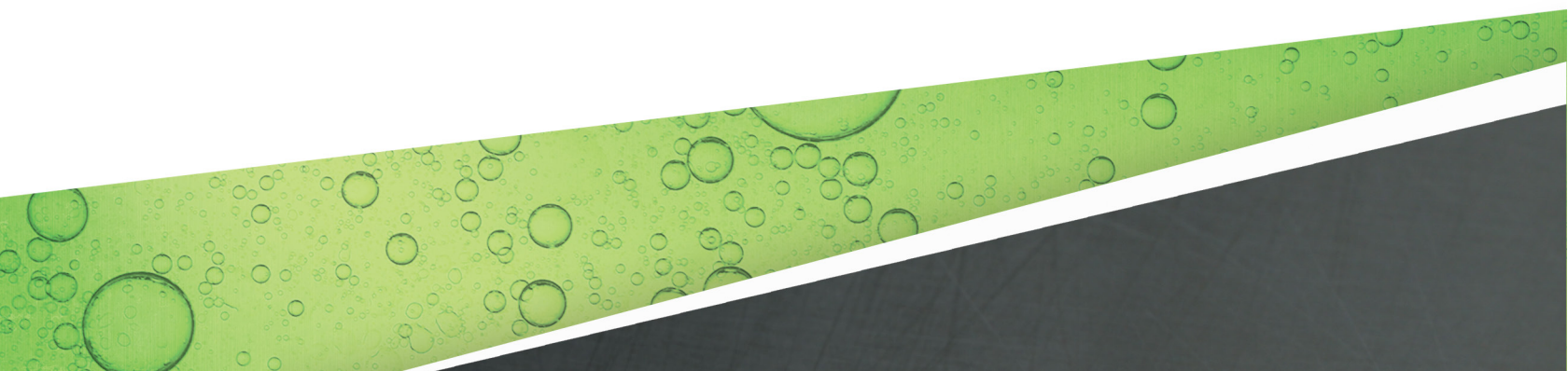


TS-SCM

SECONDARY CONTAINMENT MONITORING

INSTALLATION GUIDE



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

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000-0528 r7

CONVENTIONS USED IN THIS MANUAL

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

NOTE: This provides helpful supplementary information.

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

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

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

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

OPERATING PRECAUTIONS

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

IMPORTANT: To help prevent spillage from an underground storage tank, make sure the delivery equipment is well-maintained, that there is a proper connection, and that the fill adaptor is tight. Delivery personnel should inspect delivery elbows and hoses for damage and missing parts.

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

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

▲ WARNING: Before you enter a containment sump, check for the presence of hydrocarbon vapors. Inhaling these vapors can make you dizzy or unconscious, and if ignited, they can explode and cause serious injury or death. Containment sumps are designed to trap hazardous liquid spills and prevent environmental contamination, so they can accumulate dangerous amounts of hydrocarbon vapors. Check the atmosphere in the sump regularly while you are working in it. If vapors reach unsafe levels, exit the sump and ventilate it with fresh air before you resume working. Always have another person standing by for assistance.

▲ 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 it in danger from moving vehicles that enter the work area. To help prevent this safety hazard, secure the area by using a service truck (or some other vehicle) to block access to the work area.

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

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INTRODUCTION

This manual applies to the following Franklin Fueling Systems (FFS) consoles:

- TS-5 Series
- TS-550evo™ and TS-5000evo™
- EVO™ 550 and EVO™ 5000
- EVO™ 600 and EVO™ 6000

The TS-SCM (Secondary Containment Monitoring) system is a continuous secondary containment monitoring system that monitors the interstitial spaces of double walled tanks and sumps, secondarily contained product, and vapor return piping. You can order this product as an option with the FFS consoles listed above.

The system is comprised of an application running on an FFS console and all necessary input and output modules with installation kits. The system consists of a vacuum sensor, solenoid valve, mechanical bypass valve, and vacuum manifold. The system uses the STP siphon port vacuum to evacuate the containment space and AUTO-LEARN® technology to determine the characteristics of each secondary containment area that is monitored.

SAFETY

▲ 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 Tank Sentinel 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. EVO™ 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 EVO™ Series console or attached components should only be performed by a qualified, factory-trained technician.

▲ WARNING: The TS-SCM contains aluminum, care must be taken to avoid ignition due to impact.

▲ WARNING: The TS-SCM operates at a standard 2 to 6" Hg and should be used only to monitor containments that are designed to withstand these vacuum levels. Refer to the containment manufacturer for further information.

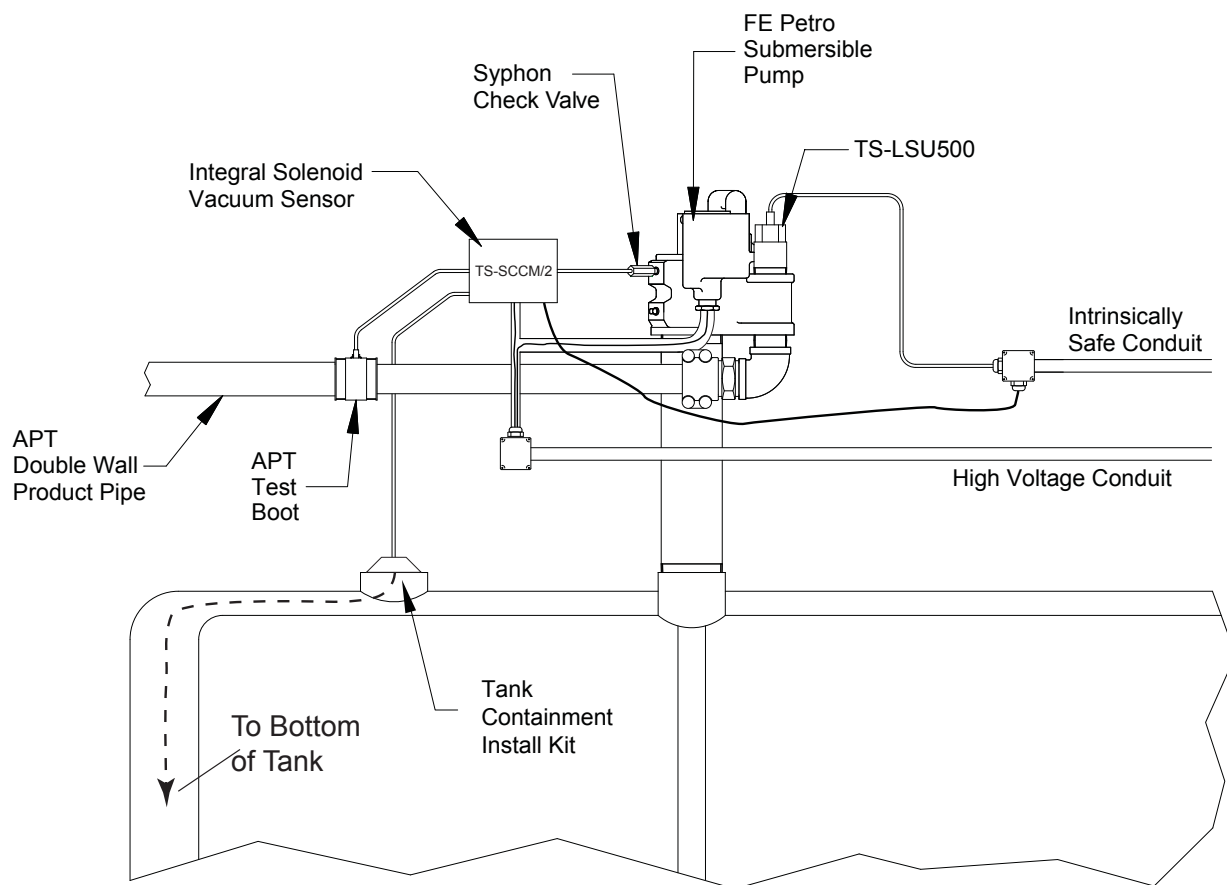
ADDITIONAL DOCUMENTATION

You may need to refer to the following documentation:

- TS-5 Series Programming Guide, part number 000-2142.
- TS-550evo™ and TS-5000evo™ Programming Guide, part number 000-2173.
- EVO™ 600 and EVO™ 6000 Programming Guide, part number 228180061.

APPLICATIONS

The following diagram illustrates a typical installation in an STP sump.



SITE REQUIREMENTS

Total Containment Volume*	Minimum - 0.25 gallons (1 L) Maximum - 500 gallons (1879 L)
Normal Operating Vacuum	2" – 6" Hg (1 – 3 PSIG)
Pre-Programmed Maximum Shutdown (Alarm Condition)	9" Hg (4.5 PSIG)
Mechanical Relief Valve Vacuum**	10" Hg (5 PSIG)
Jumper Tubing	Use only supplied vacuum tubing
Vacuum Sensor Wiring	Belden No. 87761(0.12" OD) to 400 ft. Belden No. 89182(0.31" OD) to 500 ft. (maximum distance)
Solenoid Wiring	600 V, 18 AWG minimum, UL approved. Refer to ANSI/NFPA70 or CEC electrical codes

*Refer to manufacturers' documentation to calculate containment area volumes.

**All containment areas MUST be compatible with the vacuum levels listed.

IMPORTANT: The system should be tested annually after installation.

The term "containment" (as in "secondary containment") refers to the interstitial spaces of double walled piping, sumps, and tanks that serve as a secondary restraining space if the primary containment is damaged.

