valve

Gasoline Vapor IN from Existing Dispenser Piping

Pipe Union

Vapor Flow Meter (supplied by Franklin Fueling Systems)

Intrinsically Safe Conduit to Tank Sentinel Console

Weatherproof Junction Box

1.5" NPT Reducing Bushing

1.5" NPT Pipe Nipple

Vapor Shear Valve

Gasoline Vapor Out to Field Piping

Figure 2
Flow Meter Below Shear Valve

3 Wire Cable From Console

2 Wire Cable to VFM

3 Position, No-Strip Electrical Connectors

SHLD

(RED) or YEL

WHT

(BLK)

To splice: Insert unstripped wires and use a slip-joint pliers to seat the black piece.

A 3/4 to 1/2 NPT bushing is required for the compression gland/cord grip fitting when a 3/4 junction box is used.

Cable from Console EYS Fitting (epoxy filled seal fitting is not shown)

Weatherproof junction box cover and gasket are installed after the VFM has been tested.

3 Wire Cable From Console

2 Wire Cable to VFM

Cord Grip

1.5" NPT Piping Nipple

1" NPT Pipe Nipple

Pipe Union*

Abbott

Cord Grip

1.5" NPT Piping Nipple

1" NPT Pipe Nipple

Pipe Union*

Abbott
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**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Supplied By</th>
<th>Quantity</th>
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<tr>
<td>Vapor Pressure Sensor, TS-VPS</td>
<td>INCON</td>
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<tr>
<td>Sensor Installation Kit, 020-1509</td>
<td>INCON</td>
<td>1</td>
</tr>
<tr>
<td>Weatherproof Junction Box</td>
<td>Contractor</td>
<td>1</td>
</tr>
<tr>
<td>1” to 0.5” reducing bushing</td>
<td>Contractor</td>
<td>1</td>
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</table>

**Table 2 - Below Shear Valve**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Supplied By</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Vapor Pressure Sensor, TS-VPS</td>
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<td>Contractor</td>
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</tr>
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<td>1” to 0.5” reducing bushing</td>
<td>Contractor</td>
<td>1</td>
</tr>
<tr>
<td>1.5” Piping Tee</td>
<td>Contractor</td>
<td>1</td>
</tr>
</tbody>
</table>

### 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).
Data Transfer Unit

Dispenser Retrofit Manual

Model TS-DTU
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.

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

**Important:** The TS-DTU will increase the current draw of the dispenser by 0.25 amps. Use the label supplied to note this change.
Contents

Important Safety Messages ........................................................................................................ 2
Purpose: ........................................................................................................................................ 4
Specifications: ............................................................................................................................... 5
Tools Required: .............................................................................................................................. 6

Installing the TS-DTU in the Dispenser .............................................................................. 6
Mounting the TS-DTU module ............................................................................................ 6

Intrinsically Safe Wiring .............................................................................................................. 6

Connecting the Vapor Flow Meter and Vapor Pressure Sensor ........................................... 7
   TS-VFM Splice ........................................................................................................................ 7
   TS-VPS Splice ........................................................................................................................ 7

Dispenser Specific Installation ............................................................................................... 7
   Gilbarco Advantage Narrow Frame ..................................................................................... 8
   Gilbarco Encore 300 and 500 Series .................................................................................. 12
   Tokheim Premier B .............................................................................................................. 16
   Tokheim Premier C .............................................................................................................. 20
   Wayne Vista 1 ...................................................................................................................... 28
   Wayne Vista 2 ...................................................................................................................... 32
   Wayne Vista 3 ...................................................................................................................... 36
**Purpose:**
This procedure describes the tools, methods and skill levels required to install an INCON/Franklin Fueling Systems model TS-DTU, Data Transfer Unit in UL Approved Dispensers. Each installation of a TS-DTU in a dispenser requires that a TS-DRK, dispenser installation kit, be used. The TS-DRK is ordered by specific dispenser types. Refer to Table 1 for the correct TS-DRK model. Only INCON/Franklin Fueling Systems 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 fittings referred to in these instructions must be UL "listed" or "recognized" for the purpose.

**Important Safety Messages**
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 breaker for multiple disconnects to turn off power and prevent feedback from other dispensers.
**Specifications:**

**Power**
100-240 VAC, 60 Hz, 0.25 A

**Parts List**

The TS-DTU and TS-DRK installation kit consists of the following major components. Make sure you have these parts before installing the DTU.

![Figure 1: TS-DTU/P Data Transfer Unit](image1)

- TS-DTU
- Mounting Plate
- Fasteners (5 screws, nuts, and washers)

![Figure 2: 020-1513 IS Conduit Kit](image2)

- Straight Conduit Fitting
- 90degree Conduit Fitting
- Conduit Reducer
- Flexible Conduit (1/2"PVC)
- Two splice connectors

---

<table>
<thead>
<tr>
<th>Power Harness</th>
<th>Description</th>
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<td>600-0166</td>
<td>when using Wayne Dispenser</td>
</tr>
<tr>
<td>600-0167</td>
<td>when using Gilbarco Encore Dispenser</td>
</tr>
<tr>
<td>600-0168</td>
<td>when using Gilbarco Advantage Dispenser</td>
</tr>
<tr>
<td>600-0165</td>
<td>when using Tokheim Dispenser</td>
</tr>
</tbody>
</table>

![Figure 3: 131610 Potted Nipple Assembly](image3)

One harness included per instal kit. Refer to table 1 for list of install kits.

![Figure 4: Power Harness Kits](image4)
General Instructions

Tools Required
(This applies to all dispenser installation procedures)

- Assorted Open End Wrenches 1/4" through 3/4"
- Wire Cutters/Strippers 16 AWG to 26 AWG
- 3/8" Drill Assembly
- Assorted Drill Bits 1/16" through 7/16"
- Assorted Screwdrivers (Flat blade-one must be 1/8" wide)
- 3/4" Conduit Hole Punch (For potted nipple assembly)
- Electrical Multi-meter
- 12" adjustable Wrench
- 18" Channel lock Pliers

Attaching the Mounting Bracket
For each dispenser installation, the mounting bracket will need to be attached to the back side of the TS-DTU. Refer to each dispenser installation instruction as it will specify the correct orientation of the bracket.

1. Remove the TS-DTU enclosure cover and set it aside.
2. Find the correct orientation for the mounting bracket in the dispenser-specific instructions.
3. Find two screws, washers, and star nuts from the TS-DTU/P kit. Insert the two screws into the two mounting holes of the front face of the TS-DTU enclosure.
4. Put the mounting bracket on the side of the DTU enclosure and install a washer and star nut.

Intrinsically Safe Wiring
The Intrinsically safe wiring is the same for all type of dispensers. The wires from the top end of a potted nipple should be connected to the TS-DTU module and from the bottom end to the TS-VFM and TS-VPS. These wires connect intrinsically safe devices (TS-VFM and TS-VPS) to the associated apparatus (TS-DTU) and therefore must be protected in non-hazardous area where TS-DTU is located.

- Red........... VFM+
- Black......... VFM–
- Purple ...... VPS +
- White ...... VPS–

Follow the dispenser-specific instructions for the installation location and procedure of the potted nipple on the dispenser vapor barrier.
Connecting the Vapor Flow Meter and Vapor Pressure Sensor
The connection of potted nipple to the TS-VFM and TS-VPS in the lower section of the dispenser is the same for all dispensers. For ease of installation, a junction box may be connected directly to the bottom of the potted nipple. Note, the potted nipple is a ¾” conduit thread, see Figure 8.

TS-VFM Splice
1. Find two-splice connectors in the IS Wiring Kit, 020-1513.
2. Make the following splice connections:
   • Red wire of potted nipple to Red wire of TS-VFM cable.
   • Black wire of potted nipple to Black wire of TS-VFM cable.

TS-VPS Splice
1. Find two wire nuts in the Power Harness Kit, 600-016X.
2. Make the following splice connections:
   • Purple wire of potted nipple to Black wire of TS-VPS cable.
   • White wire of potted nipple to White wire of TS-VPS cable (Refer to Figure 9).

