

Fuel Management System

Operator's Guide

TS-550 evo and TS-5000 evo



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Inspection of Materials

Visually inspect all components for defects or damage prior to installation. If any defect or damage is found, do not use the product and contact FFS for further assistance.

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FFS will not accept shipments of returned products without a Return Material Authorization (RMA) number. RMA's are obtained by contacting FFS's Technical Service division — NO RMA's will be given without the unit's serial number(s). Returned material remains the property of the buyer until replaced or repaired.

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Important Safety Messages

Franklin Fueling Systems (FFS) 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.



Alarms and warnings are designed to alert you with specific details when a problem occurs so you can take appropriate corrective action.

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 Fuel Management 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  You must run wiring from probes or sensors to the Fuel Management console in conduits which are 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.

Certified Programmer/Service Person: Only a Franklin Fueling Systems certified programmer or service person is allowed to access both the user interface keypad and areas internal to the Fuel Management System console.

Station Owner/Operator: The station owner or operator of the Fuel Management System console is only allowed to access the user interface keypad. Access to areas internal to the console is strictly prohibited.

Approvals

All Fuel Management System models are UL and cUL listed 6L79 as Liquid Level Gauge / Leak Detection Systems. Third party approved leak detection — Pd (probability of detection) = 99.2 % for 0.1 or 0.2 GPH leak tests (0.1 = annual precision test, 0.2 is the monthly regulatory compliance test).

*The static tank test does not support Manifolded tanks.

**SCALD is 3rd party approved for ONLY two Manifolded tanks.

Related Documentation

The system installation and programming instructions are provided for your use in separate documents. Detailed installation and testing instructions for each type of leak detection sensor are present in the relevant manual, and, likewise, the installation, testing and programming of various upgrade kits and optional accessories are also contained in separate manuals, addenda or in one of this document's appendices.

TS-550/5000evo Series Fuel Management Systems Installation Guide (000-2170)

TS-550/5000evo Series Fuel Management Systems Programming Manual (000-2173)

Manuals can be found on-line at: <http://www.franklinfueling.com/service/docs.asp>

Introduction

The purpose of this manual is to guide installers, operators and technicians through the operation of a TS-550evo and TS-5000evo console. The TS-550/5000evo console incorporates the monitoring and alarm capabilities of preceding automatic tank gauges with advanced technologies to supply tank and level data more accurately and efficiently. This manual is also designed to introduce technicians to the optional LCD Graphical User Interface, which is used as an input device to program system configuration and maintain all applications from the front panel of the console. Overall safety issues, troubleshooting information, start-up procedures, warranty, service and return policies, as defined in this manual, must be followed.

The TS-550/5000evo Fuel Management System consists of an open architecture, modular console that can run multiple Fuel Management Applications simultaneously. It typically contains a color LCD touch screen user interface and a built-in printer, but it can also be operated by a web-based remote interface. Magnetostrictive Liquid Level Probes inside of the tanks provide the console with inventory and leak detection information. A variety of optional sensors can be used to monitor containment spaces. TS-550/5000evo series consoles combine the power and flexibility of computer-based open architecture with a high speed modular bus design.

Definitions and Acronyms

AST – Aboveground Storage Tank

Console – The enclosure that houses the Modules.

DHI – Dispenser Hook Isolation

DW/DWT – Double Wall/Double Wall Tank

FAST – Franklin Auto Setup Tool

FMS – Fuel Management Systems

IS – Intrinsically Safe

LCD – Liquid Crystal Display

LON – Echelon Communication Module

LLD – Line Leak Detection

Module – A plug-in card within a T5 series console that is used to perform various functions for a console. Modules are used for field wiring the input and/or output of electrical signals between different functional equipment pieces.

NWGLDE – The National Work Group Leak Detection Evaluations

OTB – One Touch Button

QTB – Quick Jump Button

PC – Personal Computer

RS-232 – An EIA standard for serial communication using either a 9 or 25-pin connector or adapter.

RS-485 – An EIA standard for serial communication.

RTD – Resistance Temperature Detector

RJ-45 – An EIA standard connector for use in communications with an eight conductor cable. Usually used in data transmission applications.

RJ-11 – An EIA standard connector for use in communications using STP wiring. Usually used in voice and fax applications.

STP – Submersible Turbine Pump

TS-ACI – 12 input, AC Input Module

TS-DIMIB – Dispenser Interface Module

TS-2WSNS – 12 input, 2-Wire Sensor Module (Intrinsically Safe)

TS-3WSNS – 8 input, 3-Wire Sensor Module (Intrinsically Safe)

TS-420IB – 4-20mA Analog Input Module (Intrinsically Safe)

TS-RLY – Relay Module

TSSP-CM – Controller Module

TS-PRB – Probe Module (Intrinsically Safe)

TSSP-PS – Power Supply Module

TPI – Turbine Pump Interface

TS-EMS – Environmental Monitoring System

TS-EXPC – Expansion Console

USB – Universal Serial Bus

UST – Underground Storage Tank

XML – eXtensible Markup Language

Applications

Applications are programs designed to function as a platform for specific Inputs/Outputs. There are three different applications available to the TS-550/TS-5000 evo console.

These are: **System**, **FMS** and **SCM**

System:

This application is standard on all systems and monitors the console's operational status and manages software options and upgrades. All preferences and configuration settings are controlled by this application (e.g., display options, clock and calendar). The system application is standard on every console.

Fuel Management System (FMS):

The Fuel Management System application provides inventory management and leak detection for tanks, lines and sensors as well as tank, line and sensor control. This application also allows users to print reports, tank tests and line tests.

A broad range of liquid products can be leak-tested and inventory-monitored using Magnetostrictive LL2 probes. These probes come in a variety of lengths and typically contain two floats for indicating both product and water levels inside the of tank. Programmable limits can be set to indicate high and low conditions.