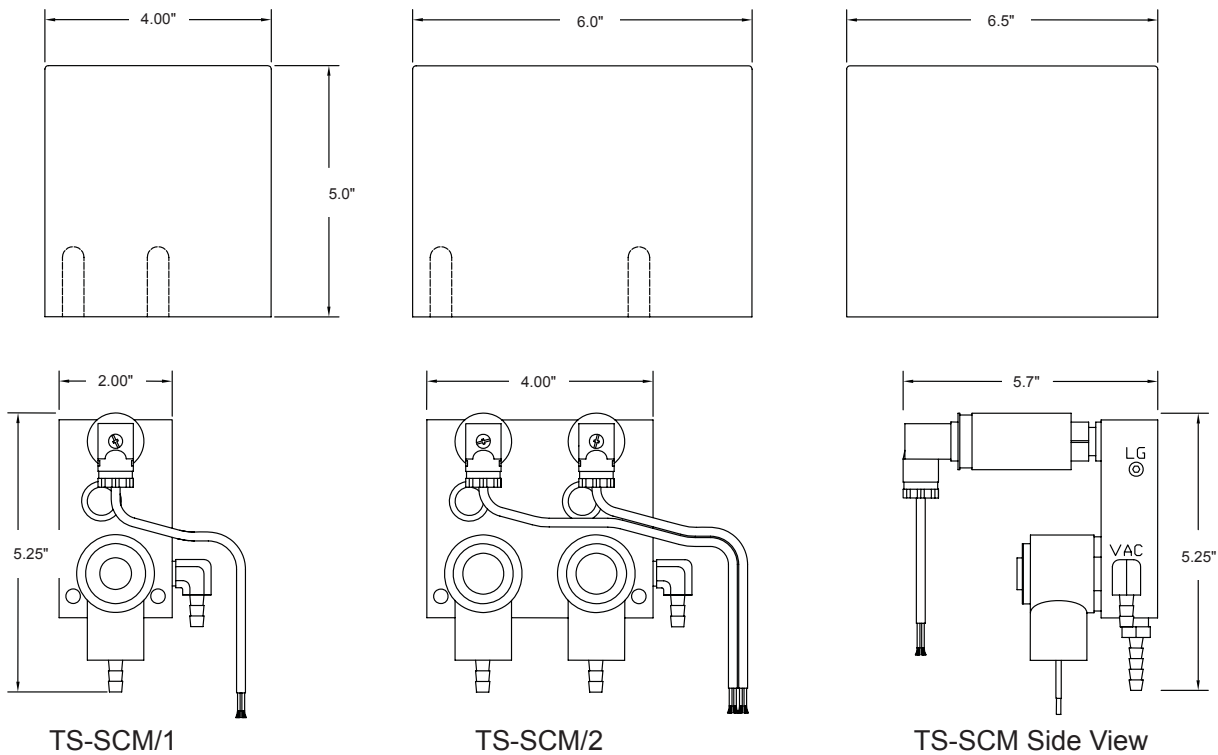
Individual containment sections of a given product pipeline may be jumpered together via a vacuum line to form one larger single containment. An example of 'jumpered' containment spaces is the secondary containment layer of product piping from the turbine containment to the first dispenser, and then jumpered to the secondary containment layer of the same product piping on the other side leading to a second dispenser containment area.

Several containment areas may be grouped together and used with a single TS-SCM. No more than four (4) TS-SCM groups should be used per pump siphon. The combination of any containment group may not exceed the volume limits listed for the TS-SCM.

NOTES:

- DO NOT jumper tank interstitials with other tank interstitials or other containments.
- DO NOT jumper containment areas of unlike product pipelines together.
- If grouping multiple containment areas together, the installer will need to purchase and use the vacuum hose, fittings, and clamps to secure the connection as specified by FFS.
- Both intrinsically safe and explosion proof conduits need to be available inside of the turbine containment for the TS-SCM.
- Refer to the FFS product catalog for the current TS-SCM configurations offered.

SCM DIMENSIONS



NOTE: The TS-SCM 1 can monitor one containment group, and the TS-SCM 2 can monitor two containment groups.

INSTALLATION

Before starting installation, conduct a site survey to identify potential containment groups. Based on that survey, plan out which STP sump the equipment will be installed in and how containment areas will be grouped together.

NOTE: For additional vacuum sensor safety information, refer to the manufacturers' documentation included with the product.

▲ WARNING: Lockout and tag circuit breakers, and disconnect console power wiring before installing or servicing any system wiring.

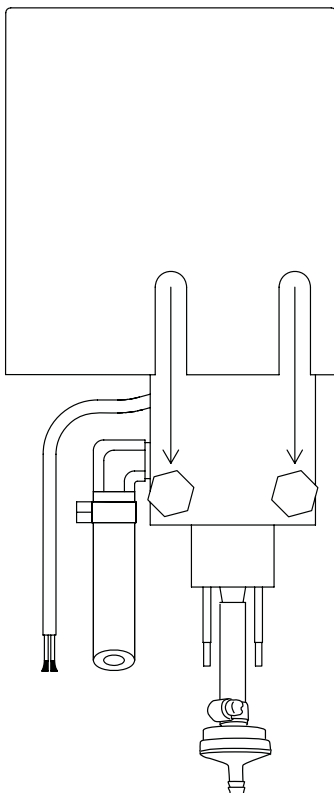
▲ WARNING: DO NOT make solenoid and/or sensor wiring connections with live power connected to the console or any module.

▲ WARNING: Do not run intrinsically safe (IS) wiring and non-intrinsically safe (non-IS) wiring in the same conduit.

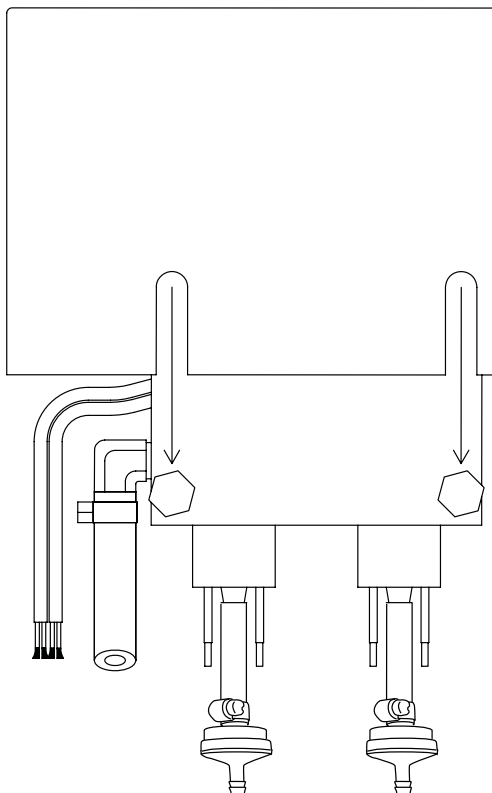
NOTE: TS-SCM must be installed in accordance with the national electrical code, ANSI/NFPA 70, CEC or other applicable national or local codes.

NOTE: Maximum torque on supplied hose clamps is 10.5 inch-lbs.

1. Pull all wiring through the conduits that will be used for the TS-SCM vacuum sensor and solenoid valve. The intrinsically safe (IS) sensor wiring must be run in an IS conduit. The non-IS solenoid wiring must be run in an approved explosion proof rigid metal conduit.
2. Mount the TS-SCM inside of the turbine containment area, supported by rigid, explosion proof conduit. Then orientate the units to allow enough clearance to make the vacuum line connections without stretching, kinking, or creating sharp bends in vacuum hoses. The TS-SCM cover is installed with the label upwards.

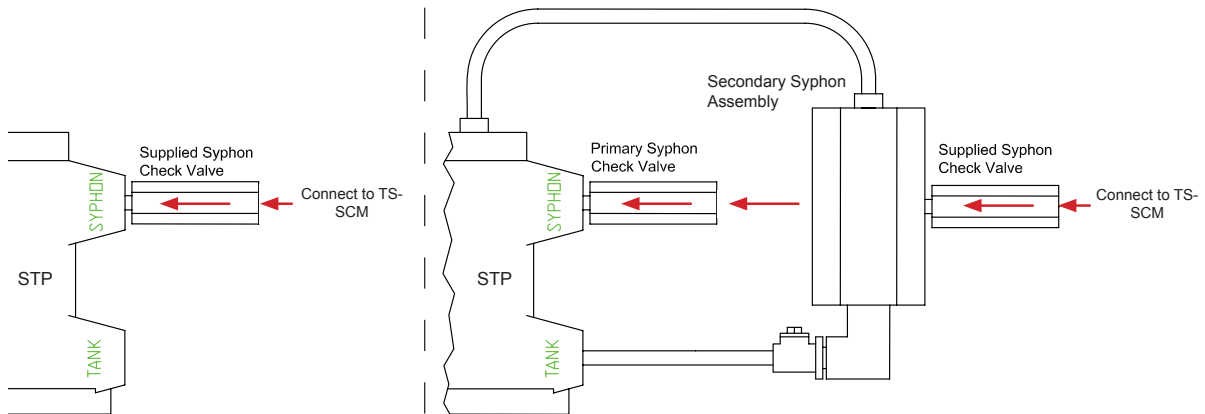


TS-SCM/1



TS-SCM/2

3. Connect the solenoid wiring to the field wiring using wire nuts to secure the connections. Replace the explosion proof junction box cover.
4. Connect the vacuum sensor wiring to the IS field wiring using epoxy wire seals to secure the connections. Replace the IS junction box cover.
5. Install the supplied Siphon Check Valve with the inscribed Flow Arrow pointing to the STP. Apply a non-hardening, thread sealing compound to the threads, then thread the valve body into the submersible turbine's siphon port. If necessary, use a FFS Secondary Syphon Assembly to connect the TS-SCM to the syphon port of the STP.



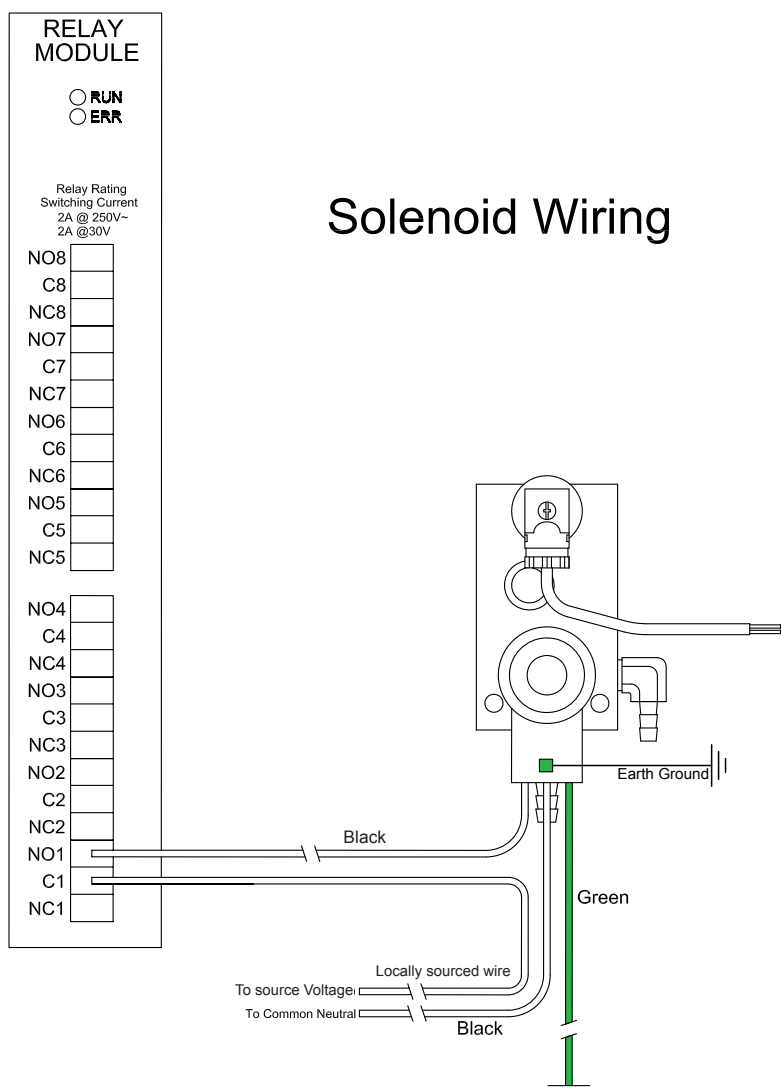
6. Plumb the siphon hose from the VAC port of the TS-SCM to the siphon check valve. Secure the hose to the fittings using one of the supplied hose clamps at each end.
7. Plumb the containment vacuum hose from the in-line air filter barb to the containment area to be monitored. Secure the hose to the air filter using one of the supplied hose clamps per air filter. Install Tee-fittings and clamps where necessary to connect the hoses if more than one containment area will be monitored as a group.