Dispenser Specific Installation
This manual covers the following types of dispensers:

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<thead>
<tr>
<th>Make</th>
<th>Type</th>
<th>Installation Kit</th>
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<td>Gilbarco</td>
<td>Advantage</td>
<td>TS-DRK/A</td>
</tr>
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<td>Encore 300 &amp; 500</td>
<td>TS-DRK/E</td>
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<td>Tokheim</td>
<td>Premier B</td>
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<td>Wayne</td>
<td>Ovation</td>
<td>TS-DRK/W</td>
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<tr>
<td></td>
<td>Vista 1V, 2V, 3V</td>
<td>TS-DRK/W</td>
</tr>
</tbody>
</table>

Table 1: Dispenser Kits
Gilbarco Advantage Narrow Frame

This section illustrates the basic components needed to retrofit a TS-DTU module into an existing or UL remanufactured dispenser. This system can be installed in any "Non-Vapor or Vapor Ready" dispenser including dispensers with existing "Balance" or "VacAssist" piping.

1. Loosen three bolts at the bottom of each main door assembly.

2. Unlock the left options door on each main door.

3. Lift latch on right side of left options door opening to release right options door on each side of the dispenser.

4. Disengage two latches, one in each right and left options door openings, and open main door on both sides of dispenser.

5. Move to side A of dispenser. Side A can be determined by the side that the credit card reader (crind) tray pops out.

6. Find ground wire mounting location shown and remove screw and star washer.

7. Reinstall ground with ring terminal screw and star washer in alternate location shown. Tighten screw securely.

8. Find shield covering opening in air gap and remove two bolts from shield. Retain shield and bolts for future reassembly.
9. Remove two screws from upper air gap knock-out cover and remove. Discard cover but keep screws for reuse.

**Figure 7: Remove Screws**

10. Remove two screws from lower air gap knockout cover and remove. Discard cover and screws.
11. Remove lower door from side A of dispenser using key lock on right side of door. Save door for future reassembly
12. Find potted nipple assembly, 131610. Remove all washers and nuts and set aside.
13. Pull wires from top side of potted nipple assembly through dispenser hydraulics enclosure up through opening in lower air gap knock-out.

**Figure 8: Potted Conduit wires**

14. Attach one nut and washer onto the potted nipple assembly before pushing wires up through electrical enclosure.
15. Pull wires and then nipple assembly up into electronics enclosure. Fit washer and nut over wires and tighten nut securely in place, as shown in Figure 9.

**Figure 9: Potted Nipple Installed**


17. Reinstall the screws previously retain in step 9. These screws seal the holes left behind by the air gap knockout.
18. Find TS-DTU/P kit and remove brackets, DTU, and hardware from box.
19. Remove cover from DTU.
20. Install mounting bracket to DTU with two screws, nuts and washers from hardware provided with DTU as described in the General Information section. Ensure that bracket is installed on correct side as shown.

**Figure 10: Mounting Bracket on DTU**

21. Remove two screws from IS wiring cover inside the DTU and remove cover. Retain cover and screws for reassembly
22. Find the 90 degree fitting from IS wiring kit, 020-1513. Remove nut from 90 degree fitting. Attach fitting to opening nearest IS wiring terminal block of DTU using nut previously removed.
23. Find power harness kit part number 600-0168. Find the Gilbarco Advantage power harness and ground with ring terminal as shown in figure 4 of the Parts List.
24. Put wiring harness end with crimp connector through opening in DTU nearest terminal block J1. Attach white lead to terminal block position labeled NEUTRAL and black lead to terminal block position labeled L1 on terminal block J1 of DTU. Attach ground wire to terminal block position labeled GND of J2 on DTU.

**Figure 11: DTU Power Connections**

25. Move DTU assembly to dispenser nearest intended mounting location
26. Find reducer from IS wiring kit, 020-1513. From electrical enclosure, pull wires from potted nipple assembly through 3/4” opening of reducer and attach reducer to the top of the nipple assembly.

27. Find straight conduit fitting from IS wiring kit, 020-1513. From electrical enclosure, pull wires from the potted nipple assembly through opening of straight conduit fitting. Attach straight conduit fitting onto the reducer.

28. Remove nut and bushing from straight conduit fitting. Place bushing on one end of flexible conduit. Push wires from nipple assembly through bushing/flexible conduit and secure flexible conduit to straight conduit fitting using nut.

29. Remove nut and bushing from 90 degree conduit fitting and push flexible conduit through nut. Put bushing on unattached end of flexible conduit. Push wires from flexible conduit through the 90 degree conduit fitting and pull excess wire into DTU. Attach flexible conduit to 90-degree fitting with nut.

30. Cut excess wire inside DTU allowing a length of 2” for terminal block wiring. Strip insulation 3/8" from ends of wire. Attach wires to DTU terminal block as follows (DIAGRAM)

31. Reinstall barrier cover using screws that were removed in step 23.

32. Replace DTU cover.

33. Install the DTU assembly on the horizontal cross bracket as shown in Figure 15. Use the two screws, washers, and nuts as supplied in the TS-DTU/P hardware kit.

34. Find input connector on AC distribution wiring harness and disconnect.

35. Insert new power harness with ferrites between input power and AC distribution harness.
36. Attach ring terminal of DTU ground wire to dispenser with bolt, nut and star washer.

37. Use wire-wrap ties to attach excess wires from AC wiring harness together.

38. Use wire-wrap ties to attach excess wire from DTU power harness and ground away from door and gears.

39. Find cable assembly extending from TS-VFM vapor meter in dispenser hydraulics enclosure.

40. Find wiring from previously installed potted nipple assembly inside hydraulics enclosure.

41. Find two wire-splice connector kits. Inside hydraulics enclosure, connect black wire from potted nipple assembly to black wire from TS-VFM flow meter by placing each lead into an opening in the wire splice connector and push fitting closed to lock.

42. Find cable extending from TS-VPS inside hydraulics enclosure. Cut yellow and blue leads from end of cable.

43. Find purple and white wires from potted nipple assembly in hydraulics enclosure. Strip wiring insulation \(\frac{3}{8}\)" from end of wire.

44. Using wire nuts provided with kit, attach purple wire from potted nipple assembly to black wire of TS-VPS and white wire from potted nipple assembly to white wire of the TS-VPS.

45. Close main doors on Side A and Side B.

46. Engage main door latches located in both option openings for each side. Refer to figure 2 & 3.

47. Tighten the three bolts at the bottom of each main door assembly. See figure 1.

48. Reinstall side A lower dispenser door. Firmly attach using key lock on right side of door.
Gilbarco Encore 300 and 500 Series
This section illustrates the basic components needed to retrofit a TS-DTU module into an existing dispenser. This system can be installed in any “Non-Vapor or Vapor Ready” dispenser including dispensers with existing “Balance” or “VacAssist” piping.

1. Unlock interface doors on both sides of dispenser. Open two latches on left side of interface door and open main doors.

2. Find TS-DTU/P from kit and remove brackets, DTU, and hardware from box.

3. Remove cover from DTU.

4. Install mounting bracket to DTU using two screws, nuts and washers from hardware provided with DTU as described in the General Information section. Make sure the bracket is installed on correct side as shown.

5. Install the DTU assembly on the horizontal cross bracket as shown in Figure 3. Use the two screws, washers, and nuts as supplied in the TS-DTU/P hardware kit.

6. Find power harness kit part number, 600-0167. Find the Gilbarco power harness as shown in figure 4 of the Parts List. Remove tie-wraps and uncoil. The Gilbarco cable will have green ground wire.

7. Inside dispenser, find the incoming power connection. Attach the new power extension cable between the original dispenser power connectors. Notice that the wire colors match up with the original connection.

8. Carefully route DTU power wiring harness to DTU.

9. Route crimp terminal end of harness through opening in the bottom of the DTU and connect white lead to terminal block position labeled NEUTRAL and black lead to terminal block position labeled L1 on terminal block J1 of DTU.
10. Find ground wire from power harness kit 600-0165. Remove ties and uncoil. From end without ring coil, strip insulation 3/8" from end of wire.
11. Route ground wire end with out ring terminal through DTU and secure to terminal block.
12. Attach ring terminal of ground wire to dispenser bracket using screw and nut as shown. Coil excess wiring and tie it to ensure that it does not interfere with door closing.