Containment sumps, interstitial spaces, monitoring wells and other areas can be monitored for water and hydrocarbon intrusion using a wide range of optional Standard and BriteSensors. These sensors come in 2-wire (non-discriminating) and 3-wire (typically discriminating) versions. These models are listed below and can be used in any combination depending on site specifications.

Secondary Containment Monitoring (SCM):

Secondary Containment Monitoring 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.

SCM is a software option that can be added to the TS-550/5000 evo. The Secondary Containment Control Module (SCCM) consists of a vacuum sensor, solenoid valve, mechanical bypass valve, and vacuum manifold. SCM uses the STP siphon port vacuum to evacuate the containment space and AutoLearn® technology to determine the characteristics of each secondary containment area that is monitored. The SCCM unit comes in two models.

Standard Sensors

Standard sensors do not discriminate between liquid and hydrocarbons and are typically 2-wire sensors.

TSP-EIS – Electro-optic Interstitial Sensors (3-wire, infrared, liquid sensor)

TSP-HLS – High product Level Sensor (2-wire, float switch, liquid level sensor)

TSP-ULS – Universal Liquid Sensor (2-wire, float switch, liquid level sensor)

BriteSensors™

BriteSensors™ are 3-wire, discriminating sensors (many of which may generate multiple alarms).

TSP-DIS – Discriminating Interstitial Sensor (Electro-optic and conductivity, liquid sensor)

TSP-HIS – Hydrostatic Interstitial Sensor (float switches, Brine sensor)

TSP-DDS – Discriminating Dispenser sump Sensor (conductivity strip and floats, liquid and vapor sensor)

TSP-DTS – Discriminating Turbine sump Sensor (conductivity strip and floats, liquid and vapor sensor)

TSP-MWS – Discriminating ground water Monitoring Well Sensor (float and conductivity strip, liquid and vapor sensor)

TSP-DVS – Discriminating Vapor well Sensor (vapor sensor)

TSP-DMS - Discriminating Magnetostrictive Sensor

Modules

A modular bus consists of modules connected by a bus backplane. Some modules are standard in all units, while the type and number of other modules are dependent on the site configuration and options purchased. Most systems have empty slots available for future expansion or can be expanded with an expansion console.

Standard Modules

Controller Module

Contains the primary controller and software applications as well as the user interface and printer controls. The module contains the Ethernet port, (2) USB ports, COMM port 1, audible horn and an optional internal modem card.

Power Supply Module

Contains a self-switching (110 & 220 VAC) input and provides power to the rest of the system. The module contains two output relays, two backup generator inputs, a Turbine Pump Interface (TPI) RS-485 connection and the COMM 2 communications port. An optional Dispenser Interface Module (TS-DIMIB) or Echelon Communications Module (TS-LON) can also be added. The Power Supply Module also has a bus expansion port that can connect a TS-550 evo TS-5000 evo console to a TS-EXPC Expansion Console.

Optional Modules

<u>2-Wire Sensor Module</u>	Provides 12 inputs for 2-wire Standard sensors.
<u>3-Wire Sensor Module</u>	Provides 8 inputs and supports both 3-wire and 2-wire sensors.
<u>4-20 mA Input Module</u>	Provides 8 inputs that can be used for TS-LS500 line leak detection transducers and SCM vacuum transducers.
<u>4-20 mA EXP</u>	Explosion-proof module. Otherwise the same as the 4-20 mA Input Module.
<u>AC Input Module</u>	Provides 12 inputs for dispenser hook signals, which are also required for LLD. This module replaces external DHI boxes.
<u>Probe Module</u>	Provides 12 inputs or LL2 probes.
<u>Relay Module</u>	Provides 8 relay outputs (2-Amp) which are typically used to control the submersible pump relays to provide pump or dispenser shutdown when line leak detection or other applications are used. Not used in combination with TPI.
<u>10-Amp Relay Module</u>	Provides 6 relay outputs which are typically used to control the submersible pump relays to provide pump or dispenser positive shutdown upon alarm conditions.
<u>Input/Output Module</u>	Provides 8 AC or DC voltage inputs that can range from 3 to 240 volts. Typically used for vapor processors and generic devices, but not for dispenser hook signals. In addition, this module also includes four 4-20 mA signal outputs which are typically used to interface to an external device, such as a SCADA (Supervisory Control and Data Acquisition), building monitoring system or fuel level monitoring.

User Interface

LED Indicators – Three LEDs below the front panel give an “at-a-glance” indication of the system status. These LEDs are standard on all systems. The green Power LED indicates that the system power is on. The yellow Warning LED gives indication that the console has detected a malfunction or condition that has been deemed a Warning. The red Alarm LED indicates that the system has detected an alarm condition.

LCD Touch Screen – The color LCD touch screen is the most commonly used user interface for the Fuel Management System. This bright and colorful display allows easy viewing in any lighting condition. Touching certain buttons or segments of the screen will allow access to menus or more detailed information. **Do not** use sharp or pointed objects to operate the touch screen or damage may result. A “Sleep Mode” screensaver can be activated under Setup / Configuration / Sleep mode to automatically turn off the back light after 5 minutes to extend the life of the display. If improper operation of the touch screen is noted, it may be necessary to calibrate the touch screen. Please refer to the Routine Maintenance chapter of this manual for calibration procedures.

Alarms and Warnings

Alarms and warnings are designed to alert you with specific details when a problem occurs so that you can take appropriate corrective action. System hardware failure warnings, tank related alarms, leak detection sensor alarms, and line leak alarms will always notify the user in certain ways, other notification options are programmable.