NOTE: The containment vacuum hose must be placed in the lowest point of the containment space. For double walled tanks, this means ensuring that the vacuum line rests at the bottom most part of the tanks interstitial space. Use the same industry procedures used to install any sensor at the bottom of a double walled tank.

NOTE: Installation kits include connections for both Schrader valve and push fit connections. The push fit stub must be secured to the tubing with a band clamp.



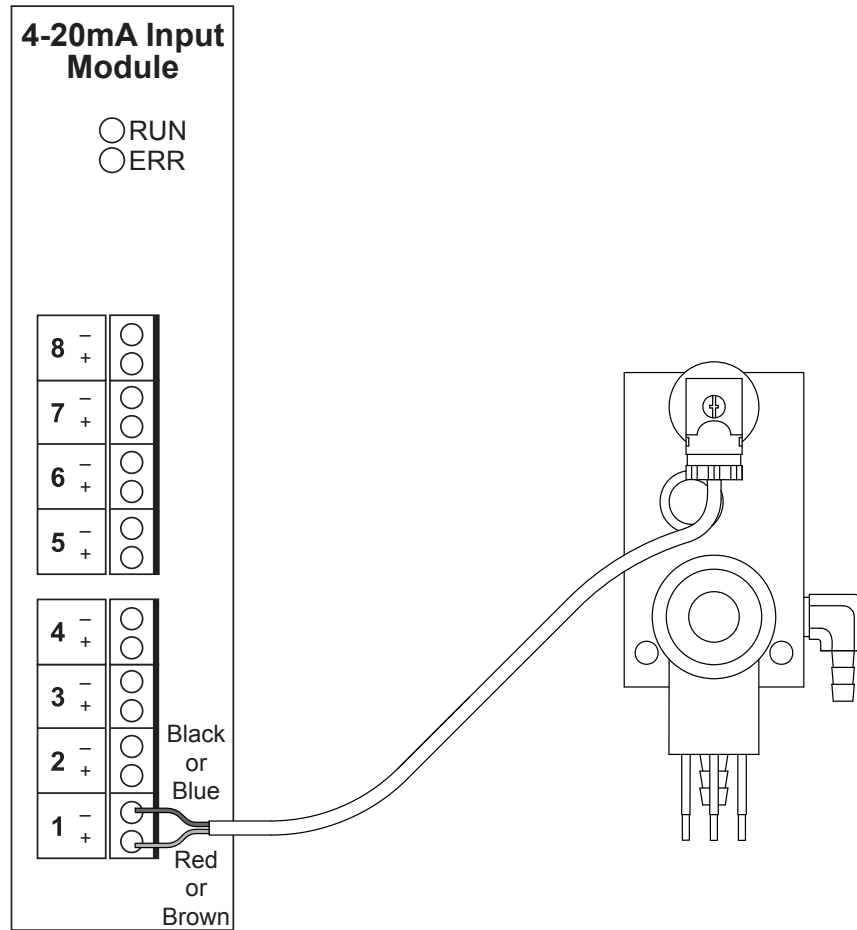
8. Secure all containment boots, lids and caps. Clean pipe surfaces to clear debris or foreign objects prior to tightening secondary test boots on secondary containment product or vapor return piping. Make all jumper connections inside of dispenser sumps by using supplied hardware.
9. Inside the console, the TS-SCM solenoid wiring must enter the console from the explosion proof rigid conduit through a designated knockout on the non-IS side of the barrier inside. Connect the line to a single unused channel on the Relay Module (RLY). The solenoid should be wired to the Normally Open (NO) contacts of the channel selected. Source voltage (110 VAC) will need to be provided to the dry contact relay.



NOTE: TS and VS are different source voltages. For additional information, refer to the manufacturers' documentation included with the product.

⚠ WARNING: If you use console power wires to provide power to a dry contact relay channel, ensure that the console is positively shut down during installation and service. Failure to remove power may result in damage to equipment, personal injury or even death.

10. The TS-SCM sensor wiring must enter the console in IS conduit through a knockout on the IS side of the barrier. Secure each pair of sensor wires to a single channel on the 4-20mA Analog Input Module. Always use the next available channel when wiring; for example, if Channels 1–3 are being used, Channel 4 must be used next. Pay close attention to the polarity (+/-) of the wires.



NOTE: If vacuum sensor wires are black and red, connect the black wire to the negative (-) terminal and the red wire to the positive (+) terminal. If vacuum sensor wires are blue and brown, connect the blue wire to the negative (-) terminal and the brown wire to the positive (+) terminal.

PROGRAMMING

The following instructions cover TS-SCM programming only. Administrator privileges are necessary to program the TS-SCM application. (For console programming instructions or information about obtaining Administrator access level, see the list of programming manuals in the “ADDITIONAL DOCUMENTATION” section.)

Access the console, and open the Setup Menu. Go to each of the following sections, and adjust the TS-SCM parameters accordingly. You will be prompted to enter the Administrator access level when it is required.

NOTE: Sites setups vary depending on products used and other equipment installed. Setup information in the sections of this chapter depict a typical site and are meant as examples only.

EVO™ 600 AND EVO™ 6000 PROGRAMMING

When you program a containment you want to monitor, obtain the following information:

- The pump that is providing the vacuum.
- The 4-20 mA channel the vacuum sensor transducer is connected to.
- The relay that is controlling the solenoid.

From Fuel Management>Secondary Containment Monitoring +:

Secondary Containment Monitoring +	
☐ SCM Containment 1 --	Name SCM Containment 1 Enable Yes Shutdown on Alarm Yes Pump Pump 1
☐ Transducer »	...
☐ Solenoid	Relay SCM Solenoid
☐ SCM Containment 2 --	Name SCM Containment 2 Enable Yes Shutdown on Alarm Yes Pump <not set>
☐ Transducer	Connection Type 4-20mA Input Module Module <not set> Channel <not set>
☐ Solenoid	Relay <not set>

1. Select the pump the TS-SCM Module is paired with. Pumps are defined in the Pump section.

☐ SCM Containment 2 --	Name SCM Containment 2 Enable Yes Shutdown on Alarm Yes Pump Pump 1
---	--

Where the pumps are defined:

Pumps +	
☐ Pump 1 --	Name Pump 1 Connection Type Smart Controller Controller Type STP-SCI Controller Address 6 Is Grouped No Tank Unleaded Inlet Height 5.00 in
☐ External Hooks +	
☐ Shutdown On Alarm +	

2. Next select which channel of the 4-20mA Module the TS-SCM transducer is connect to:

☐ SCM Containment 2	-	Name	SCM Containment 2
		Enable	Yes
		Shutdown on Alarm	Yes
		Pump	Pump 1
☐ Transducer		Connection Type	4-20mA Input Module
		Module	1
		Channel	4

3. Next select the Relay where the TS-SCM solenoid is connected to:

☐ Secondary Containment Monitoring	+		
☐ SCM Containment 1	-	Name	SCM Containment 1
		Enable	Yes
		Shutdown on Alarm	Yes
		Pump	Pump 1
☐ Transducer	»	...	...
☐ Solenoid		Relay	SCM Solenoid
☐ SCM Containment 2	-	Name	SCM Containment 2
		Enable	Yes
		Shutdown on Alarm	Yes
		Pump	Pump 1
☐ Transducer		Connection Type	4-20mA Input Modul
		Module	1
		Channel	4
☐ Solenoid		Relay	SCM Solenoid SCCM Solenoid #2

Relays are defined in the Relay section:

☐ Relays	+		
☐ SCM Solenoid	»	...	...
☐ SCCM Solenoid #2	-	Name	SCCM Solenoid #2
		Connection Type	Relay Module
		Module	1
		Channel	2
		Enabled	Yes

EVO™ 550 AND EVO™ 5000 PROGRAMMING

AC INPUT MODULE

The AC Input Module can accept incoming dispenser hook control signals. Hook signals are used to activate the STP via the relay channel connected to the pump controllers. Control signals from the dispenser tell the console which product is requested by the dispenser, then control signals activate the appropriate STP. To perform tests accordingly, the TS-SCM needs to know when pumps/dispensers are being used by other applications.

Parameter	Parameter Value
Number Gasoline Hooks per Dispenser	The number of product hook signal inputs to the console from the dispensers.
Channels	Only select the total number of inputs intended for use.
Name	Should be a specific device from which the signal is originated.
Enabled	If yes, will allow the channel to be mapped to another module. Other modules may use this signal to trigger an event.
Active State	If set to High, a high signal level will activate the channel and a low signal will deactivate the channel. If set to Low, then the channel is inverted and will only become active when a signal is absent and inactive when a signal is present.
Action	None (no response) Alarm (to activate an Alarm) Event (To trigger an event, i.e. record the event to the application)

Example: AC Input Module TS-SCM Setup

Group Name	Parameter Name	Parameter Value
AC Input Modules	Number Gasoline Hooks per Dispenser	2
Module 1	Channels	‘#’
Channel 1	Name	Disp 1 Unleaded Hook Signal
	Enabled	Yes
	Active State	High
	Action	None
Channel 2	Name	Disp 2 Unleaded Hook Signal
	Enabled	Yes
	Active State	High
	Action	None
Channel 3	Name	Disp 3 Unleaded Hook Signal
	Enabled	Yes
	Active State	High
	Action	None

4-20mA INPUT MODULE

SCM Vacuum Sensors use a single 4-20mA channel per sensor to accept an incoming signal that allows the console to monitor secondary containment vacuum levels.