13. Find side of dispenser opposite of power supply. Remove lower door on that side of dispenser by loosening two screws.
14. Remove lower doors on both sides of dispensers. Set doors aside and save for later assembly.
15. Find knockout panel on the bottom of the electrical enclosure closest to the DTU (See Figure 7).
16. Using screwdriver, remove one knockout plug from knockout panel.
17. Find potted nipple assembly, 131610. Undo wire ties and uncoil wiring.
18. Remove top nut from potted nipple and remove one washer by pulling over wire leads. Keep nut and washer for future use.
19. Pull wires from top of potted nipple assembly up through the opening created in step 16 from the hydraulics enclosure to the electrical enclosure. Ensure that wiring is not damaged by sharp edges.

20. Pull top of potted nipple assembly through the bottom of the electrical enclosure as shown in Figure 9.
21. Put wires in electrical enclosure through washer and nut that were removed from potted nipple assembly in step 18.
22. Tighten nut to tightly hold potted nipple assembly.
23. Find reducer from IS wiring kit, 020-1513. From electrical enclosure, pull wires from the potted nipple assembly through ¾" opening of reducer and attach reducer to the top of the nipple assembly.
24. Find straight conduit fitting from IS wiring kit 020-1513. From electrical enclosure, pull wires from the potted nipple assembly through opening of straight conduit fitting. Attach straight conduit fitting onto the reducer. Refer to Figure 10.

25. Remove two screws from IS wiring cover inside the DTU and remove cover. Keep cover and screws for future reassembly.

26. Find the 90-degree fitting from IS wiring kit, 020-1513. Remove nut from 90-degree fitting. Attach fitting to opening of DTU nearest the IS connector using nut previously removed.

27. Find the flexible conduit from the IS Wiring Kit, 020-1513. Using 90-degree fitting and straight fitting installed earlier, determine length of flexible conduit assembly needed and cut to fit. Refer to Figure 12.

28. Pull wires from potted nipple assembly through flexible conduit.

29. Remove nut and bushing from straight conduit fitting.

30. Push bushing onto end of flexible conduit and reattach to straight fitting using nut.

31. Remove bushing and nut from 90-degree conduit fitting on DTU and pull wiring/flexible conduit through.

32. Route wires through 90-degree conduit fitting and pull into the DTU enclosure.

33. Using nut and then bushing, attach flexible conduit to 90-degree conduit fitting.
34. Cut excess wire inside DTU allowing a length of 2” for terminal block wiring. Strip wire insulation 3/8” from the end. Connect wires to DTU terminal block.

35. Reinstall barrier cover using screws from step 23.

36. Replace DTU cover.

37. Find cable assembly extending from TS-VFM vapor meter in dispenser hydraulics enclosure.

38. Find wiring from previously installed potted nipple assembly inside hydraulics enclosure.

39. Find two wire splice connector kits. Inside hydraulics enclosure connect black wire from potted nipple assembly to black wire from TS-VFM flow meter by putting each lead into an opening in the wire splice connector and push fitting closed to lock.

40. Find cable extending from TS-VPS inside hydraulics enclosure. Cut yellow and blue leads from end of cable.

41. Find purple and white wires from potted nipple assembly in hydraulics enclosure. Strip wiring insulation 3/8” from end of wire.

42. Using wire nuts provided with kit, attach purple wire from potted nipple assembly to black wire of TS-VPS and white wire from potted nipple assembly to white wire of the TS-VPS.

43. Attach lower hydraulics covers to dispenser and secure each using key lock.

44. Close both main doors of dispenser. Securely attach the two latches on the left side of each interface door.

45. Close both interface doors and lock.

Gilbarco Encore 300 and 500 - DTU Installation
Tokheim Premier B (422B)

This section illustrates the basic components needed to retrofit a TS-DTU module into an existing dispenser. This system can be installed in any “Non-Vapor or Vapor Ready” dispenser including dispensers with existing “Balance” or “VacAssist” piping.

Note: Conduit knockouts measure 1 1/4”. Holes are too small for conduits to make a good seal. These knockouts cannot be used. New conduit knockouts will need to be made.

1. Open right options door with key on Side A of dispenser. Side A has manufacturer’s nameplate. Remove door and set aside for future installation.

2. Open printer door on B side of dispenser.

3. Unlock right options door on B side of dispenser.

4. Release latch on display cover on B side of dispenser.

5. Loosen two screws on display assembly and lower it.

6. Remove lower hydraulics door from side A of dispenser by releasing key lock on either side of door.

7. From side A of dispensers, examine opening on right side of electrical enclosure. Choose drilling location ensuring that components in electrical enclosure and hydraulics enclosure will not be disturbed by the drilling. Use washer to insure proper clearance after install.

8. Using a low speed pneumatic drill, drill a small pilot hole through the bottom of the electrical enclosure.

Note: During drilling, put a catch pan under the drilling location to catch shavings and metal filing during drilling operation.

9. Carefully remove all metal filing and shavings from inside of electrical enclosure.
10. Using a ¾” conduit hole punch, open hole previously drilled.

11. Find potted nipple assembly, 131610. Undo wire ties and unwind wiring.

12. Remove and dispose of rubber washer from assembly.

13. Remove top nut and washer from potted nipple. Keep nut and washer for future use.

14. Pull wires from top of potted nipple assembly up from the hydraulics enclosure to the electrical enclosure. Make sure wiring is not damaged by sharp edges.


16. Find reducer from IS wiring kit 020-1513. From electrical enclosure, pull wires from the potted nipple assembly through ¾” opening of reducer and thread reducer to the top of the nipple assembly.

17. Find straight conduit fitting from IS wiring kit. From electrical enclosure, pull wires from the potted nipple assembly through opening of straight conduit fitting. Attach straight conduit fitting onto the reducer.

18. Find TS-DTU/P kit and remove brackets, DTU, and fasteners from box.

19. Remove cover from DTU.

20. Install mounting bracket to DTU with two screws, nuts and washers from hardware provided with DTU as described in the General Information section. Ensure that bracket is installed on correct side as shown.

21. Remove two screws from IS wiring cover inside the DTU and remove cover. Retain cover and screws for future reassembly.

22. Find 90-degree fitting from IS wiring kit. Remove nut from 90-degree fitting. Attach fitting to opening nearest IS wiring terminal block of DTU using nut previously removed.

23. Find power harness kit part number 600-0165. Find the Tokheim power harness and ground wire with ring terminal as shown in figure 4 of the Parts List. Remove tie-wraps and uncoil.

24. Route wiring harness end with crimp connector through opening in DTU nearest terminal block J1. Attach white lead to terminal block position labeled NEUTRAL and black lead to terminal block position labeled L1 on terminal block J1 of DTU. Attach ground wire to terminal block position labeled GND of J2 on DTU.
25. Remove nut and bushing from straight conduit fitting. Place bushing on one end of flexible conduit. Push wires from nipple assembly through bushing/flexible conduit and attach flexible conduit to straight conduit fitting using nut.

26. Remove nut and bushing from 90-degree conduit fitting and pull flexible conduit through nut. Attach bushing on unattached end of flexible conduit. Pull wires from flexible conduit through the 90-degree conduit fitting and pull excess wire into DTU.

27. Attach flexible conduit to 90-degree fitting with nut.

28. Cut excess wire inside DTU allowing a length of 2” for terminal block wiring. Strip wire insulation 3/8” from the ends of wire. Attach wires to DTU terminal block as follows.

29. Reinstall barrier cover using screws uninstalled in step 23.

30. Replace DTU cover.

31. Install the DTU assembly on the dispenser vertical bracket as shown in Figure 14. Use the two screws, washers, and nuts as supplied in the TS-DTU/P hardware kit.

Tokheim Premier B DTU Installation
32. Route power cable along bottom of electrical enclosure and attach to AC power distribution board as shown. Ensure that wiring is kept away from sharp edges and will not interfere with door closing.

33. Plug the connector from the Tokheim power harness into available connector on AC power distribution board.

34. Attach ring terminal of ground wire to dispenser bracket using screw and nut as shown. Coil excess wiring and secure with tie-wraps to ensure that it does not interfere with door closing.

35. Find cable assembly extending from TS-VFM in dispenser hydraulics enclosure.

36. Find wiring from previously installed potted nipple assembly inside hydraulics enclosure.

37. Find two wire splice connector kits. Inside hydraulics enclosure, connect black wire from potted nipple assembly to black wire from TS-VFM flow meter by putting each lead into an opening in the wire splice connector and push fitting closed to lock.