Alarms and Warnings will always:

- Cause the red Alarm light or yellow Warning light to flash (standard).
- Change the alarm button from showing normal:



to showing the alarm. i.e.:



Optionally, on alarm the system can:

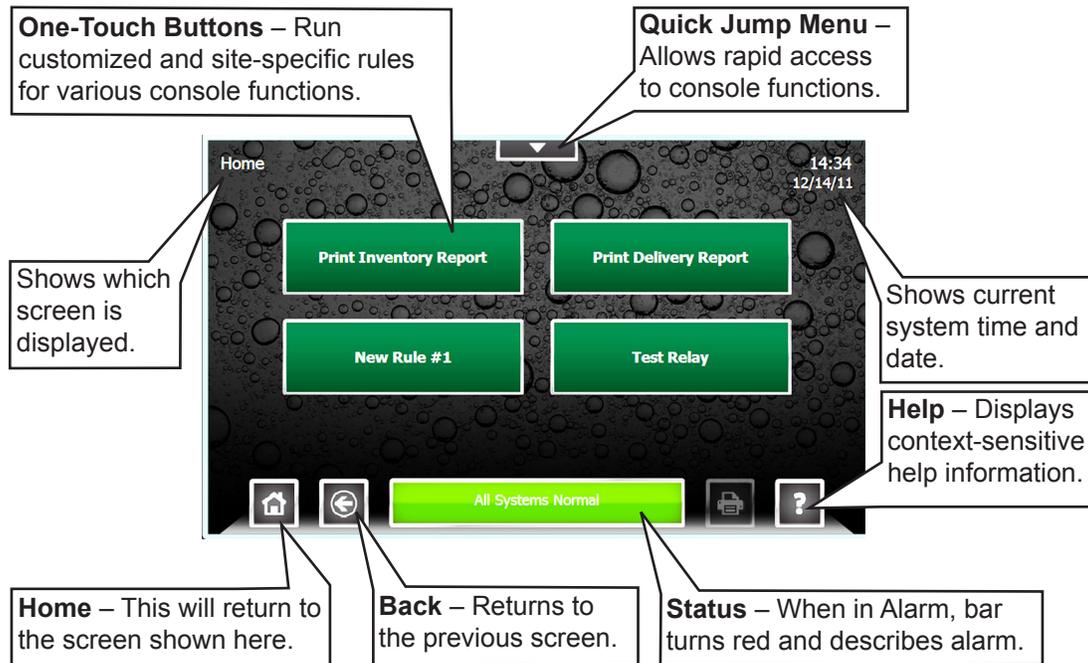
- Sound the console’s internal alarm horn.
- Activate relay outputs and sound external alarm devices.
- Print alarm reports.
- E-mail alarm reports to a specified destination.
- Notify remote monitoring software via optional internal modem or Ethernet.

For help with troubleshooting alarms, refer to the Troubleshooting chapter of the *TS-550/5000evo Series Programming Manual* (000-2173).

Programming and Navigation

Console Navigation

The operating system is designed for easy navigation. Applications allow the user to modify programming options by responding to on-screen commands. The following instructions show various operating system functions, so that issues can be corrected efficiently without interrupting dispensing or sales.

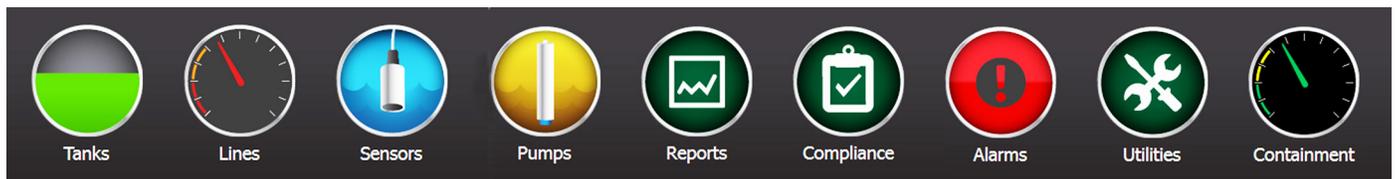


Navigation Buttons

There are many ways to navigate the applications of the TS-550/5000evo console. Listed below are buttons that will help you navigate the functions of the console.

Quick Jump Menu (QJM)

The Quick Jump Menu was developed to simplify system navigation. From the Quick Jump Menu you can access sections of the TS-550/5000evo with a few quick selections.



Quick Jump Menu

Note: Your console will display some selections depending upon installed equipment.

Selecting the icon will take you to the summary screen for that item and allow you to access more detailed information.

Tanks – The Tanks selection provides inventory information and control functions for the tanks and manifolds at a site

Lines – The Lines selection provides Line Status, Line Leak Test status, as well as Line control & calibration functions for each line at a site.

Sensors – The Sensors selection provides Sensor status, and control functions for the sensors at a site.

Pumps – The Pump selection provides the status and control functions for all Pumps connected to the system using the Turbine Pump Interface.

Reports – The Reports selection allow the user to generate any number of system and application reports.

Compliance – The Compliance selection provide detailed information regarding the compliance status of: Tanks, Manifolds, Lines, and Sensors monitored by the system.

Alarms – The Alarms selection provide a list of current active alarms, as well as an alarm history and an application event history.

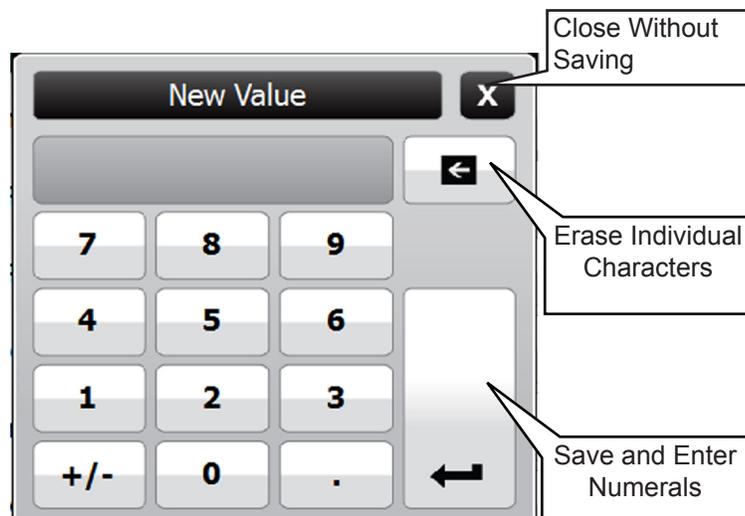
Utilities – The Utilities selections provides access to the various setup, configuration, and system tools used to configure and maintain the site.