Parameter	Parameter Value
Channels	The total number of channels used for TS-SCM, LLD, or other analog devices connected to the module.
Name	Should be a specific device or location where the TS-SCM Vacuum Sensor is located.
Service Type	Indicates the type of device sending the input to the console. Choose Secondary Containment Monitor to indicate that the device is a TS-SCM 4-20mA Vacuum Sensor.

Example: 4-20mA Input Module TS-SCM Setup

Group Name	Parameter Name	Parameter Value
4-20mA Input Modules		
Module 1	Channels	3
Channel 1	Name	Unleaded SCM Vacuum Sensor
	Service Type	Secondary Containment Monitor
Channel 2	Name	Premium SCM Vacuum Sensor
	Service Type	Secondary Containment Monitor
Channel 3	Name	Diesel SCM Vacuum Sensor
	Service Type	Secondary Containment Monitor

RELAY MODULE

The Relay Module contains eight separate relays (called Relay Channels). A channel is used to open and close an individual TS-SCM solenoid. For the TS-SCM, the solenoid relay channel is controlled by an input from the 4-20mA Input Module (the TS-SCM Vacuum Sensor channel).

Parameter	Parameter Value
Channels	The total number of channels used for any equipment connected to the module.
Enabled	Set to Yes.
Input Channel	Select the 4-20mA Input Module channel connected to the TS-SCM vacuum sensor on the same TS-SCM as the solenoid being programmed.
Input Type	Select the 4-20mA Input Module that contains the TS-SCM vacuum sensor on the same TS-SCM as the solenoid being programmed.
Logic	Set to OR logic.
Name	Should be a specific device or location of the TS-SCM Solenoid connected to the relay.
Number of Inputs	Set to 1.
Physically Wired As	Select Normally Open to indicate which contacts the solenoid is wired to.
Polarity	Set to Normal.
Type	Select Solenoid for type identify the type of device connected to the relay is a TS-SCM solenoid.

Example: Relay Module TS-SCM Setup

Group Name		Parameter Name	Parameter Value
Relay Modules			
Module 1		Channels	3
Channel 1		Name	Unleaded Solenoid Valve
		Enabled	Yes
		Type	Solenoid
		Polarity	Normal
		Logic	OR Logic
		Physically Wired As	Normally Open
		Number of inputs	1
Input 1		Type	4-20mA Input Module
		Channel	Unleaded SCM Vacuum Sensor
Channel 2		Name	Premium Solenoid Valve
		Enabled	Yes
		Type	Solenoid
		Polarity	Normal
		Logic	OR Logic
		Physically Wired As	Normally Open
		Number of inputs	1
Input 1		Type	4-20mA Input Module
		Channel	Premium SCM Vacuum Sensor
Channel 3		Name	Diesel Solenoid Valve
		Enabled	Yes
		Type	Solenoid
		Polarity	Normal
		Logic	OR Logic
		Physically Wired As	Normally Open
		Number of inputs	1
Input 1		Type	4-20mA Input Module
		Channel	Diesel SCM Vacuum Sensor

STP MAPPING

Example: STP Mapping

Group Name		Parameter Name	Parameter Value
Relay Modules			
	Module 1	Channels	3
	Channel 2	Name	Unleaded STP controller
		Enabled	Yes
		Type	Submersible
		Polarity	Normal
		Logic	OR Logic
		Physically Wired As	Normally Open
		Number of inputs	2
	Input 1	Type	4-20mA Input Module
		Channel	Unleaded SCM Vacuum Sensor
	Input 2	Type	AC Input Module
		Channel	Unleaded Hook Signal
	Channel 2	Name	Premium STP controller
		Enabled	Yes
		Type	Submersible
		Polarity	Normal
		Logic	OR Logic
		Physically Wired As	Normally Open
		Number of inputs	2
	Input 1	Type	4-20mA Input Module
		Channel	Premium SCM Vacuum Sensor
	Input 2	Type	AC Input Module
		Channel	Premium Hook Signal
	Channel 3	Name	Diesel STP controller
		Enabled	Yes
		Type	Submersible
		Polarity	Normal
		Logic	OR Logic
		Physically Wired As	Normally Open
		Number of inputs	2
	Input 1	Type	4-20mA Input Module
		Channel	Diesel SCM Vacuum Sensor
	Input 2	Type	AC Input Module
		Channel	Diesel Hook Signal

TURBINE PUMP INTERFACE (TPI) APPLICATIONS (ALTERNATE STP CONTROL)

TPI is an alternative to using the Relay Module to actuate an STP on demand (from a dispenser request or TS-SCM). Just as with using a relay channel, this method will provide positive pump shutdown on alarm (if that option is chosen in the setup). When using the standard TPI feature of the console to control a STP, be sure to map the TS-SCM vacuum sensor as an Input for the STP it is connected to (as shown below). This allows the TS-SCM application to actuate the STP when it is necessary to regulate the vacuum levels in the containment. (For further information, see the “ADDITIONAL DOCUMENTATION” section.)

Example: TPI Setup

Group Name		Parameter Name	Parameter Value
Power Supply			
	RS-485	Enable Interface	Yes
	TS-TPI	Enable Interface	Yes
	Controllers	Number of Controllers	3
		Controller 1	
		Name	Unleaded Controller
		Enabled	Yes
		Type	Mag/Eco
		Address	1
		Group	0
		Tank	1
		Height	5.00 in
		Number of inputs	2
		Input 1	
		Type	AC Input Module
		Channel	Unleaded Hook Signal
		Input 2	
		Type	4-20mA Input Module
		Channel	Unleaded SCM Vacuum Sensor
		Controller 2	
		Name	Premium Controller
		Enabled	Yes
		Type	Smart I
		Address	2
		Group	0
		Tank	2
		Height	5.00 in
		Number of inputs	2
		Input 1	
		Type	AC Input Module
		Channel	Premium Hook Signal
		Input 2	
		Type	4-20mA Input Module
		Channel	Premium SCM Vacuum Sensor
		Controller 3	
		Name	Diesel Controller
		Enabled	Yes
		Type	Smart III
		Address	3
		Group	0
		Tank	3
		Height	5.00 in
		Number of inputs	2
		Input 1	
		Type	AC Input Module
		Channel	Diesel Hook Signal
		Input 2	
		Type	4-20mA Input Module
		Channel	Diesel SCM Vacuum Sensor

TS-SCM APPLICATION

Programming the TS-SCM application sets the parameters for the TS-SCM and enables it to monitor a set number of channels. Each containment area or group must be programmed separately on the console.

Parameter	Parameter Value
Enabled	Set to Yes.
Name	Should be a specific location or product type of the containment area.
Number of Containments	The number of TS-SCMs connected to the console.
Pump Shutdown on Alarm	If set to Yes, provides positive pump shutdown when the containment area is in alarm.
Submersible Pump Channel	Maps the containment area to the specific pump control output channel.
Submersible Pump Module	Maps the containment area to a specific pump to provide pump on/off.
Transducer	Maps the containment area to the TS-SCM Vacuum Sensor as specified by the 4-20mA Input Module channel assignments.

Example: TS-SCM Application Setup

Group Name	Parameter Name	Parameter Value
Secondary Containment Monitor	Number of Containments	3
Containment 1	Name	Unleaded Line Containment
	Enabled	Yes
	Pump Shutdown on Alarm	Yes
	Submersible Pump Module	Relay Module (or Power Supply for TPI)
	Submersible Pump Channel	Unleaded STP Controller
	Transducer	Unleaded SCM Vacuum Sensor
Containment 2	Name	Premium Line Containment
	Enabled	Yes
	Pump Shutdown on Alarm	Yes
	Submersible Pump Module	Relay Module (or Power Supply for TPI)
	Submersible Pump Channel	Premium Pump Controller
	Transducer	Premium SCM Vacuum Sensor
Containment 3	Name	Diesel Line Containment
	Enabled	Yes
	Pump Shutdown on Alarm	Yes
	Submersible Pump Module	Relay Module (or Power Supply for TPI)
	Submersible Pump Channel	Diesel Pump Controller
	Transducer	Diesel SCM Vacuum Sensor

TS-SCM STATUS AND CONTROL SCREENS

The status of each containment channel can be viewed at any time by navigating to the TS-SCM Status or Control screens. To get to the TS-SCM Status or Control screens, go to TS-SCM>Status (Summary) or TS-SCM> Control (Containment).

TS-SCM STATUS SUMMARY SCREEN EVO™ 550 AND EVO™ 5000

Franklin Fueling Systems				SCM Status		
System	FMS	VRM	SCM	Setup	Preferences	Auto Refresh
Status	Alarms	Control	Reports			06/26/2013 14:10:50
Parameter	Containment 1		Containment 2			
	ENABLED		ENABLED			
Status	Ok		Ok			
Vacuum Level	0		0			
Fail to Reach Vacuum	⊗		⊗			
Fail to Hold Vacuum	⊗		⊗			
Vacuum Unstable	⊗		⊗			
Not Learned	⊗		⊗			
Pump Request	⊗		⊗			
Solenoid Status	⊗		⊗			
Sensor Malfunction	⊗		⊗			
High Vacuum	⊗		⊗			
Low Vacuum	⊗		⊗			
Program Error	⊗		⊗			
Pump Request Ignored	⊗		⊗			

When viewing the TS-SCM Status Summary screen, remember to enable Auto Refresh. The Auto Refresh button will allow the on-screen results to be automatically updated. When the results will update is dependent on the user-defined parameter Refresh Rate found on the Configuration page.

STATUS AND ALARM INDICATORS

Indicator	Description
Fail to Hold Vacuum	The containment will not maintain the learned level of vacuum within the learned amount of time.
Fail to Reach Vacuum	The containment has not reached the learned level of vacuum within the learned amount of time.
High Vacuum	The vacuum level of the containment has exceeded 9" Hg.
Low Vacuum	The vacuum level of the containment has dropped below 1.25" Hg.
Not Learned	The containment has not been learned.
Program Error	SCM has encountered an error.
Pump Request	SCM is attempting to cycle the pump on.
Pump Request Ignored	The pump is being used by another application.
Sensor Malfunction	SCM has detected a failure of the TS-SCM vacuum sensor.
Solenoid Status	Indicates whether the normally closed TS-SCM solenoid is open or closed.
Status	Indicates the condition of the containment.
Vacuum Level	A direct reading from the TS-SCM vacuum sensor.
Vacuum Unstable	The level of vacuum in the containment is not statistically sound.