38. Find cable extending from TS-VPS inside hydraulics enclosure. Cut yellow and blue leads from end of cable.

39. Find purple and white wires from potted nipple assembly in hydraulics enclosure. Strip wiring insulation 3/8" from end of wire.

40. Using wire nuts provided with kit, attach purple wire from potted nipple assembly to black wire of TS-VPS and white wire from potted nipple assembly to white wire of the TS-VPS.

41. Replace lower hydraulics door to side A and lock with key.

42. Lift the display assembly back to normal position and tighten with two attached screws.

43. Lock latch on display cover on B side of dispenser.

44. Close right options door on B side and lock.

45. Close printer door on B side and lock.

46. Close right options door on A side and lock.
Tokheim Premier C

This section illustrates the basic components needed to retrofit a TS-DTU module into an existing dispenser. This system can be installed in any “Non-Vapor or Vapor Ready” dispenser including dispensers with existing “Balance” or “VacAssist” piping.

1. Unlock left door from each side of dispenser and open the door.

2. Release inside latch from left door assembly and open center door.

3. Repeat step 2 for right door assembly.

4. Find side B of dispenser. Side B will be the side without the AC distribution board. Unit will be installed on the right side of side B.

5. Find TS-DTU/P kit and remove brackets, DTU, and fasteners from box.

6. Remove cover from DTU.

7. Install mounting bracket to DTU with two screws, nuts and washers from hardware provided with DTU as described in the General Information section. Ensure that bracket is installed on correct side as shown.

8. Remove two screws from IS wiring cover inside the DTU and remove cover. Keep cover and screws for future reassembly.

9. Find 90-degree fitting from IS wiring kit 020-1513. Remove nut from 90 degree fitting. Attach fitting to opening nearest IS wiring terminal block of DTU using nut previously removed.

10. Find power harness kit part number 600-0165.

Find the Tokheim power harness and ground wire with ring terminal as shown in figure 4 of the Parts List. Remove tie-wraps and uncoil.

11. Pull wiring harness end with crimp connector through opening in DTU nearest terminal block J1. Attach white lead to terminal block position labeled NEUTRAL and black lead to terminal block position labeled L1 on terminal block J1 of DTU. Attach ground wire to terminal block position labeled GND of J2 on DTU.

12. Find vapor barrier plug on bottom of dispenser electronics barrier enclosure.

13. Remove lower door on side A of dispenser (side with AC distribution board).
14. Remove nut from top of plug using wrench.
15. Remove plug, washers, and nuts and discard all hardware.

16. Find potted nipple assembly 131610.
   Untie wire ties and unwind wiring.
17. Remove and dispose of rubber washer from assembly.
18. Remove top nut from potted nipple and remove nut and one washer by pulling over wire leads. Keep nut and washer for future use.
19. Put wires from top of potted nipple assembly up from the hydraulics enclosure to the electrical enclosure. Ensure that wiring is not damaged by sharp edges.


21. Find reducer from IS wiring kit, 020-1513. From electrical enclosure, pull wires from the potted nipple assembly through \( \frac{3}{4} \)" opening of reducer and attach reducer to the top of the nipple assembly.

22. Find straight conduit fitting from IS wiring kit. From electrical enclosure, pull wires from the potted nipple fitting through opening of straight conduit assembly. Attach straight conduit fitting onto reducer.
23. Remove two screws from IS wiring cover inside the DTU and remove cover. Keep cover and screws for future reassembly.
24. Find 90-degree fitting from IS wiring kit. Remove nut from 90-degree fitting. Attach fitting to top opening of DTU using nut previously removed.
25. Find flexible conduit from IS wiring kit 020-1513. Using 90-degree fitting and straight fitting installed earlier, determine length of flexible conduit needed and cut to fit.
26. Pull wires inside electrical enclosure through flexible conduit.
27. Remove nut and bushing from straight conduit fitting.
28. Push bushing onto end of flexible conduit and reattach to straight fitting using nut.

29. Remove bushing and nut from 90-degree conduit fitting on DTU and pull wires through the bushing.

30. Pull wires through 90-degree conduit fitting.

31. Using nut, firmly attach flexible conduit to 90 degree conduit fitting.

32. Cut excess wire inside DTU allowing a length of 2" for terminal block wiring. Strip wire insulation \( \frac{3}{8} \)" from ends of wire. Attach wires to DTU terminal block as follows.

33. Reinstall barrier cover using screws that were removed in step 23.

34. Replace DTU cover.

Install the DTU assembly on the supporting studs located on the vertical side of the dispenser as shown in Figure 15. Use two 10-24 locking nuts to secure the assembly to the dispenser.

35. Route power cable along bottom of electrical enclosure to AC power distribution board as shown. Ensure that wiring is kept away from sharp edges and will not interfere with door closing.
36. Attach connector from the Tokheim power harness into available connector on AC power distribution board.

37. Attach ring terminal of ground wire to dispenser bracket using screw and nut as shown. Coil excess wiring with tie wraps to ensure that it does not interfere with door closing.

38. Find cable assembly extending from TS-VFM vapor meter in dispenser hydraulics enclosure.

39. Find wiring from previously installed potted nipple assembly inside hydraulics enclosure.

40. Find two wire splice connector kits. Inside hydraulics enclosure connect black wire from potted nipple assembly to black wire from TS-VFM flow meter by placing each lead into an opening in the wire splice connector and push fitting closed to lock.

41. Find the cable extending from TS-VPS inside hydraulics enclosure. Cut yellow and blue leads from end of cable.

42. Find purple and white wires from potted nipple assembly in hydraulics enclosure. Strip wiring insulation $\frac{3}{8}''$ from end of wire.

43. Using wire nuts provided with kit, attach purple wire from potted nipple assembly to black wire of TS-VPS and white wire from potted nipple assembly to white wire of the TS-VPS.

44. Close right door assembly and tighten latch. Refer to Figure 3.

45. Close center door assembly and tighten latch. Refer to Figure 2.

46. Close and lock left options door.

47. Repeat steps 45 through 47 for opposite side of dispenser.
Wayne Ovation
This section illustrates the basic components needed to retrofit a TS-DTU module into an existing dispenser. This system can be installed in any “Non-Vapor or Vapor Ready” dispenser including dispensers with existing “Balance” or “VacAssist” piping.

1. Open the upper dispenser door on both sides by loosening two screws on each door.

Figure 1: Open Dispenser

2. Find TS-DTU/P kit and remove brackets, DTU, and hardware from box.

3. Remove cover from DTU.

4. Install the mounting bracket on DTU with two screws, nuts and washers from hardware provided with DTU as described in the General Information Section. Ensure that bracket is installed on correct side as shown.

Figure 2: Mounting Bracket Installed

5. Install the DTU assembly in the vertical dispenser bracket as shown in Figure 3. Use the two screws, washers, and nuts as supplied in the TS-DTU/P hardware kit.

Figure 3: Attach DTU to Dispenser

6. Find power harness kit part number 600-0166. Find the Wayne power harness as shown in Figure 4 of the Parts List. Remove tie-wraps and uncoil.

7. Pull wiring harness end with crimp connector through bottom of DTU. Attach white lead to terminal block position labeled NEUTRAL and black lead to terminal block position labeled L1 on terminal block J1 of DTU.

Figure 4: Attach Power Wiring

8. Inside dispenser, find the incoming power connection on the dispenser power supply board and disconnect.

9. Attach the Wayne power extension cable between the incoming power connector and the power supply board (Figure 5).

Figure 5: Attach Power extension Cable
10. Pull wires away from door using positioning devices included with dispenser.
11. Find ground wire from power wiring harness kit. From end without ring terminal, strip 3/8" of wiring insulation.
12. Attach ground wire to terminal block position labeled GND of J2 on DTU.
13. Attach ring terminal of ground wire to dispenser bracket using screw and nut as shown. Wind excess wiring and attach with tie wraps to ensure that it does not interfere with door closing.