• Page 8 list further information about these menu items

Text Entry Screen



Number Entry Screen



User Role - Access Control

There are three levels of access into the console's operating system: Guest, User, and Administrator. Each level will allow an operator to access different features and controls of the console. This security feature prevents unauthorized access to critical information and settings. The password for each access level can be adjusted by the Administrator. The Administrator level is typically reserved for an Franklin Fueling Systems certified technician. User's will be automatically prompted for a password to access or change data as required.

The User Role icon displays the current access level allowed. White bars displayed in this icon indicate the access level. Pressing the User Role indicator on your LCD display will return the system to Guest access level.

GUEST level: Guests are allowed to access menu options, check the system configuration and print reports. A GUEST will not be able to modify the console's settings.

USER level: Users are given access to more functions of the operating system so that they can perform line/tank leak tests and reset line alarms.

ADMINISTRATOR: This level grants access to all areas of programming and setup configuration. The administrator privilege is usually reserved for Franklin Fueling Systems certified technicians.

DIAGNOSTIC LEVEL: This level is only used for advanced troubleshooting and diagnostics. Contact FFS Technical Service.

System Identification

In order to understand what sections of this manual apply to your system, you must be able to identify what Fuel Management System you have and what Options and Applications it is running.

Model Number – Located on the front of the console.

Serial Number – Located on a sticker on the left side panel (along with Model number).

Options – To see what Applications and Options the system is running, press **QJM>Utilities>System**

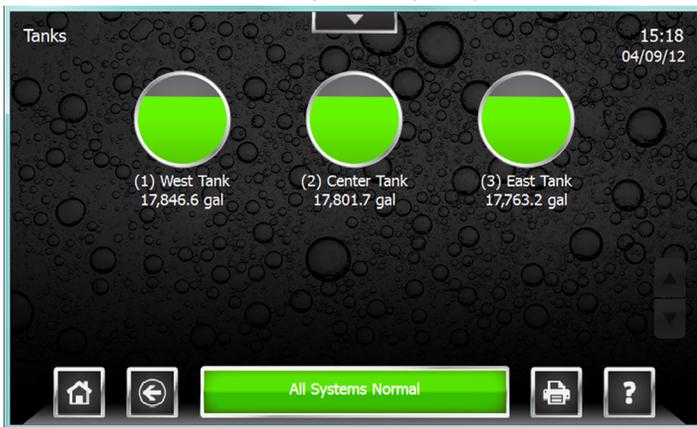
Quick Jump Menu Selection Descriptions



Tank Inventory Summary Screen

The **Tank Inventory Summary** screen displays a graphical representation of the product and water levels in the tanks and indicates any alarm conditions. The Product name and current Volume are also displayed for each tank. An alarm condition on the tank is also indicated here, if present. Pressing the print button while on this screen will print an Inventory Report for all tanks.

To access the Tank Inventory Summary screen select Tanks from the Quick Jump Menu (QJM).

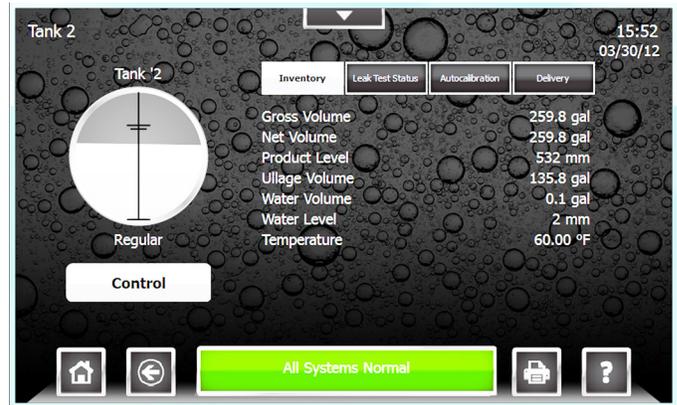


Tank Inventory Detail Screen

The Tank Inventory detail screen will provide detailed information on product volume, level, temperature and ullage space available in a particular tank. The level and volume of any water will also be displayed. The hash marks on the graphic indicate the various programmed high and low alarm limits. An alarm condition on the tank is also indicated here, if present.

The Tank Inventory Detail screen also provides details regarding the tanks Static Leak Test status, Autocalibration status, and Delivery history using the four tabs at the top of the left hand column. Pressing the print button while on the page will print an Inventory Report for just this tank.

To access the Tank Inventory Detail Screen select a tank from the Tank Inventory Summary screen.



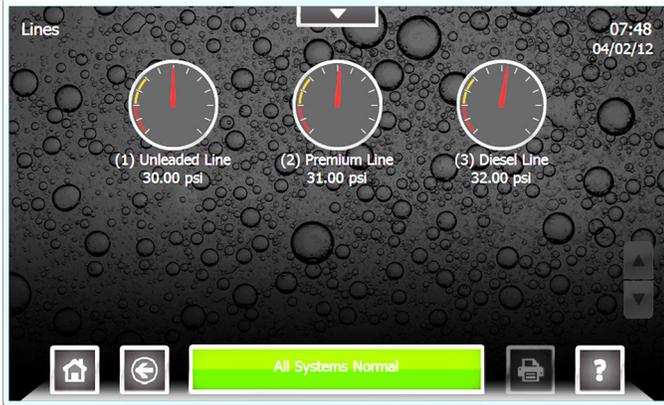
Tank Controls feature can be accessed using the Control Button on the Tank Inventory Detail Screen. This will allow authorized users and technicians to start tank tests or autocalibration.