For more information on alarms and troubleshooting, refer to the "Alarms" chapter in this manual.

TS-SCM CONTROL SCREEN EVO™ 550 AND EVO™ 5000

Franklin Fueling Systems		SCM Control
System FMS VRM SCM Setup Preferences		
Status Alarms Control Reports		
Status	Containment 1	
Vacuum Level	0	
Enabled		
Not Learned		
Solenoid On		
Alarm		
Control		
Enable/Disable		
Reset Alarm		
Reset Containment		
Solenoid On/Off		
Learn		
Start/Stop		
Learn Message	Learned	
Learn Mode Active		
Learn Mode Error		

The TS-SCM Control screen automatically updates containment information. Administrator privileges are necessary to access the TS-SCM Control screen. (For further information, see the “ADDITIONAL DOCUMENTATION” section.)

STATUS INDICATOR TABLE

Indicator	Description
Alarm	The containment is in an alarm condition.
Enabled	The containment has been enabled by the user or by the application automatically (if the Auto-Enable on Reset parameter is turned on in the TS-SCM Setup).
Not Learned	The containment has not been learned.
Solenoid On	Indicates whether the normally closed TS-SCM solenoid is open or closed.
Vacuum Level	A direct reading from the TS-SCM Vacuum Sensor.

CONTROL INDICATOR TABLE

Indicator	Description
Enable/Disable	Manually enable or disable the containment.
Reset Alarm	Manually reset an alarm on the containment.
Reset Containment	Manually reset the testing cycle of the containment.
Solenoid On/Off	Manually cycle the solenoid on or off.

LEARN INDICATOR TABLE

Indicator	Description
Learn Message	The status of the learning process.
Learn Mode Active	The containment is being learned.
Learn Mode Error	An error has been detected during the learning process.
Start/Stop	Start or stop the learning procedure.

TS-SCM STATUS AND CONTROL SUMMARY SCREEN EVO™600 AND EVO™ 6000

SCM STATUS	
SCM Containment 1	
Alarm Status	
Scm Monitoring	Off
Vacuum Status	OK
Vacuum	3.0 inHg
Solenoid Valve	Off
Pump Status	Idle
Up Test Status	Up Test Up Region
Last Up Test Result	Aug 5, 2021, 3:41:34 PM: Failed
Down Test Status	Down Test Failed To Hold Vacuum Gross Leak
Last Down Test Result	Aug 5, 2021, 3:36:20 PM: Failed
Last Passing Down Test	Aug 4, 2021, 11:55:11 AM
Last Precision Down Test Result	Aug 4, 2021, 11:55:11 AM: Passed
Last Passing Precision Down Test	Aug 4, 2021, 11:55:11 AM
Learn Status	Learning Done
	Start Monitoring
	Learn
	Reset Containment
	Reset and Clear Alarms
	Open Valve

STATUS AND ALARM INDICATORS

Indicator	Description
Alarm Status	Indicates the condition of the containment.
Scm Monitoring	Indicates if the monitoring function is running or stopped.
Scm Status	Provides detail on last SCM event.
Vacuum Status	Indicates if Vacuum is active.
Vacuum	Level of the Vacuum in inHg
Solenoid Valve	Indicates if the solenoid is off or on; (Valve closed or open)
Pump Status	Provides information on the pump that is providing the vacuum
Up Test Status	Active or Inactive state (Vacuum increases for Up test.)
Last Up Test Result	Provides date and time of last pass or fail
Last Passing Up Test	Provides date and time of last pass.
Down Test Status	Active or Inactive state (Vacuum pump is off and vacuum decreases during Down test.)
Last Down Test Result	Provides date and time of last pass or fail
Learn Status	Provides detail of the Learn mode of the containment.

NOTE: For more information on alarms and troubleshooting, refer to the "Alarms" chapter in this manual.

CONTROL INDICATOR TABLE

Indicator	Description
Start Monitoring/Stop Monitoring	This Enables or Disables the SCM Monitoring activity.
Learn	Learn containment evacuation and calibrated leak profile.
Reset Containment	Manually reset the testing cycle of the containment.
Reset and Clear Alarms	Manually reset and clear alarms on the containment.
Open Valve	Manually cycle the solenoid on or off.

LEARN INDICATOR TABLE

Indicator	Description
Inactive	Learning Not Completed yet.
Learning Up Region	Learning the UP Region when the Pump is running and drawing vacuum
Learning Down Region	Learning the DOWN Region when the Pump is off and vacuum is dissipating
Learning Done	Start or stop the learning procedure.
Learning Waiting For User to Open Leak Valve	Part of learning the DOWN Region, the user must open the leak generator

PRE-OPERATIONAL CONTAINMENT TESTING

Pre-operational containment tests determine the tightness of the entire TS-SCM system, including the TS-SCM and inter-connect tubing. These tests consist of two separate procedures: Containment Tightness Tests and STP Siphon Tests. The first procedure, Containment Tightness Testing, determines whether the containment areas chosen to be monitored are tight. The second, STP Siphon Testing, determines if the STP is capable of creating enough vacuum for proper TS-SCM operation.

The Containment Tightness Testing procedure assumes that all STP's and pump controllers have been installed, wired, calibrated, and are operational and in accordance with their respective installation and operation procedures. It also assumes that all console programming has been completed.

▲ WARNING: Do not apply vacuum or pressure until consulting the containment manufacturer on the maximum allowed vacuum or pressure levels.

▲ WARNING: Do not use equipment that is not explosion proof in classified areas. Keep vacuum pumps outside class 1, division 1, and class 2 areas. Refer to NFPA 30A, Chapter 8.

▲ WARNING: Do not proceed to the Learn Process until each containment successfully completes pre-operational testing. Failure to perform these tests or ignoring any failed tests may prevent the TS-SCM application from detecting a containment fault.

NOTE: State and/or local laws may require a separate, more stringent containment tightness test. ALWAYS verify and comply with local regulations.

NOTE: The STP connected to the TS-SCM being tested will need to be activated by lifting the appropriate product dispenser handle. Verify that all STP's and pump controllers are installed, calibrated and operational.

REQUIRED EQUIPMENT

- Vacuum Pump (or other vacuum source)
- In-line Regulator
- Shut-off / Isolation Ball Valve
- Two 0" to -30" Hg Vacuum Gauge (2" Hg max. graduation marks)
- T-Fittings (where applicable)

CONTAINMENT TIGHTNESS AND CONTINUITY TEST

Perform the following steps for each TS-SCM channel:

1. Calculate the approximate containment volume for each area. Consult the secondary containment equipment manufacturer's manuals, data sheets, or other official references.

APT SC Pipe Size	Interstitial Volume (gal/ft)	Interstitial Volume (gal/100 ft)
1.00" (XP-100-SC)	0.006	0.600
1.50" (XP-150-SC)	0.008	0.800
1.75" (XP-175-SC)	0.009	0.900
2.00" (XP-200-SC)	0.010	1.000

EN Pipe:

Pipe Size	Interstitial Volume (liter/m)	Interstitial Volume (liter/30m)
1 ½" (001-063-050-XXX-E)	0.675	20.248
2" (001-075-063-XXX-E)	0.622	18.661
3" (001-090-110-XXX-E)	1.682	50.456
4" (001-125-110-XXX-E)	0.884	26.507

UPP Pipe Size	Interstitial Volume (gal/ft)	Interstitial Volume (gal/100ft)
1 ½" (001-063-050-XXX-E)	0.054	5.435
2" (001-075-063-XXX-E)	0.050	5.009
3" (001-090-110-XXX-E)	0.135	13.542
4" (001-125-110-XXX-E)	0.071	7.114

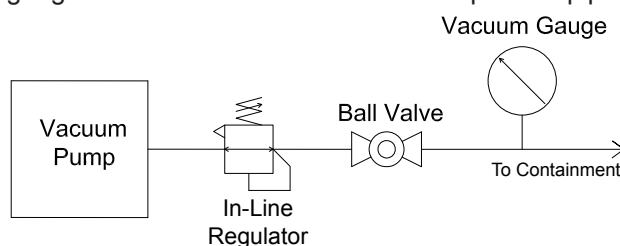
UL Pipe:

UPP Pipe Size	Interstitial Volume (liter/m)	Interstitial Volume (liter/30m)
1 ½" (001-063-050-XXXpse)	0.463	13.903
2" (001-075-063-XXXpse)	0.322	9.668
3" (001-090-110-XXXpse)	1.037	31.112
4" (001-125-110-XXXpse)	0.437	13.106

UPP Pipe Size	Interstitial Volume (gal/ft)	Interstitial Volume (gal/100ft)
1 ½" (001-063-050-XXXpse)	0.037	3.731
2" (001-075-063-XXXpse)	0.026	2.595
3" (001-090-110-XXXpse)	0.084	8.350
4" (001-125-110-XXXpse)	0.035	3.518

2. Vacuum Gauge Installation

- For Individual DW Turbine and Tank Sump Containments, connect the vacuum gauge as shown below.
- For SC Pipe and Multiple Jumpered Containments, in addition to the setup shown below, connect a vacuum gauge to the end of the last interstitial space or pipe test boot.



- Install a vacuum gauge, regulator and isolation / shut-off ball valve in-line, onto the vacuum pump. With the ball valve closed, power on the vacuum pump. Adjust the regulator to 6.5–7" Hg maximum. Power the vacuum pump off.
- Remove the plug in the leak generator port on the TS-SCM. Connect the vacuum pump to this port.
- Power the vacuum pump on. Open the isolation ball valve slowly to evacuate the containment area to 6" Hg. Close the isolation ball valve:
 - If the vacuum level does not increase after 30 seconds while the vacuum pump is running, inspect each component for leaks. Large containments may take up to 10 minutes.
 - If the gauge drops below 6" Hg immediately after closing the valve then steadies before zero. Slowly open the isolation ball valve again to evacuate the containment to 6" Hg. Repeat as necessary until containment remains at 6" Hg and close the isolation ball valve.
 - If the gauge immediately drops to zero. This indicates that a leak exists. All leaks must be identified and repaired before continuing this test.

NOTE: Vacuum leaks can be identified by pressurizing the containment area per the manufacturer's specified levels, then spraying a solution of water and liquid soap on connections and fittings. Consistent bubbling on soaped connections/fittings will give a visual indication of the source of a leak. Consult the manufacturer's documentation for appropriate pressure levels.