14. Find the side of dispenser opposite of power supply. Remove lower door on that side by loosening two screws. Set door aside and save for later assembly.
15. Remove nut from hole plug located at the bottom of the electrical enclosure using two wrenches. Remove bolt, nut, and washers and dispose of them.
16. Find potted nipple assembly, 131610.
17. Remove and dispose of rubber washer from assembly.
18. Turn top nut from potted nipple counter-clockwise and remove nut and one washer by pulling it over wire leads. Keep nut and washer for future use.
19. Using ¾" conduit hole punch, increase size of 1/2" hole exposed after following step 14.
20. Push wires from top of potted nipple assembly up from the hydraulics enclosure through to the electrical enclosure. Make sure that wiring is not damaged by sharp edges.

22. Find reducer in IS conduit kit. From electrical enclosure, pull wires from the potted nipple assembly through ¾" opening of reducer and thread reducer to the top of the nipple assembly.

23. Find straight conduit fitting from IS wiring kit. From electrical enclosure, pull wires from the potted nipple assembly through opening of straight conduit fitting. Turn straight conduit fitting clockwise onto reducer.

24. Remove two screws from IS wiring cover inside the DTU and remove cover. Retain cover and screws for future reassembly.

25. Find 90-degree fitting from IS conduit kit. Remove nut from 90-degree fitting. Attach fitting to top opening of DTU using nut previously removed.

26. Find flexible conduit fitting in IS conduit kit, 020-1513. Using 90-degree fitting and straight fitting installed earlier, determine length of flexible conduit needed and cut to fit.

27. Pull wires inside electrical enclosure through IS conduit assembly.

28. Remove nut and bushing from straight conduit fitting.
29. Push bushing onto end of flexible conduit and reattach to straight fitting using nut.

30. Remove bushing and nut from 90-degree fitting on DTU and pull wiring and flexible conduit through.

31. Pull wires through 90-degree fitting and pull into the DTU enclosure.

32. Use nut and attach flexible conduit to 90-degree fitting.

33. Cut excess wire inside DTU allowing a length of 2” for terminal block wiring. Strip insulation 3/8” from end of wire. Attach wires to DTU terminal block as follows:

34. Reinstall barrier cover using screws removed in step 24.

35. Replace DTU cover.

36. Find cable assembly extending from TS-VFM vapor meter in dispenser hydraulics enclosure.

37. Locate wiring from previously installed potted nipple assembly inside hydraulics enclosure.

38. Find two-wire splice connector kits. Inside hydraulics enclosure connect black wire from potted nipple assembly to black wire from TS-VFM flow meter by placing each lead into an opening in the wire splice connector and push fitting closed to lock.

39. Find cable extending from TS-VPS inside hydraulics enclosure. Cut yellow and blue leads from end of cable.

40. Find purple and white wires from potted nipple assembly in hydraulics enclosure. Strip wiring insulation at end 3/8”.

41. Using wire nuts provided with kit, attach purple wire from potted nipple assembly to black wire of TS-VPS and attach white wire from potted nipple assembly to white wire of the TS-VPS.

42. Replace lower hydraulics door using two screws on door.

43. Close dispenser doors on each side of the unit and firmly attach with two screws located in each door.

Figure 14: Attach Flexible Conduit to Potted Nipple

Figure 15: Attach Flexible Conduit to 90-Degree Fitting

Figure 16: Terminal Block Wiring

Figure 17: Attach Cover to DTU
Wayne Vista 1
This section illustrates the basic components needed to retrofit a TS-DTU module into an existing dispenser. This system can be installed in any “Non-Vapor or Vapor Ready” dispenser including dispensers with existing “Balance” or “VacAssist” piping.

1. Remove lower brand panel door using key locks.
2. Remove two thumb screws from each side of bezel and pull bezel off of dispenser
3. Remove product select connector from center bezel.

4. Remove keypad data P2 cable, and LCD power connectors from door

NOTE: Alternate display assembly will require the removal of a fourth connector from the LCD/keypad assembly.

8. Find potted nipple assembly, 131610. Open wire ties and unwind wiring.
9. Remove and dispose of rubber washer from assembly.
10. Remove top nut from potted nipple and remove nut and one washer by pulling over wire leads. Keep nut and washer for future use.
11. Pull top wires of potted nipple assembly from the hydraulics enclosure to the electrical enclosure. Ensure that wiring is not damaged by sharp edges.
12. Pull top of potted nipple assembly through opening in electrical enclosure. Route wires inside electrical enclosure through washer and nut retained in step 10. Attach potted nipple assembly by tightening nut.

13. Find reducer from IS conduit kit, 020-1513. From electrical enclosure, pull wires from the potted nipple assembly through ¾” opening of reducer and attach reducer to the top of the nipple assembly.
14. From electrical enclosure, pull wires from the potted nipple assembly through opening of straight conduit. Attach straight conduit fitting onto reducer.

Wayne Vista 1 - DTU Installation
15. Find TS-DTU/P kit and remove brackets, DTU, and hardware from box.
16. Remove cover from DTU.
17. Attach mounting bracket to DTU with two screws, nuts and washers from hardware provided with DTU as described in the General Information Section. Ensure that bracket is installed on correct side as shown in Figure 6.

**Figure 6: Mounting Bracket on DTU**

18. Remove two screws from IS wiring cover inside the DTU and remove cover. Keep cover and screws for reassembly.

**Figure 7: 90-Degree Fitting Installed**

**Note:** The installation of the DTU in the dispenser will occur after all connections have been made to the DTU.
20. Find power harness kit part number 600-0165. Find the Wayne power harness and ground wire with ring terminal as shown in figure 4 of the Parts List. Remove tie-wraps and uncoil.
21. Push wiring harness end with crimp connector through opening in DTU nearest power terminal block J1. Attach white lead to terminal block position labeled NEUTRAL and black lead to terminal block position labeled L1 on terminal block J1 of DTU. Attach ground wire to terminal block position labeled GND of J2 on DTU.

**Figure 8: DTU Wiring**

22. Cut connector off the Wayne power harness kit. Strip wire insulation 3/8” from the end of the wire.
23. Pull wire underneath bracket, along bottom of dispenser and through wire bushing in display assembly.

**Figure 9: Power Harness Wiring**


Wayne Vista 1 - DTU Installation
25. Using wire nuts provided, connect all three white wires together. Connect three black wires together.

26. Use tie-wrap to attach connections together.

27. Attach wiring from power wiring harness to the side of the display assembly using adhesive backed anchor and wire tie.

28. Close display assembly and firmly attach using two screws. Ensure that all wiring is free of sharp edges and pinching when doors close. If sharp edges or pinching is observed, use additional tie wraps and anchors to reroute wiring as necessary.

29. Attach ring terminal of ground wire to dispenser bracket using screw and nut as shown. Wind excess wiring and firmly attach with tie wraps to ensure that it does not interfere with door closing.

30. Find straight conduit fitting and flexible conduit from IS conduit kit, 020-1513. Remove nut and bushing from straight conduit fitting. Push bushing on one end of flexible conduit. Pull wires from nipple assembly through bushing/flexible conduit and attach flexible conduit to straight conduit fitting using nut.

31. Remove nut and bushing from the 90-degree conduit fitting and feed flexible conduit through nut. Put bushing on unattached end of flexible conduit. Pull wires from flexible conduit through the 90-degree conduit fitting and pull excess wire into DTU. Use nut to attach flexible conduit to 90-degree fitting.

32. Cut excess wire inside DTU allowing a length of 2" for terminal block wiring. Strip wire insulation 3/8" from the end of the wire.
33. Attach wires to DTU terminal block as follows.

34. Reinstall barrier cover using screws that were removed in step 20.

35. Replace DTU cover.

36. Install the DTU assembly on the horizontal cross bracket as shown in Figure 16. Use the two screws, washers, and nuts as supplied in the TS-DTU/P hardware kit. Take care that the flexible conduit does not interfere with the electronics on the side of the dispenser.

39. Find two wire splice connector kits. Inside hydraulics enclosure, connect black wire from potted nipple assembly to black wire from TS-VFM flow meter by placing each lead into an opening in the wire splice connector and push fitting closed to lock.

40. Locate cable extending from TS-VPS inside hydraulics enclosure. Cut yellow and blue leads from end of cable.

41. Find purple and white wires from potted nipple assembly in hydraulics enclosure. Strip wire insulation 3/8” from the end of the wire.

42. Using wire nuts provided with kit, attach purple wire from potted nipple assembly to black wire of TS-VPS. Attach white wire from potted nipple assembly to white wire of the TS-VPS.