Line Status Summary Screen

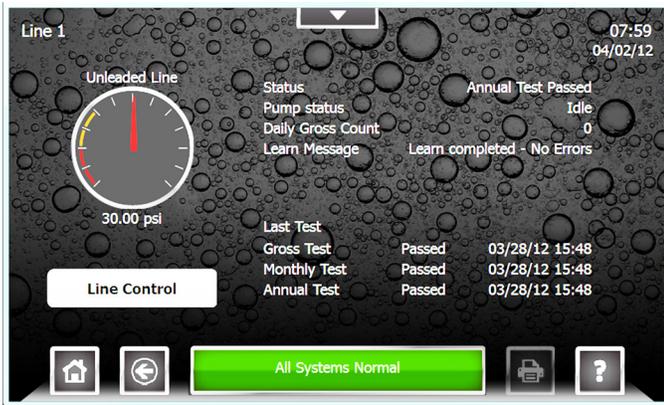
The Line Status Summary screen displays a graphical representation of the line pressures in each line and will indicate any alarm conditions. The Line name and current pressure reading are also displayed for each line.

To access the Lines Status Summary screen select Lines from the Quick Jump Menu (QJM).

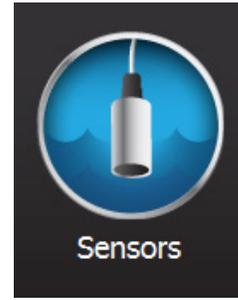
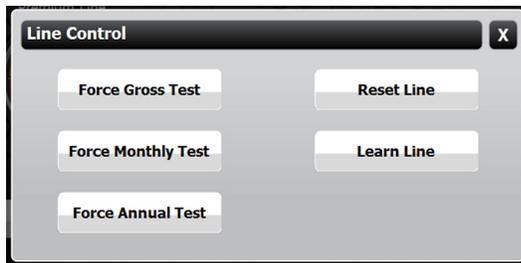


Line Status Detail Screen

The Line Status Detail screen will provide detailed information on Line Leak Testing and the Line Status. The Line status, Pump status, number of Gross Leak Tests performed, Line Learn Messages, and the date and time of the last line test completed. An alarm condition on the Line is also indicated here, if present. From the Line Detail screen Line Control can be accessed. To access the Line Status Detail Screen select a line from the Line Status Summary screen.



Line Controls feature can be accessed using the Line Control Button on the Line Status Detail Screen. This will allow authorized users and technicians to start line leak tests, reset the line, and learn the line.



Sensor Status Summary Screen

The Sensor Status Summary screen displays a graphical representation of a sensor, the name of the sensor and will indicate any alarm conditions. Pressing the print button from the screen will print a sensor status report for all of the sensors.

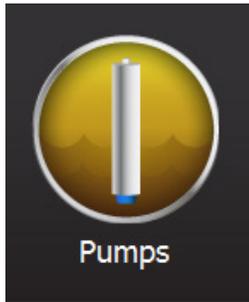
To access the Sensor Status Summary screen select Sensors from the Quick Jump Menu (QJM).



Sensor Status Detail Screen

The Sensor Status Detail screen will provide details on the sensor type and the sensors current status. Any alarm condition on the Sensor is also indicated here, if present. Pressing the print button from this screen will print a sensor report for that tank. To access the Sensor Status Detail Screen select a sensor from the Sensor Status Summary screen.





Pumps

Pump Status Summary Screen

This screen displays a graphical representation of the submersible pumps, the name of the pump, and an indication whether the pump is running or not. An alarm condition on the pump is also indicated here, if present. Pressing the print button while on this screen will print a Pump Status Report for all Pumps.

To access the **Pump Status** Summary screen select Pumps from the Quick Jump Menu (QJM).

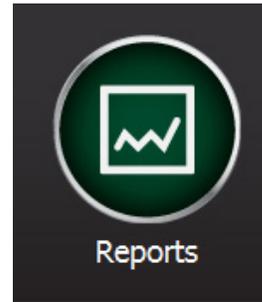


Pump Status Detail Screen

This screen provides a variety of information regarding the pump and its settings. Information including: Pump Name, Enabled/Disabled, Controller Type, Controller Address, the tank the pump is installed in, and Pump Group. The screen also includes status information such as Pump Running, has the pump been forced off, and if a hook signal is present. Pressing the print button while on the page will print a Pump Status Report for just this tank.



Pump Controls feature can be accessed using the Control Button on the Pump Status Detail Screen. This will allow authorized users and technicians to reset the Pump hardware and software.

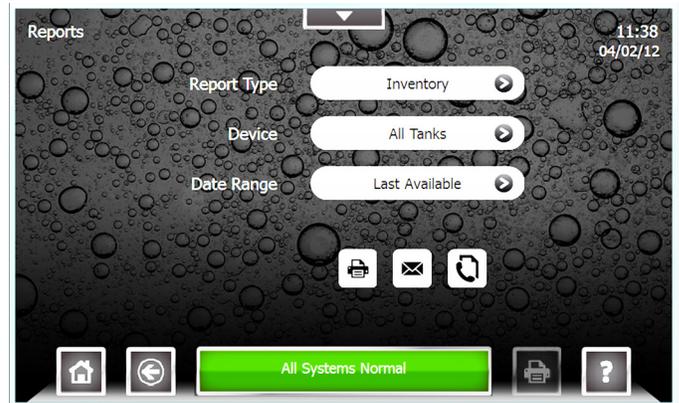


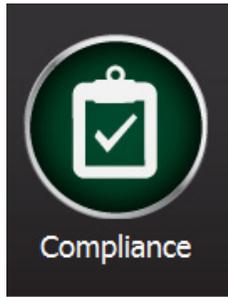
Reports

Report Generator Screen

The Report Generator screen is used to create a variety of reports. The report options available depend on software options and system configuration. The available reports include: Alarm History, Application Event History, Setup, Inventory, Delivery, Tank Test, SCALD, Line Test, Pump Status, Reconciliation, Regulatory, and Sensor Status.

To access the Report Generator screen select Reports from the Quick Jump Menu (QJM).





Compliance

Compliance Screen

The Compliance screen displays regulatory status information for Tanks, Manifolds, Lines, and Sensors. Each page lists every device, the number of days remaining and the date when that specific device will be out of compliance. The screen will indicate compliance concerns with a color coded status indicator.