- Once a stable vacuum level is reached (4.5–7" Hg on the vacuum gauge in-line with the vacuum pump), record the level. Use the table to the right to determine the required wait time. The containment vacuum level should remain stable throughout the entire wait time; the vacuum pump may be shut off at this point.

If the vacuum level drops more than 1" Hg during the required wait time, then the containment failed the test. All leaks must be identified and repaired first, then the Containment Tightness Test should be repeated until it successfully completes.

Containment Volume (Gal)	Wait Time
0.25–5	15 min
5–50	30 min
50–100	60 min
100–250	2 hr
250–500	4 hr

- If a vacuum gauge has been installed at the end of the system, compare the gauge reading with the console. If the measurements are not within ± 2 " Hg, a blockage may exist within the containment and/or between the TS-SCM and vacuum gauge. All blockages must be identified and corrected. Once the blockage is corrected, restart the Containment Tightness Test.
- Uninstall the vacuum pump, regulator, isolation / shut-off valve and vacuum gauges at this time. Continue on to the STP Vacuum Test in the next section. Do not replace the Leak Generator Port Plug.

STP SIPHON FLOW RATE TEST

▲ WARNING: Failure to open the leak generator (TS-SCMCAL) during this test can apply an excessive vacuum level to the containment, causing irreversible damage. Ensure that the leak generator is installed properly and that the toggle switch is in the Open position prior to energizing the STP.

NOTE: If during this procedure the containment reaches 9" Hg, which will cause the console to display a High Vacuum alarm and disable the containment. High Vacuum will shut down the STP even if Pump Shutdown on Alarm is not chosen in the options. A disabled containment will not allow the STP to be activated. Navigate to the TS-SCM Control screen, press Reset Alarm to continue.

- Install a vacuum gauge and the vacuum leak generating device (TS-SCMCAL) into the leak generator (LG) port on the TS-SCM using necessary fittings. Switch the toggle valve to the *DOWN* (open) position.
- At the console, navigate to the TS-SCM Control Menu. Press the Solenoid button activate (open) the solenoid.
- Activate the STP by lifting the appropriate dispenser handle.
- With the STP on and toggle valve open, the vacuum level must be able to reach at least 6.5" Hg. Verify vacuum levels at the gauge connected to the containment area.

Large Containments (>50 gal.) may take several minutes. For large containments, close the leak generator until the vacuum level reaches approximately 6" Hg. Open the leak generator. Allow the vacuum to build. The vacuum level must be able to reach at least 6.5" Hg, but, if the vacuum is not able to reach at least 6.5" Hg, then the STP siphon assembly must be repaired or replaced.
- Once the vacuum level is verified above 6.5" Hg, return the hook signal to turn off the STP.
- At the console (LCD or TSA), navigate to the TS-SCM Control Menu. Press the Solenoid button to deactivate (close) the solenoid.
- Allow the vacuum to decay to 0" Hg.

NOTE: If you are going to do to the Learn Process next, you can leave the TS-SCMCAL installed.

SECONDARY CONTAINMENT MONITORING APPLICATION

Programming the TS-SCM application sets the parameters for TS-SCM and enables it to monitor a set number of channels. Each containment area or group must be programmed separately on the console.

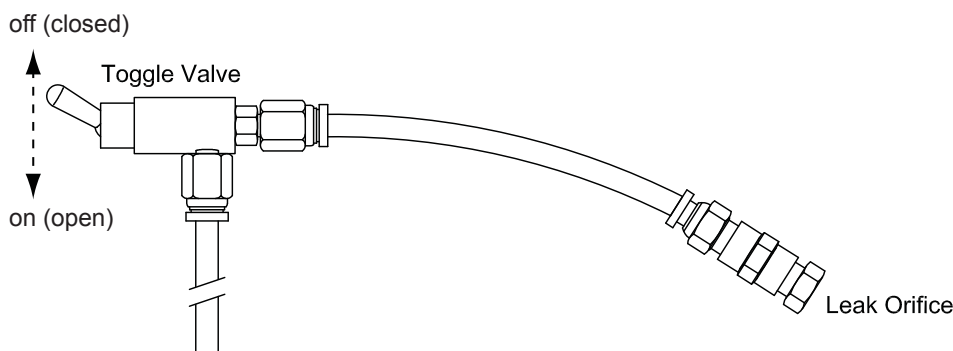
Parameter	Parameter Value
Enabled	Set to Yes.
Name	Should be a specific location or product type of the containment area.
Number of Containments	The number of TS-SCMs connected to the console.
Pump Shutdown on Alarm	If set to Yes, provides positive pump shutdown when the containment area is in alarm.
Submersible Pump Channel	Maps the containment area to the specific pump control output channel.
Submersible Pump Module	Maps the containment area to a specific pump to provide pump on/off.
Transducer	Maps the containment area to the TS-SCM Vacuum Sensor as specified by the 4-20mA Input Module channel assignments.

Example: TS-SCM Application Setup:

Group Name	Parameter Name	Parameter Value
Secondary Containment Monitor	Number of Containments	3
Containment 1	Name	Unleaded Line Containment
	Enabled	Yes
	Pump Shutdown on Alarm	Yes
	Submersible Pump Module	Relay Module (or Power Supply for TPI)
	Submersible Pump Channel	Unleaded STP Controller
	Transducer	Unleaded TS-SCM Vacuum Sensor
Containment 2	Name	Premium Line Containment
	Enabled	Yes
	Pump Shutdown on Alarm	Yes
	Submersible Pump Module	Relay Module (or Power Supply for TPI)
	Submersible Pump Channel	Premium Pump Controller
	Transducer	Premium TS-SCM Vacuum Sensor
Containment 3	Name	Diesel Line Containment
	Enabled	Yes
	Pump Shutdown on Alarm	Yes
	Submersible Pump Module	Relay Module (or Power Supply for TPI)
	Submersible Pump Channel	Diesel Pump Controller
	Transducer	Diesel TS-SCM Vacuum Sensor

LEARN PROCESS

Each containment area must be Learned before the TS-SCM system can continuously monitor it. Learning involves evacuating the containment area, then introducing a calibrated leak using the Leak Generator Kit (TS-SCMCAL) shown below. The system learns what the evacuation and decay curves look like by employing this process. The system then uses the curves it has learned to determine if there is a leak while it monitors the containment area.



NOTES:

- All console programming must be completed prior to the learn process. Refer to the TS-SCM Setup (Console Programming) chapter in this manual for details. Administrator privileges are necessary to Learn containments. (For further information, see the "ADDITIONAL DOCUMENTATION" section.)
- Complete the Pre-Operation Containment Testing chapter prior to starting the Learn Process.
- No dispensing can take place during the Learn Process. If product is dispensed while Learning, stop the process by pressing the Reset button. Always restart the Learn Process from the beginning.
- Do not submerge or block the TS-SCMCAL orifice while learning the containment. The orifice must be kept free of dirt and debris.

WHEN TO LEARN/RE-LEARN

- SCM installation and start-up
- After repairs or modifications to containment areas
- After repairs or modifications that may affect the siphon flow rate
- After 4-20mA Input Module replacement
- After certain 4-20mA Input Module firmware upgrades (consult FFS Technical Services Department)
- If moving the TS-SCM to another 4-20mA channel
- When adding or removing volume from a containment

PROCEDURE

1. The TS-SCM leak generator port is plugged for normal operation, but may have been removed for pre-operational testing. If the leak generator port is plugged, remove the plug.
2. Install a TS-SCMCAL at the leak generator port on the TS-SCM; the TS-SCMCAL may remain installed from the "Pre-Operational Containment Testing" chapter.
3. Switch the toggle valve to the Up (closed) position.
4. At the console, navigate to the TS-SCM Control screen. Verify that the console is indicating less than 0.2" Hg before the containment is Learned. If the vacuum level is above 0.2" Hg, open the toggle valve to equalize containment vacuum to 0" Hg. Close the toggle valve when the containment is below 0.2" Hg.

5. Press/Click the Learn button. TS-SCM will activate the pump and open the solenoid valve. The vacuum level of the containment should rise and the Learn Message should display Learning Evacuation Curve. When the vacuum reaches 6" Hg, the solenoid will close and the STP will turn off. The solenoid may cycle on and off during evacuation, which is part of its normal operation during this procedure.
6. When the message Open Leak Toggle Valve appears, switch the toggle valve to the DOWN (open) position. TS-SCM will learn the vacuum decay curve and display Learning Decay Curve on-screen. The vacuum level will begin to fall.
7. When finished, the message "Learn Completed – No Errors" is displayed on-screen and the Not Learned indicator will become inactive.
NOTE: If any errors are encountered at any time during the Learn Process, the screen will display the appropriate error message and the Not Learned indicator will be active. Refer to the Alarms chapter of this guide for information on troubleshooting any errors that are displayed.
8. Once the containment has been successfully learned, enable the containment on the TS-SCM Control screen with the leak generator open. The console will automatically begin a test on the containment. This test should fail, forcing the containment into alarm status.
9. Close the leak generator. To clear the alarm, navigate to the Containment Control screen and choose Reset Alarm. The containment will be automatically enabled after resetting the alarm condition and will automatically begin a test on the containment. This test should pass, allowing TS-SCM to continue to monitor the containment. If this test fails, isolate why the test failed, make necessary repairs, and then retry the test.
10. Remove the leak generator and replace the leak generator plug. Apply sealant to the threads of the plug, then tighten the plug. If alarms or errors occur, refer to the "Alarms" chapter of this guide. When the condition is corrected, restart the learn process.