43. Reinstall lower hydraulic door using key-lock.

44. Reinstall all connectors removed in step 3 & 4.

45. Close the bezel on the dispenser and secure using two thumb screws from each side of the bezel.

46. Repeat steps 44 & 45 for the opposite side of the dispenser.

Note: Moving the 90-degree conduit fitting on DTU slightly away from the dispenser PCB board will aid in separating the conduit from the that board.

37. Find cable assembly extending from TS-VFM vapor meter in dispenser hydraulics enclosure.

38. Find wiring from previously installed potted nipple assembly inside hydraulics enclosure.
Wayne Vista 2
This section illustrates the basic components needed to retrofit a TS-DTU module into an existing dispenser. This system can be installed in any “Non-Vapor or Vapor Ready” dispenser including dispensers with existing “Balance” or “VacAssist” piping.

1. Using key-lock, remove lower door on B side of dispenser. B side of the dispenser does not have dispenser marking at the base.
2. Open upper dispenser door on both sides by loosening two screws on each door.

![Figure 1: Open Upper Dispenser Door](image1.png)

3. On “B” side, remove two screws holding display assembly and carefully lower into resting position.

![Figure 2: Carefully Lower Door](image2.png)

4. DTU will be installed in the location shown below. (The DTU will not be installed until step 21) Examine the bottom of the electrical enclosure to determine location of unused hole plugs and choose the appropriate side of dispenser.

![Figure 3: DTU Installed](image3.png)

5. Remove lower dispenser door using key lock closest to the hole plug chosen in step 2.
6. Using two wrenches, remove nut from hole plug found at the bottom of the electrical enclosure. Remove bolt, nut, and washers and dispose of them.

![Figure 4: Remove Hole Plug](image4.png)

7. Find potted nipple assembly, 131610. Open wire ties and unwind wiring.
8. Remove and dispose of rubber washer from assembly.
9. Remove top nut from potted nipple and remove nut and one washer by pulling over wire leads. Keep nut and washer for future use.
10. Pull top wires of potted nipple assembly from the hydraulics enclosure to the electrical enclosure. Ensure that wiring is not damaged by sharp edges.

![Figure 5: Potted Nipple Installed](image5.png)

12. Find reducer from IS conduit kit, 020-1513. From electrical enclosure, pull wires from the potted nipple assembly through ¼” opening of reducer and attach reducer to the top of the nipple assembly.

Wayne Vista 2 - DTU Installation

Note: Hole plugs beneath plastic catch pans cannot be used as there is not enough clearance to install conduit fittings.
13. From electrical enclosure, pull wires from the potted nipple assembly through opening of straight conduit. Attach straight conduit fitting onto reducer.

![Figure 6: Straight Conduit Installed](image)

14. Find TS-DTU/P kit and remove brackets, DTU, and hardware from box.
15. Remove cover from DTU.
16. Install mounting bracket to DTU with two screws, nuts and washers from hardware provided with DTU, as described in the General Information Section. Make sure that bracket is installed on correct side as shown in Figure 7.

![Figure 7: Mounting Bracket on DTU](image)

17. Remove two screws from IS wiring cover inside the DTU and remove cover. Keep cover and screws for reassembly.
18. Find 90-degree fitting in IS conduit kit, 020-1513. Remove nut from 90-degree fitting. Attach fitting to opening nearest IS wiring terminal block of DTU using nut previously removed.

**Note:** The installation of the DTU in the dispenser will occur after all connections have been made to the DTU.

19. Find power harness kit part number 600-0165. Find the Wayne power harness and ground wire with ring terminal as shown in figure 4 of the Parts List. Remove tie-wraps and uncoil.

20. Push wiring harness end with crimp connector through opening in DTU nearest power terminal block J1. Attach white lead to terminal block position labeled NEUTRAL and black lead to terminal block position labeled L1 on terminal block J1 of DTU. Attach ground wire to terminal block position labeled GND of J2 on DTU.

![Figure 8: 90-Degree Fitting Installed](image)

21. Cut both connectors off the Wayne power harness kit. Strip wire insulation 3/8” from the end of the wire.
22. Pull wire underneath bracket, along bottom of dispenser and through wire bushing in display assembly.

![Figure 9: DTU Wiring](image)

23. Dispenser supply power wires from the potted nipple. Cut wires 6 to 12 inches away from the potted nipple, forming four leads and uncoil. Strip wire insulation 3/8” from the end of each wire.

![Figure 10: Power Harness Wiring](image)
24. Using wire nuts provided, connect the incoming power, one end of the wire with the ferrite, and a wire for the DTU power.

25. Use tie-wrap to attach connections together.

26. Attach wiring from power wiring harness to the side of the display assembly using adhesive backed anchor and wire tie.

27. Close display assembly and firmly attach using two screws. Ensure that all wiring is free of sharp edges and pinching when doors close. If sharp edges or pinching is observed, use additional tie wraps and anchors to reroute wiring as necessary.

28. Attach ring terminal of ground wire to dispenser bracket using screw and nut as shown. Wind excess wiring and firmly attach with tie wraps to ensure that it does not interfere with door closing.

29. Find straight conduit fitting and flexible conduit from IS conduit kit, 020-1513. Remove nut and bushing from straight conduit fitting. Push bushing on one end of flexible conduit. Pull wires from nipple assembly through bushing/flexible conduit and attach flexible conduit to straight conduit fitting using nut.

30. Remove nut and bushing from the 90-degree conduit fitting and feed flexible conduit through nut. Put bushing on unattached end of flexible conduit. Pull wires from flexible conduit through the 90-degree conduit fitting and pull excess wire into DTU. Use nut to attach flexible conduit to 90-degree fitting.

31. Cut excess wire inside DTU allowing a length of 2” for terminal block wiring. Strip wire insulation 3/8” from the end of the wire.
32. Attach wires to DTU terminal block as follows

![Figure 16: Wires Connected to DTU](image)

33. Reinstall barrier cover using screws that were removed in step 20.

34. Replace DTU cover.

35. Install the DTU assembly on the horizontal cross bracket as shown in Figure 17. Use the two screws, washers, and nuts as supplied in the TS-DTU/P hardware kit. Make sure the flexible conduit does not interfere with electronics inside dispenser.

![Figure 17: DTU Installed with Cover On](image)

**Note:** Moving the 90-degree conduit fitting on DTU slightly away from the dispenser PCB board will aid in separating the conduit from the board.

36. Find cable assembly extending from TS-VFM vapor meter in dispencer hydraulics enclosure.

37. Find wiring from previously installed potted nipple assembly inside hydraulics enclosure.

38. Find two wire splice connector kits. Inside hydraulics enclosure, connect black wire from potted nipple assembly to black wire from TS-VFM flow meter by placing each lead into an opening in the wire splice connector and push fitting closed to lock.

39. Locate cable extending from TS-VPS inside hydraulics enclosure. Cut yellow and blue leads from end of cable.

40. Find purple and white wires from potted nipple assembly in hydraulics enclosure. Strip wire insulation 3/8" from the end of the wire.

41. Using wire nuts provided with kit, attach purple wire from potted nipple assembly to black wire of TS-VPS. Attach white wire from potted nipple assembly to white wire of the TS-VPS.

42. Reinstall lower hydraulic door using key-lock

43. Close upper dispencer door on each side by tightening two screws, refer to figure 1.
Wayne Vista 3

This section illustrates the basic components needed to retrofit a TS-DTU module into an existing dispenser. This system can be installed in any “Non-Vapor or Vapor Ready” dispenser including dispensers with existing “Balance” or “VacAssist” piping.

1. Open upper dispenser door on both sides by loosening two screws on each door.

2. Find the location where the DTU will be installed. (The DTU will not be installed until step 21). Examine the bottom of the electrical enclosure to determine location of unused hole plugs and choose the appropriate side of dispenser.

3. Remove lower dispenser door using key lock closest to the hole plug chosen in step 2.

4. Using two wrenches, remove nut from hole plug located at the bottom of the electrical enclosure. Remove bolt, nut, and washers and dispose of them.

Note: Hole plugs beneath plastic catch pans cannot be used as there is not significant clearance to install conduit fittings.