Compliance Status

-  Compliant – The device is in compliance.
-  Compliance Alert – The device will be out of compliance in 8 to 14 days.
-  Compliance Warning – The device will be out of compliance in 1 to 7 days.
-  Compliance Alarm – The device is out of compliance.

Tank Compliance Screen

Device	Name	Type	Last Passed	Status	Days Left	Out of Compliance
Monthly						
Tank 1	Tank &1	Static			26	04/28/12 12:56
Tank 2	Tank *2	SCALD	03/30/12 15:07		27	04/29/12 15:07
Tank 3	Tank *3	SCALD	03/30/12 15:07		27	04/29/12 15:07
Tank 4	Tank >4	Static	03/30/12 07:07		27	04/29/12 07:07
Tank 5	Tank <5	SCALD	03/30/12 15:11		27	04/29/12 15:11
Tank 6	Tank 6	Static	04/02/12 08:14		30	05/02/12 08:14
Tank 7	Tank 7	Static	04/02/12 08:14		30	05/02/12 08:14
Tank 8	Tank 8	Static	04/02/12 08:14		30	05/02/12 08:14
Tank 9	Tank 9	Static	04/02/12 08:14		30	05/02/12 08:14



Alarms

Alarm Summary Screen

The Alarm Summary screen displays active alarms, an alarm history, and an application event history. From the alarm summary screen users can view currently active alarms and review alarm and application event histories, as well as access more details about active alarms.

To access the Alarm Summary screen select Alarms from the Quick Jump Menu (QJM).



Active Alarm Detail Screen

The Active Alarm Detail screen provides detailed information regarding an active alarm. These details include the device, the date and time the alarm occurred, and a description of the alarm. It will also provide hints for recommended actions and precautions. Many alarms will also have a “Go To Device” link which directs users straight to the device to allow users to perform corrective actions. Pressing help from this screen will provide further details regarding the specific alarm. To access the Alarm Detail Screen select an Alarm from the list of active alarms.





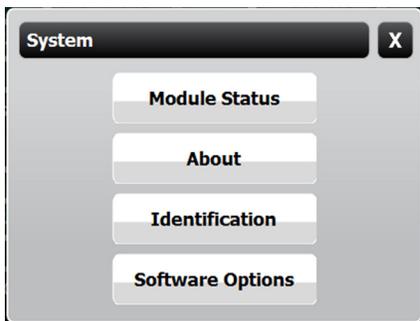
Utilities Screen

The Utilities Screen allows users and technicians to change console configuration, setup, and preferences. It also provides system diagnostic tools allowing technician to test, troubleshoot and reboot the system.



System

View Module Status, About the Console, System Identification, and Software Options.



Module Status

Displays each module installed along with the modules' Slot, State, and Software Version.

About

Displays contact information for Franklin Fueling Systems and a note regarding Open Source software.

Identification

Displays system identification information including: System Serial Number, Ethernet Address, Controller Serial Number, and the system creation date.

Software Options

Displays a list of optional software and whether they are activated.

Setup

Provide access to all of the systems setup and configuration options.



Configuration - (see below)

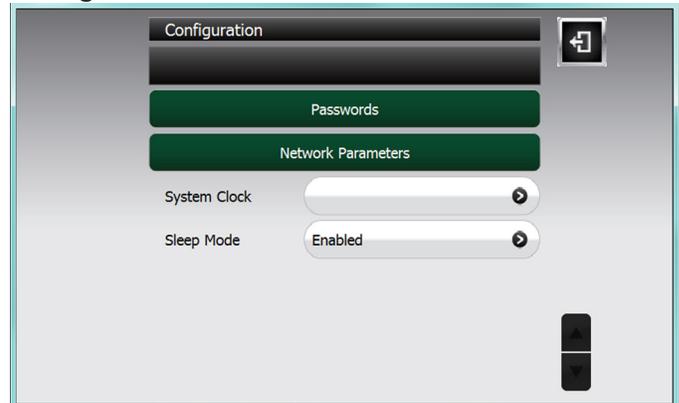
FAST

This function is only for use by installers / programmers.

Parameters

See the Programming manual for detail regarding system setup and configuration.

Configuration Menu



Use the Configuration Menu to configure:

Passwords

Set the passwords for all access levels (Administrator Use Only).

Network Parameters

Configure IP connection settings.

System Clock

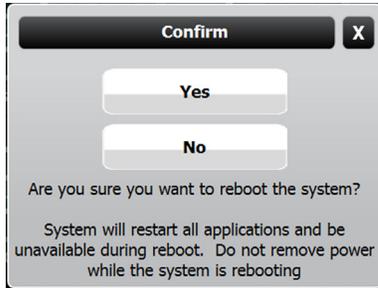
Set the system date, Time, & Time Zone.

Sleep Mode

This will enable or disable the console blanking the display after 5 minutes of inactivity.

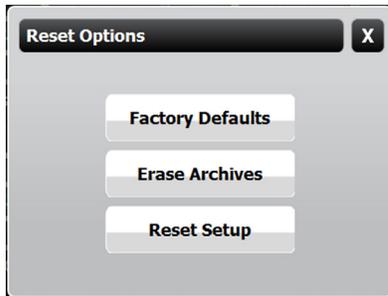
Reboot System

This will perform a system software reboot and requires an administrator password.



Reset options

Reset to factory defaults, erase archives, or reset setup.



Tools

Provides access to various system tools such as: Annunciator, Test Relays, generate a Diagnostic Key, access DIM Diagnostics, Test Relays, or Calibrate the touch screen.



Test Annunciator

Tests the operation of the internal alarm.

Diagnostic Key

Enters Diagnostic Mode (Certified technician access only).

DIM Diagnostics

Allows technician to interface with the Internal DIM settings.

Test Relays

View relay state and test operation (read screen caution notice)!

Calibrate Touchscreen

Enables re-calibration of the touchscreen.