LEARN MESSAGES

Message	Description
Existing Vacuum Detected	The Learn Process was started with .5" Hg or more existing in the containment. The Learn Process needs to be restarted at 0" Hg.
Learned	The containment has been Learned with no errors.
Learning Decay Curve	Displayed during the Learn Process to indicate that the calibrated leak decay curve is being recorded.
Learning Evacuation	During the Learn Process, TS-SCM is recording the time and vacuum levels while evacuating the containment.
Failed to Reach Target Vacuum Time Limit Exceeded Pre-Existing Leak	A vacuum leak is present when the leak generator should not be open.
No Leak Detected	Vacuum level is constant or has risen while Learning the decay curve.
No Leak Detected Time Limit Exceed	The leak valve was opened when prompted, but the leak valve was closed before the Learn Process was completed. Restart the Learn Process and open the leak valve when prompted. Close the leak valve after the Learn Process has completed.
Not Learned	The containment has been programmed, but the containment has never been Learned. Refer to the TS-SCM Learn Process section to Learn the containment. Follow all Warnings, Cautions, and Notes prior to Learning the containment.
Open Leak Valve	This is a required step during the Learn Process. When shown, open the leak generator.
Pump Request Ignored	SCM sent a request to start the STP, but the vacuum did not increase. The STP may be used or disabled by other applications.
Sensor Malfunction	This message is displayed if the containment is enabled in the setup, and the sensor was disconnected. Verify sensor wiring. When this alarm occurs, the system also has a high vacuum level reading. 17-19" Hg.
Exceed Time Limit to Reach Target Vacuum	Evacuation learning time exceeded the limit.
Time Out for Leak Valve Not Opened	The leak valve is not open during the Learn Process. Restart the Learn Process and open the leak valve when prompted to by the console.

SCM REPORTS

SCM reports are available on demand from the console locally or remotely (with TSA). Several report options may be used to print or save generated reports. (For further information, see the “ADDITIONAL DOCUMENTATION” section.)

SCM ALARM REPORTS

SCM Alarm Reports include any TS-SCM alarms or application events that occurred within the date range chosen by the user. An example of an TS-SCM Alarm History Report can be found below.

Last 30 Days					27-Feb-07 16:00:05
SCM Alarm History Report					
Device	Description	Type	Date Occurred	Date Cleared	
Containment 1	Vacuum Pressure Sensor Failed/Not Connected	Warning	23-Feb-07 17:47:02		
Containment 1	Not Learned	Warning	23-Feb-07 17:47:02		

APPLICATION EVENT REPORTS

Application Event Reports include any system warning pertaining to TS-SCM equipment that occurred within the date range chosen by the user.

 **Franklin Fueling Systems**

SCM Reports

TS-550 

Generate

System FMS SCM Setup

Status Alarms Control Reports

06/28/2013 09:03:48

Available Reports

☒ Alarm History ☒ Alarm ☒ Warning ☒ Failure

☐ Application Event History

Date Range

☐ Last 1 Day(s)

☐ Today

☒ Last 30 Days

☐ Month June Year 2013

☐ Year 2013

☐ Last Available

SCM REPORTS

SCM reports are available on demand from the console locally or remotely (with TSA). Several report options may be used to print or save generated reports. (For further information, see the “ADDITIONAL DOCUMENTATION” section.)

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APPLICATION EVENT REPORTS

Application Event Reports include any system warning pertaining to TS-SCM equipment that occurred within the date range chosen by the user.

Franklin Fueling Systems SCM Reports TS-550

System FMS SCM Setup Generate

Status Alarms Control Reports 06/28/2013 09:03:48

Available Reports

☒ Alarm History ☒ Alarm ☒ Warning ☒ Failure

☐ Application Event History

Date Range

☐ Last 1 Day(s)

☐ Today

☒ Last 30 Days

☐ Month: June Year: 2013

☐ Year: 2013

☐ Last Available

ALARMS

When a console is in alarm, the Alarm LED on the front of the console will flash. If TS-SCM has been programmed to shut down the pump on alarm (in the TS-SCM Setup), the pump will be unavailable for all system tests and dispensing until the containment with the active alarm is manually Reset. If the condition still exists after reset, the alarm will return. A service visit may be required to identify and correct the condition.

⚠ WARNING: Always REMOVE POWER from the console prior to installing/removing a module or performing any maintenance while the console door is open.

NOTE: Refer to the Important Safety Messages outlined in the beginning of this manual before performing any console maintenance.

NOTE: If at any time while troubleshooting a Warning or Alarm this guide is not able to help you correct the issue, please contact FFS Technical Services.

SCM ALARMS AND WARNINGS

To troubleshoot your alarm or warning, identify the Alarm/Warning display on the console in the table below and review the solution presented in the Error Code Table that follows.

Alarm/Warning	Possible Error Codes
Channel Not Learned	G
Failed to Hold Vacuum	A, B, H
Failed to Reach Target Vacuum	A, B, C, D, F
Low Vacuum	A, B, C, D, F
Low Vacuum and Pump Request Ignored	A, B, F, G
Not Configured	G
Not Learned	G
Program Error Detected	Check TS-SCM Programming
Pump Request Ignored	F
Unstable Vacuum	B, D, C
Vacuum Sensor Failure	E
Vacuum Sensor Failure / Not Connected	E
Vacuum Too High	B, G

Error Code	Error	Solution
A	Containment Tightness	Refer to the Containment Tightness Testing section of this guide and perform the tests in that section to ensure that there are no leaks and that the tank is tight.
B	Thermal Contraction	Caused by temperature variations of the air (or liquid if present) in the containment.
C	Liquid in Containment	This will decrease the containment size. If liquid is drawn through the containment, through the STP siphon, various parameters and containment vacuum readings will be incorrect. Containments should remain free of liquid at all times.
D	Siphon Function Check	The siphon must be able to pull a vacuum of 8" Hg or more if connected to other equipment. The vacuum also must have a minimum flow rate of 146 L/Hr. Perform a STP Siphon Flow Rate Test as illustrated in the Pre-Operational Containment Testing chapter.
E	SCM Vacuum Sensor Function Check	The transducer is sending incorrect data or no data to the console. Verify wiring from the transducer to the console. If wiring is correct, setup and program the transducer on a different, unused channel for testing.
F	STP Function Check	Use the dispenser to signal the STP when the dispenser is authorized then the STP should run. Also, TS-SCM must be able to signal the STP pump on. Force a test on the containment using the TS-SCM Control screen. The STP will start only if necessary to evacuate the containment. If the STP does not run to evacuate the containment, verify programming.
G	Verify Programming	Refer to the TS-SCM Setup chapter of this guide for all TS-SCM related programming information.
H	SCM Vacuum Relief Valve Function Check	The mechanical vacuum relief valve is designed to open when containment vacuum levels reach or exceed 10" Hg. If at any time the containment vacuum level exceeds 10" Hg while the pump is on, this error will occur as an indication of a relief valve failure.

CLEARING ALARMS

Clearing a console of alarms is important because, depending on how the console has been set up, alarms can: disable channels, start an annunciator, or stop an TS-SCM test under way.

Administrator privileges will be necessary to clear TS-SCM alarms on the console. For instructions on how to obtain an Administrator access level, see the list of programming manuals in the "ADDITIONAL DOCUMENTATION" section.

1. Identify the alarm on the TS-SCM Alarms screen.
2. Diagnose the condition using information found in the Alarms chapter of this guide.
3. Follow the troubleshooting steps in the previous section of this chapter to correct the issues indicated by the alarms.
4. Navigate to the TS-SCM Control screen.
5. Select Reset Alarms on the Control screen.

NOTE: If the condition still exists, the alarm can take up to several hours to reappear after the containment is enabled.

ENABLING/DISABLING TS-SCM

After learning the channel(s), each channel will need to be enabled to allow containments to be monitored. The Containment Status reflects the current status of the channel.

ENABLING TS-SCM CHANNELS

At the console (LCD or TSA), navigate to the TS-SCM Control screen. Press the Enable/Disable button to enable the channel.

Only while the channel is enabled will that channel continuously monitor and test vacuum levels by activating the STP as necessary. Normal TS-SCM operating vacuum level is between 2" Hg and 5" Hg. During vacuum recharge periods, it is normal for the vacuum levels to reach 6" Hg.

NOTE: A channel will not enable properly if it is not learned, in an alarm status, or if an error condition exists (such as a sensor malfunction). An alarm must be reset to enable a TS-SCM channel.

DISABLING TS-SCM CHANNELS

At the console (LCD or TSA), navigate to the TS-SCM Control screen. Press the Enable/Disable button to disable the channel.

IMPORTANT: While the channel is Disabled, TS-SCM will neither maintain nor test containment vacuum levels.

Disabling the channel will force the console to display a Containment Not Enabled warning. This warning will also appear on the TS-SCM History Report. The channel may be re-Enabled at any time.

NOTE: If alarms or errors occur, please refer to the "Alarms" chapter of this guide.

SCM ANNUAL FUNCTIONAL TESTING

Perform a TS-SCM Functional Test annually. This test will verify that the TS-SCM application will detect and alarm on a leak condition. This test should be performed during times when there is no dispensing.

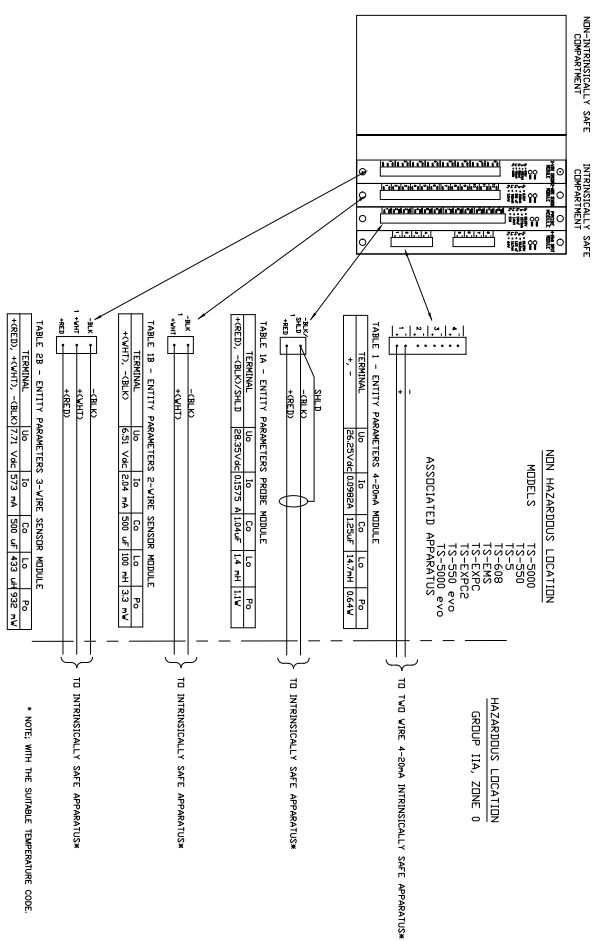
1. If the channel is Enabled, disable the channel. At the console (via LCD or TSA), navigate to the TS-SCM Control screen. Press the **Enable/Disable** button to disable the channel.
2. Remove the plug in the Leak Generator (LG) port on the TS-SCM. Connect the TS-SCMCAL (Leak Generator Kit) to this port.
3. Switch the toggle valve to the DN (closed) position.
4. Enable the channel. Wait for the containment vacuum levels to reach normal operating levels.
5. Switch the toggle valve to the *UP* (open) position.
6. The vacuum levels will then fall, which could take several minutes for large containments. Verify that the console displays an alarm.
7. The channel will be disabled by the TS-SCM application. Remove the TS-SCMCAL. Apply TFP tape sealant to the threads of the Leak Generator Port Plug. Replace and tighten the plug.
8. At the console (via LCD or TSA), navigate to the TS-SCM Control screen. Press the **Reset Alarm** button to enable the channel, then press the **Enable/Disable** button to enable the channel. Resume normal operation.
9. If the TS-SCM Annual Functional Test passed, please skip this step. If the system did not catch the leak and the test failed, disable the channel and run the pre-operational tests. Perform the annual test again. If the channel still fails to detect the leak, please contact FFS.