5. Using ¾” conduit hole punch, increase size of ½” hole to ¾”.

6. Find and remove potted nipple assembly, 131610.

7. Remove wire ties and unwind wiring.

8. Remove and dispose of rubber washer from assembly.

9. Remove top nut from potted nipple and remove nut and one washer by pulling over wire leads. Keep nut and washer for future use.

10. Pull top wires of potted nipple assembly from the hydraulics enclosure to the electrical enclosure. Ensure that wiring is not damaged by sharp edges.

12. Find reducer from IS conduit kit PN 020-1513. From electrical enclosure, pull wires from the potted nipple assembly through ¾” opening of reducer and thread reducer to the top of the nipple assembly.

13. Find straight conduit fitting from IS conduit kit 020-1513. From electrical enclosure, pull wires from the potted nipple fitting through opening of straight conduit fitting. Turn straight conduit fitting clockwise onto reducer.

14. Find TS-DTU/P from kit and remove brackets, DTU, and hardware from box.

15. Remove cover from DTU.

16. Install mounting bracket to DTU with two screws, nuts and washers from hardware provided with DTU as described in the general Information Section. Ensure that bracket is installed on correct side as shown.

17. Remove two screws from IS wiring cover inside the DTU and remove cover. Keep cover and screws for future reassembly.

18. Find 90-degree fitting from IS wiring kit. Remove nut from 90-degree fitting. Attach fitting to opening nearest IS wiring terminal block of DTU using nut previously removed.

19. Find power harness kit part number 600-0166. Find the Wayne power harness and ground wire with ring terminal as shown in figure 4 of the Parts List. Remove tie-wraps and uncoil.

20. Push wiring harness end with crimp connector through opening in DTU nearest power terminal block J1. Attach white lead to terminal block position labeled NEUTRAL and black lead to terminal block position labeled L1 on terminal block J1 of DTU. Attach ground wire to terminal block position labeled GND of J2 on DTU.

Note: The installation of the DTU in the dispenser will occur after all connections have been made to the DTU.
21. Find the incoming power connection on the dispenser power supply board shown in Figure 9.

![Figure 9: Attach White Connector](image)

22. Attach the new Wayne power extension cable between the incoming power connector and the power supply board.

![Figure 10: Attach Power Cable](image)

23. Find straight conduit fitting and flexible conduit from IS conduit kit, 020-1513. Remove nut and bushing from straight conduit fitting. Put bushing on one end of flexible conduit.

24. Determine length of flexible conduit needed and cut to fit.

25. Push wires from nipple assembly through bushing/flexible conduit and attach flexible conduit to straight conduit fitting using nut.

![Figure 11: Flexible Conduit Installation](image)

26. Remove nut and bushing from 90-degree conduit fitting and push flexible conduit through nut. Push bushing on unattached end of flexible conduit. Pull wires from flexible conduit through the 90-degree conduit fitting and pull excess wire into DTU. Attach flexible conduit to 90-degree fitting with nut.

![Figure 12: 90-Degree Fitting Installed](image)

27. Cut excess wire inside DTU allowing a length of 2” for terminal block wiring. Strip wire insulation 3/8” from end of wire. Attach wires to DTU terminal block as follows.


29. Replace DTU cover.

Wayne Vista 3 - DTU Installation
30. Install the DTU assembly on the horizontal cross bracket as shown in Figure 14. Use the two screws, washers, and nuts as supplied in the TS-DTU/P hardware kit.

31. Attach ring terminal of ground wire to dispenser bracket using screw and nut as shown. Coil excess wiring and firmly attach with tie wraps to ensure that it does not interfere with door closing.

32. Find cable assembly extending from TS-VFM vapor meter in dispenser hydraulics enclosure.

33. Find wiring from previously installed potted nipple assembly inside hydraulics enclosure.

34. Find two wire splice connector kits. Inside hydraulics enclosure, connect black wire from potted nipple assembly to black wire from TS-VFM flow meter by putting each lead into an opening in the wire splice connector and push fitting closed to lock.

35. Find cable from TS-VPS inside hydraulics enclosure. Clip yellow and blue leads from end of cable.

36. Find purple and white wires from potted nipple assembly in hydraulics enclosure. Strip wiring insulation 3/8" from end of wire.

37. Using wire nuts provided with kit connect purple wire from potted nipple assembly to black wire of TS-VPS. Connect white wire from potted nipple assembly to white wire of the TS-VPS.

38. Reinstall lower hydraulic door using key-lock.

39. Close dispenser doors on each side of the unit and firmly attach with two screws located in each door.
Overview
The TS-DTU will be installed in the dispenser when it is used as a Remote DTU or inside the building when used as a Console DTU. These installation instructions are to be used for installing the TS-DTU inside the building.

When used as a Console DTU, data is received from the Remote DTU units via power line communication. The data is then sent to the System Console (TS-550/5000/EMS) for processing. Unlike the Remote DTU units, the Console DTU will have no Intrinsically safe sensors connected to it.

Site Inspection
A licensed electrician should perform a site inspection before installing any equipment. The Console DTU must be connected to all electrical phases that supply power to dispensers containing Remote DTUs.

Check for any electrical isolation. Isolation between the electrical panel and the dispenser can result in poor or no communication with the DTU. Make sure there is not a power conditioner between the Console DTU and dispenser power.

Installation Procedure
Tools and Supplies Needed

<table>
<thead>
<tr>
<th>• 1/2” Cord grip/strain relief</th>
<th>• Small slotted screwdriver</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Multimeter</td>
<td>• Mounting screws</td>
</tr>
<tr>
<td>• 2-wire shielded cable</td>
<td>• 14 AWG wire (one for each phase and ground)</td>
</tr>
</tbody>
</table>

Step 1 – Remove System Power
Remove power from the TS-5XXX Series System Console and do NOT return power to the System Console or to the Console DTU until instructed to do so.

Electrical Hazard! Always disconnect power supplies before installing or servicing the console TS-DTU. Use proper lock-out and tag-out procedures to ensure no power is accidentally applied to the system. Failure to do so could result in severe injury or death.

Step 2 – Mounting the Console DTU
Mount the Console DTU as close to the circuit breaker panel that is supplying the dispenser(s). Remove the cover and insert a screw (not supplied) into each of the four corners of the enclosure. Mount the unit to the wall. You may optionally use the supplied mounting brackets.

Step 3 – Power Connection
The Console DTU may use the same circuit breaker as the System Console but DO NOT connect the power for the Console DTU inside the Console enclosure. Install a junction box or wire the Console directly to the circuit breaker panel.

Ideally, the circuit selected for the console power will be on the same phase as all dispensers and no further power connections will be required. If any dispensers are on a different phase, run wires from the L2 and L3 connections on the Console DTU to the appropriate circuit breakers for the required extra phases. If there is any question about what phase some of the dispensers are on, it is recommended to connect all three phases to the Console DTU.

Connect the neutral for the Console DTU to the same neutral supplying the dispensers. If there is not a clean neutral return for the DTU then poor quality may result.

Warning: Cycling power to the Console DTU without powering off the System Console will cause the System Console to reboot.

Installer must use conduit for connecting the DTU on the power connection side.
Step 4 – Bus Termination Jumper Removal
The Console DTU will provide system bus termination when installed and running. Therefore the system bus termination currently provided by the Power Supply Module needs to be removed. Refer to the TS-5XXX Series Installation Guide for instructions on how to remove a module.

Be extremely careful when removing the power supply module so it does not rub against any other part of the system. After it is removed from the system, locate the system bus termination jumper JP1 and remove it (Figure 2).

Re-Install the power supply module, securing it properly in place and replace the communication bracket as required.

Step 5 – Data Connection
The Console DTU acts as an external System Console module and therefore must be connected to the system bus. This is made possible via the external BUS EXT connection, located on the power supply module.

The bus connection requires 2-wire shielded cable and FFS recommends Belden 87761. On the Console DTU, the cable enters through the Intrinsically Safe (I.S.) opening but is connected outside of the I.S. area, which is not used in the Console DTU. Therefore the I.S. shield will need to be removed and discarded. Secure the bus cable on the Console DTU side using a cord grip.

On the System Console communications bracket, locate the BUS EXT connector (Figure 4). The connector is removable for convenient wiring. Refer to the following table and make the proper BUS (HIGH, LOW, GND) connections (Figure 3). To make the necessary connections between the System Console and the DTU, plug the BUS EXT connector back into the System Console. Secure the bus cable so it is not accidentally disconnected.