Save L-Factors

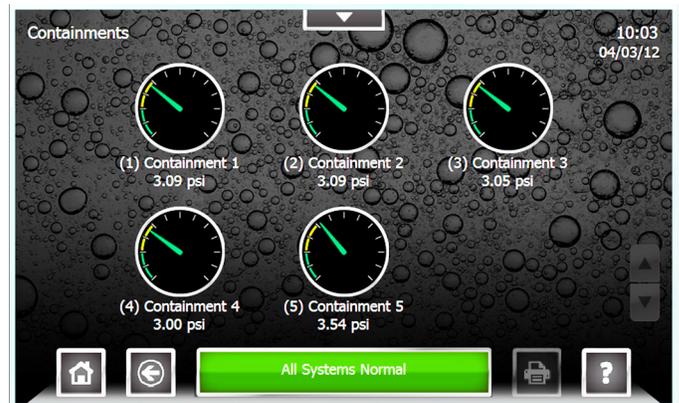
Allows technician to save line factors.



Secondary Containment Status Summary Screen

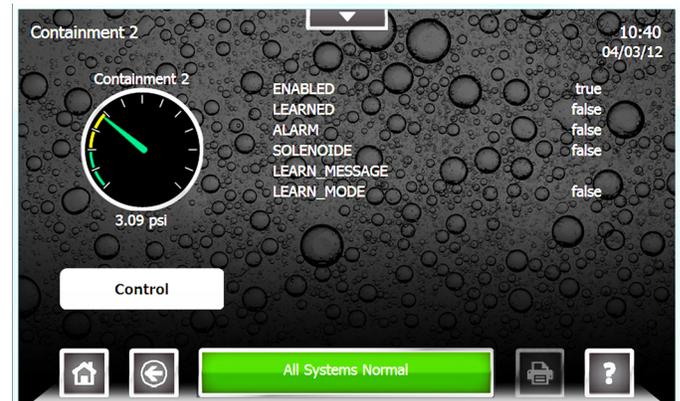
The Secondary Containment Status Summary screen displays a graphical representation of the vacuum levels for each Containment and will indicate any alarm conditions. The Containment name and current vacuum reading are also displayed for each line.

Access the Secondary Containment Status Summary screen select Containments from the Quick Jump Menu (QJM).

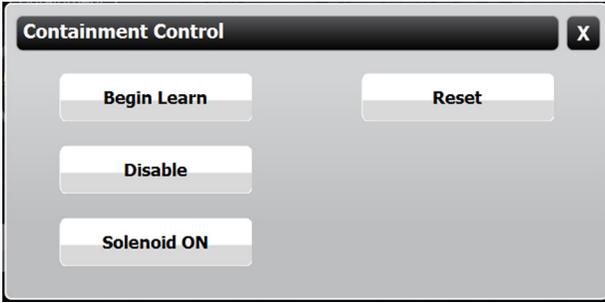


Secondary Containment Detail Screen

The Secondary Containment Detail screen will provide detailed information on Secondary Containment Testing and the Containment Status. From the Secondary Containment Detail screen Containment Control can be accessed.



Containment Control features can be accessed using the Control Button on the Secondary Containment Detail Screen. This will allow authorized users and technicians to learn the containment, reset, or disable the containment.



Printing Reports

Internal Printer

An internal printer is optional on TS-550/5000 evo console. The printer is a thermal style printer that requires thermal paper. For paper loading instructions, refer to the Routine Maintenance chapter in this manual.

External Printers

External printing is accomplished via USB. No software drivers need to be installed to print via USB. Connect the USB cable to the printer and the USB port on the console. The unit is now ready to print. *Approved printer are updated regularly, please see our web page for details.*

Note: The setup will need to be changed so the printer option is 0, save the configuration, connect the printer and cycle the power of the tank gauge.

Print Button

The Print Button will print the data displayed on the LCD when available.



Reports Options

The following reports are available for the different optional Applications. Each report allows you to select the date range of data you wish that report to contain.

Reports

Report	Description
Alarm History	A history of the Alarms that have occurred.
Application Event History	A history of the Application Events that have occurred.
Setup	A printout of the system programming.
Inventory	Complete level, volume, temperature and ullage info for each tank.
Delivery	Start and ending level and volume information and total amount delivered.
Tank Test	Annual and monthly static tank testing results. (tank testing option required)
SCALD	24hr continuous monthly tank testing results. (tank testing option required)
Lines	Gross, monthly and annual line tests. (line leak option required)
Regulatory	Complete compliance report for all tanks, lines, sensors.
Sensor	Alarm status of all monitoring sensors.

Tank Testing

There are two types of Tank Testing available in the Fuel Management Systems: Static and SCALD.

Static tests are run during quiet times when the tank is thermally stable and the site is closed so that no dispensing or deliveries will occur. There are two types of Static tests: Monthly (0.2 gph) and Annual (0.1 gph). Static tests can be scheduled to run on a Daily, Weekly or Monthly basis in the Setup menu (Administrator use only). They can also be started on demand from the **tank detail screen**. Make sure that all testing conditions are met before starting a Static Tank Test.

SCALD (Statistical Continuous Automatic Leak Detection) tests run 24 hours a day and look for periods of quiet time when the tank is thermally stable and no dispensing or deliveries are occurring. These quiet periods are collected and analyzed and the tightness of the tank is determined. SCALD tests will update whenever possible and can be setup to print automatically when they do. The more common method is to schedule the latest SCALD test to print out once a week, saving a significant amount of paper because SCALD tests can be generated multiple times a day on a quiet tank.

Static and SCALD tests run independently of each other and can be run at the same time. A SCALD test will likely complete during the time that the Static test is running.

All Franklin Fueling Systems Fuel Management Systems meet the requirements of the U.S. Environmental Protection Agency (EPA/530/UST-90/006 test protocol) for Automatic Tank Gauging Systems (ATGS). The system(s) also meet the requirements for Annual Tank Tightness Testing for 0.1 gal/hr leaks of the National Work Group on Leak Detection Evaluations (NWGLDE). Third Party Testing Laboratory test results (for standard static tank leak tests) are also available at <http://nwglde.org/>.