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NOTES:

1. THE MODEL TS-5000, 590, 5, 608, TS-EXS, TS-EXPC, AND TS-EXPC2 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 MINIMUM DISTANCE BETWEEN GROUND TERMINALS AND EARTH GROUND SHALL BE LESS THAN 1 OHM.
3. CAPACITANCE AND INDUCTANCE OF THE FIELD WIRING FROM THE INTRINSICALLY SAFE EQUIPMENT TO THE BARRIER SHALL BE CALCULATED AND MUST BE INCLUDED IN THE SYSTEM CALCULATIONS AS SHOWN IN TABLE 1, 1A, 1B, AND 1C. THE CAPACITANCE (C) MUST BE LESS THAN THE MARKED CAPACITANCE(C) SHOWN ON ANY BARRIER USED. THE SAME APPLIES FOR INDUCTANCE (L) Lc AND Lp, RESPECTIVELY, WHERE THE SAME APPLIES FOR INDUCTANCE PER FOOT C=60pF/ft(200pF/m), Lc=0.2uH/ft (0.7uH/m), BE USED.
4. WIRING, CARLING AND STALS MUST BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE NATIONAL OR LOCAL CODES.
5. SEE INSTALLATION MANUAL FOR MORE DETAIL.
6. THE ENTRY CONCEPT ALLOWS THE USER TO IDENTIFY ACCEPTABLE COMBINATIONS OF INTRINSICALLY SAFE APPARATUS AND ASSOCIATED APPARATUS SEPARATELY BY AT EX NOTIFIED BODY AND ASSIGNED A SET OF PARAMETERS CALLED ENTRY PARAMETERS. THE ENTRY PARAMETERS FOR TS-5000, 590, 5, 608, TS-EXS, TS-EXPC, AND TS-EXPC2 (ASSOCIATED APPARATUS) CAN BE FOUND IN THE ENTRY PARAMETERS TABLES. THE ENTRY PARAMETERS TO R 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:
 $U_o \leq U_i$
 $U_o \leq U_i$
 $C_o \leq C_i + C_{cable}$ (SEE NOTE 4)
 $L_o \leq L_i + L_{cable}$ (SEE NOTE 4)
7. THE OUTPUT CURRENT OF THIS ASSOCIATED APPARATUS IS LIMITED BY A RESISTOR SUCH THAT THE OUTPUT VOLTAGE-CURRENT PLLOT IS A STRAIGHT LINE DRAIN BETWEEN OPEN-CIRCUIT VOLTAGE AND SHORT-CIRCUIT CURRENT.
8. ASSOCIATED APPARATUS MUST BE INSTALLED IN AN ENCLOSURE SUITABLE FOR THE APPLICATION IN ACCORDANCE WITH THE NATIONAL AND LOCAL CODES, AS APPLICABLE.
9. INTRINSICALLY SAFE CIRCUITS MUST BE WIRED AND SEPARATED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES, AS APPLICABLE.
10. THIS ASSOCIATED APPARATUS HAS NOT BEEN EVALUATED FOR USE IN COMBINATION WITH ANOTHER ASSOCIATED APPARATUS.
11. DEVICE MUST BE USED AND OPERATED WITHIN AN AMBIENT RANGE OF 0°C TO 40°C.
12. OPENINGS (GROTS) MUST BE PROVIDED WITH A MODULE, PLACE-HOLDING COVER, OR THE PARTITION, WHICH MUST BE FIRMLY SECURED IN PLACE.
13. THE PARTITION MUST BE INSTALLED BETWEEN THE INTRINSICALLY SAFE MODULES AND ALL OTHER MODULES.
14. DURING INSTALLATION, EXTRA CARE MUST BE TAKEN TO ENSURE INTRINSICALLY SAFE FIELD WIRING IS PROPERLY ROUTED AND SECURED, AS NECESSARY, SO AS TO NOT BE DAMAGED WHEN THE COVER IS CLOSED.



- NOTES:

1. THE MODEL EV00000, EV000000, TS EX-9C, AND TS EX-9C2 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. CAPACITANCE AND INDUCTANCE OF THE FIELD WIRING FROM THE INTRINSICALLY SAFE EQUIPMENT TO THE BARRIER SHALL BE CALCULATED AND MUST BE INDICATED ON THE EXTERNAL CONNECTIONS AS SHOWN IN FIGS. 14, 15, AND 16. THE CAPACITANCE AND INDUCTANCE OF THE CABLE CAPACITANCE AND INDUCTANCE SHALL BE INDICATED ON THE MARKED CAPACITANCE/INDUCTANCE SHOWN ON ANY BARRIER USED. THE SAME APPLIES FOR INDUCTANCE ILL AND INDUCTANCE/RESISTANCE, WHERE THE CABLE CAPACITANCE AND INDUCTANCE PER FOOT ARE NOT KNOWN, THE FOLLOWING VALUES SHALL BE USED:
Cable capacitance (pF/ft) = 4200
Cable inductance (uH/ft) = 0.00012
Coil capacitance (pF) = 100
Coil inductance (uH) = 0.00012
Cable and coil values must be installed in accordance with the applicable national or local codes.
5. SEE INSTALLATION MANUAL FOR MORE DETAIL.



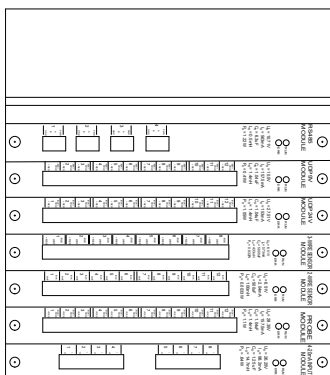
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[Ex ia Ga] IIA
DENKO 05 ATEX 0430464X
IECEx UL 05.0013X

17. ALL OF THE ABOVE INFORMATION CAN BE COMBINED INTO A CONTROL PROGRAM WITH OTHER CERTIFICATION OR IN THE INSTALLATION IN ANY CASE, ALL INFORMATION ON THIS DRAWING MUST BE SHIPPED WITH EACH PRODUCT.
18. SPECIAL CONDITIONS FOR SAFE USE ARE AS FOLLOWS:
1. THE OPERATING TEMPERATURE RANGE OF THE DEVICE MUST BE USED AND OPERATED WITHIN AN AMBIENT TEMPERATURE RANGE OF 0°C TO 40°C.
2. THE PARTITION MUST BE PROVIDED WITH A MOBILE, PLACE-HOLDING COVER, OR THE PARTITION WHICH IS NOT USED FOR THE PARTITION MUST BE COVERED BY A MOBILE, PLACE-HOLDING COVER.
3. THE PARTITION MUST BE INSTALLED BETWEEN THE INTRINSICALLY SAFE MODULES AND ALL OTHER MODULES.
4. DURING INSTALLATION EXTRA CARE MUST BE TAKEN TO ENSURE INTRINSICALLY SAFE FIELD WIRING IS PROPERLY RATED AS NECESSARY, SO AS TO NOT BE DAMAGED WHEN THE COVER IS CLOSED.
19. THE ASSOCIATED APPARATUS MAY ALSO BE CONNECTED TO SIMILAR APPARATUS AS DEFINED IN ARTICLE 904.2 AND INSTALLED AND TEMPERATURE CLASSIFIED IN ACCORDANCE WITH ARTICLE 904.10(B) OF THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70), OR OTHER LOCAL CODES, AS APPLICABLE.

NON-INTRINSICALLY SAFE
COMPARTMENT

INTRINSICALLY SAFE
COMPARTMENT



NON HAZARDOUS LOCATION

MODELS: EV0000, EV00000, 1S-EXP-0
TS-EXP2

ASSOCIATED APPARATUS

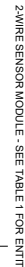
4-20mA MODULE - SEE TABLE 1 FOR ENTITY PARAMETERS



PROBE MODULE, UDP9V MODULE, UDP24V MODULE

-SEE TABLE 1 FOR ENTITY PARAMETERS

SHLD



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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S-485 MODULE - SEE TABLE 1 FOR ENTITY PARAMETER



ON*

TABLE 1 - ENTITY PARAMETERS INTRINSICALLY SAFE MODULE

MODULE NAME	TEMPERATURE	Li	Co	Po
4.20MA MODULE	+(-)	Up	98.2 mV	10.6 mV
PROBE MODULE	+(-)RED, -BLACK/SHD	28.35 mV	1.25 mV	1.1 V
UPDR 2MA MODULE	+(-)RED, -BLACK/SHD	27.51 mV	1.04 mV	1.05 V
UPDR MODULE	+(-)RED, -BLACK/SHD	10.5 mV	1.04 mV	1.04 V
2-AMPERE SENSOR MODULE	+(-)H/L, -BLK	16.3 mV	196 mV	1.04 mV
2-AMPERE SENSOR MODULE	+(-)H/L, -BLK	16.3 mV	100 mV	1.04 V
3-AMPERE SENSOR MODULE	+(-)RED, -10W/L, -BLK	7.71 mV	500 mV	0.0033 V
3-AMPERE SENSOR MODULE	+(-)RED, -10W/L, -BLK	7.71 mV	433 mV	0.02 V
3-AMPERE SENSOR MODULE	(PWR/L, BLK, GND)	10.71 mV	565 mV	1.22 V
3-AMPERE SENSOR MODULE	(PWR/L, BLK, GND)	10.71 mV	6.3 mV	0.98 V

* NOTE: WITH THE SUITABLE TEMPERATURE CODE.

MODEL	012	MODIFIED	FALSE	STATE
DRAWING	2.7	MODIFIED	FALSE	
REVISION	EN	DESCRIPTION	ZONE	INITIALS DATE
2	-	SEE SHEET 1	-	-

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