<table>
<thead>
<tr>
<th>Belden Cable</th>
<th>BUS EXT</th>
<th>Console DTU Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Wire</td>
<td>HIGH</td>
<td>HIGH</td>
</tr>
<tr>
<td>Black Wire</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>Shield</td>
<td>GND</td>
<td>GND</td>
</tr>
</tbody>
</table>

Figure 2: JP1 Location on the Power Supply Module
Figure 3: Console DTU BUS EXT Connection
Figure 4: Console Side BUS EXT Connection

Step 6 – Review All Connections
Review power and data connections and make sure the cable is attached securely. Finally replace the Console DTU Cover.

Step 7 – Power Up
Return power to the System Console and the newly installed Console DTU.

Related Documents
000-2146 DTU Dispenser Retrofit Manual
000-2142 T5 Console Programming Manual, rev D or higher
000-2150 T5 Installation Manual
000-2058 VRM IOM manual rev C or higher
NOTES:
1.) THE MODEL TS-DTU/P SHALL NOT BE CONNECTED TO ANY EQUIPMENT WHICH USES OR GENERATES GREATER THAN 250V.
2.) EACH GROUND TERMINAL SHALL BE CONNECTED TO A SUITABLE SYSTEM EARTH GROUND. THE DC RESISTANCE BETWEEN GROUND TERMINALS AND EARTH GROUND SHALL BE LESS THAN 1 OHM.
3.) THE MODEL TS-DTU/P WIRING SHALL BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE NATIONAL OR LOCAL CODES. IN THE SAME CABLE/CONDUIT MUST HAVE AT LEAST 0.25mm OF INSULATION.
4.) CAPACITANCE AND INDUCTANCE OF THE FIELD WIRING FROM THE INTRINSICALLY SAFE EQUIPMENT TO THE BARRIER SHOULD BE CALCULATED AND SHOULD BE INCLUDED IN THE SYSTEM CALCULATIONS AS SHOWN IN TABLE 1, 1A.
5.) WIRING, CABLING AND SEALS MUST BE INSTALLED IN ACCORDANCE WITH THE
6.) USE ONLY CABLE THAT IS SPECIFIED IN USER INSTALLATION MANUAL OR LISTED EQUIVALENT FOR THE INSTALLATION OF LIQUID LEVEL PROBES.
7.) USE THE FOLLOWING WIRE TYPES:
   FOR I.S. WIRING USE 18AWG MINIMUM OIL AND GASOLINE RESISTANT TYPES, TFFN, THWN, THHN.
8.) ONLY USE CRIMP TYPE CONNECTORS FOR ELECTRICAL CONNECTIONS (DO NOT USE WIRE NUTS OR OTHER TYPE CONNECTORS).
9.) SEAL ALL FIELD WIRING CONNECTIONS FROM MOISTURE WITH EPOXY SEAL - PACKS.
10.) SEE INSTALLATION MANUAL FOR MORE DETAIL.
11.) THE ENTITY CONCEPT ALLOWS THE USER TO IDENTIFY ACCEPTABLE COMBINATIONS OF INTRINSICALLY SAFE APPARATUS AND ASSOCIATED APPARATUS THAT HAVE NOT BEEN EXAMINED AS A SYSTEM. EACH APPARATUS IS EXAMINED SEPARATELY BY A NATIONALLY RECOGNIZED TEST LABORATORY (NRTL) OR NOTIFIED BODY AND ASSIGNED A SET OF PARAMETERS CALLED ENTITY PARAMETERS. THE ENTITY PARAMETERS TS-DTU/P (ASSOCIATED APPARATUS) CAN BE FOUND IN TABLE 1, 1A. TO DETERMINE THE Vmax (Ui), Imax (Ii), Ci, AND Li VALUES THE CONTROL DRAWING FOR THE INTRINSICALLY SAFE APPARATUS SHALL BE USED. THE COMBINATION OF THE INTRINSICALLY SAFE APPARATUS AND ASSOCIATED APPARATUS MUST COMPLY WITH THE FOLLOWING:

- Uo (Voc) \leq Ui (Vmax)
- Io (Isc) \leq Ii (Imax)
- Po \leq Pi (Pmax)
- Co (Ca) \geq Ci + Ccable
- Lo (La) \geq Li + Lcable.

12.) THE GENERAL CONTRACTOR MUST SUPPLY THE SPECIFIED WIRE, FOR POWER AND GROUND WIRING.

13.) USE MOUNTING HOLES TO SECURE TS-DTU/P TO WALL OR MOUNTING BRACKET (SUPPLIED).
INCON Level 1 Training Certification Required to Install the Thermal Printer
**Printer Installation**

The following instructions are for the addition of an internal printer or replacement of an existing printer in a T5 Series Fuel Management System.

**Note:** The thermal printer requires controller module firmware rev 1.5 or higher.

**Included with Printer:**
- Plastic Bezel
- Thermal Printer on PCB (Printed Circuit Board)
- Hardware includes:
  - (2) stand-offs
  - Mounting screws (Quantity, size and use shown in chart)

<table>
<thead>
<tr>
<th>(4) #6</th>
<th>(2) #8</th>
<th>(2) #10</th>
</tr>
</thead>
<tbody>
<tr>
<td>For lower 4 holes in the PCB</td>
<td>For top of PCB, in stand-offs</td>
<td>For Plastic Bezel</td>
</tr>
</tbody>
</table>

**Note:** Use only the provided hardware to mount the printer.

**Installation Procedure**

**Warning** Disconnect power before opening the console cover.

1. Open the Tank Gauge front door.
2. Remove the front door’s inside cover plate by unscrewing the screws located on the plate. (Number of screws vary by model).

**To Retrofit a Printer in a Console Without One**

a. Remove the 4 nuts that secure the blank-off plate.
b. Remove the plate (blank-off plate may stick to the overlay).
c. Carefully cut out the part of the overlay that covers the printer opening using a sharp knife.

Go to step 9.

3. Disconnect the cable that connects the impact printer to the interface board in the front door.
4. Remove the roll of paper from the printer.
5. Remove the 4 screws that hold the impact printer to the front door.

**Note:** Be careful not to damage the ribbon cable.

6. Pull the printer gently and slowly a couple of inches away from the door. Completely remove the impact printer board.
7. Remove the 4 screws that hold the printer’s plastic cover printer to the front door.

8. Remove the plastic cover.
9. Place the new plastic bezel over the cutout in the front door. Fasten the bezel to the enclosure using the two #10 self-tapping screws supplied. Start the screws in the lower two mounting holes. Do not tighten screws all the way at this time. These screws will be tightened after installing the printer assembly.
10. Install the 2 stand-offs on the studs located next to the printer opening (Figure 4).
11. Mount the printer so that the clear printer cover faces outward of the front door.

12. Attach the 6 screws for the thermal printer board to the front door (Figure 6). Refer to the screw chart on the previous page.

13. Connect the cable from the thermal printer board to the interface board of the front door (Figure 6).

14. Tighten the two screws that hold the plastic bezel by inserting a screwdriver through the access holes in the circuit board.

15. Check to make sure the foam pad covers the corner of the circuit board where the power cables connect.

16. Replace the metal inside cover plate on the front door and fasten the screws. Make sure to reattach the ground connector to the plate.

17. Lift up on the green panel to open the printer and load paper (Figures 7-9). Make sure the roll is oriented as shown.

18. Close the printer door.

19. Restore power to the tank gauge.

**Paper Specifications**

Type: Thermal Printer Paper
Width: 58 mm (2.28”)
FFS part #: TS-TP2 (box of 5 rolls)
TS-TP2C (Carton of 20 boxes = 100 rolls)
To print a test page

1. Once the tank gauge is on, press the Main Menu key on the LCD with the figure of a table (Figure 10).

2. Press the arrow on the right side bar once.

3. Press Diagnostics.

4. Press Print Test Page.

Printer Operation Notes

- On rare occasions, when printing excessively long reports at high ambient temperature, the printer may need to pause momentarily. Printing will resume automatically after a few seconds.
- An open printer door or no-paper will generate an out-of-paper alarm.
- If you are trying to print and the paper is spooling but no text is printing, check paper roll orientation per Figure 7.
- The paper tear-bar is located at the top. Tear the paper with a lifting motion (Figure 14).