Why Test the Integrity of a Tank

In compliance with federal, state and local regulatory policies, all tanks must be monitored for leaks due to environmental and public safety/health concerns. Tank tightness testing determines if there is a leak.

Static Testing

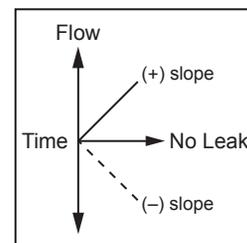
Terms

Threshold – Test results must be within these programmable limits to pass a leak test. There are Monthly, Annual and Sentinel Mode Thresholds.

Sentinel Mode – Sentinel mode is designed to monitor the product levels in your tank(s) when there isn't supposed to be any dispensing.

Confidence – Level of testing sensitivity indicating the probability that the test will detect a leak. Higher confidence percentages will produce more sensitive test results. Check local regulations to verify acceptable confidence levels.

Slope (Tank Testing Reports) – A ratio of the calculated rate of change to the time the rate is measured. Slope is affected by leaks and by many other sources of interference. A negative slope or decrease indicates loss of product volume. A positive slope or increase indicates a rise in product volume.



Tank Testing Requirements

Static Tank Testing is a standard feature of the Fuel Management System. SCALD is an option that can be ordered when purchasing the console or after initial purchase by using the part number TS-TT.

Test Types

This system is designed to perform two types of static tests to comply with regulatory policies.

- **0.1 GPH Annual Leak Test** — Detects a rate increase or decrease of product in the tank, other than dispensing (no testing during dispensing), at a rate greater than 0.1 gallons per hour.
- **0.2 GPH Monthly Leak Test** — Detects a rate increase or decrease of product in the tank, other than dispensing (no testing during dispensing), at a rate greater than 0.2 gallons per hour.

Ideal Testing Conditions

Tank and environmental conditions play an important role in passing results. Consider the following items when scheduling or manually forcing a static leak test:

Variable	Explanation
Product Level	The level in the tank must submerge at least the lowest RTD (temperature sensor) inside the probe shaft.
Temperature Stability	A tank with more product inside is likely to be stable thermally and allow for higher quality results.
Time of Day	This variable ties in with temperature stability. Though not likely, product in the tank may dramatically rise and fall in temperature from dawn to afternoon and then from dusk to night. Typically, thermal issues affect Aboveground Storage Tanks more often than Underground Storage Tanks.
Deliveries	A period of time is required to wait without a delivery between the last delivery and testing. The time to wait is 4 hr 9 min for a 0.2 GPH and 5 hr 18 min for a 0.1 GPH after a delivery (in accordance with third party testing). This time will allow the product to settle. If the wait time is not observed, then the test may abort or fail.
Dispensing	If dispensing occurs during a test, that test will be aborted.
Test Time	The test should be scheduled or manually forced when the test will not exceed the maximum leak test time. If the maximum time is surpassed, an Incomplete result is likely to occur. If scheduling or manually forcing a test, take into account what the sites hours of operation are to avoid a dispense during testing. Doing this will prevent aborted and incomplete tests.

How to Manually Start Static Tests

This procedure requires User level privileges.

1. Starting at the Home screen, open the Quick Jump menu.
2. Select Tanks and then click on which tank to start a test.
3. Press the Control button.



4. Press the Test Type and choose either Monthly or Annual.

Static Test Results

Pass – A passing result ensures the integrity of the tank is good.

Fail – Test failure will be indicated by a Warning light and/or annunciator. Additionally, a report may print (if the console is programmed to do so, see the *TS-550/5000 evo Programming Guide p/n 000-2173*)

Abort – The result has been stopped due to variations in float level and/or product temperature that are outside of the leak test threshold. This may be caused by:

- Dispensing
- Loss of Probe Signal
- Delivery
- Rapid Temperature Change
- Theft
- Product Lower than the lowest RTD
- Pump Started

Incomplete – When the test does not collect enough data before the programmed time limit ends, the test will be Incomplete. When it's necessary to obtain valid results for compliance reasons, start the test manually.

Statistical Continuous Automatic Leak Detection (SCALD)

SCALD (Statistical Continuous Automatic Leak Detection) runs 24hrs a day performing 0.2 GPH tests on tanks at sites that do not have enough quiet time to complete static tests (some static tests may take up to eight hours to complete).

SCALD Testing is available only if the option for Tank Testing is enabled. This option can be ordered when initially purchasing the console or afterwards. The part number for this option is TS-TT for the TS-550/5000 evo.

Why Continuously Test Tank Integrity

In compliance with federal, state and local regulatory policies, all tanks must be monitored for leaks due to environmental and public safety/health concerns. Tank Integrity Tests determine whether there is a leak.

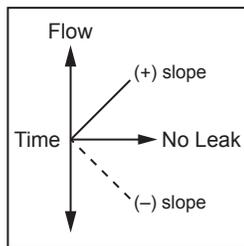
Since SCALD continuously runs statistical tank leak tests during the inactive periods between product deliveries and dispensing, it is particularly useful for:

- Operations that are open for business on a continuous (24 hours, 7 days a week) schedule
- Operations that are open for business on a two-shift schedule and where deliveries may occur at any time during non-business hours (normally schedule tank leak tests may require up to 8 hours of inactivity).

Terms

Qualify – The percentage of product that the tank is required to contain prior to testing according to the programmed “Qualify” parameter.

Slope (Tank Testing Reports) – A ratio of the calculated rate of change to the time the rate is measured. Slope is affected by leaks and by many other sources of interference.



A negative slope or decrease indicates loss of product volume. A positive slope or increase indicates a rise in product volume.

SCALD Testing Requirements

To perform SCALD testing, the SCALD software must be enabled. To verify that the software is enabled:

1. Starting at the Home screen, open the Quick Jump Menu.
2. Select Utilities from the QJM then select System.
3. Press the Software Options Button.
4. Under Software Options, Tank Testing will appear. A “yes” in the Enabled column indicates that the software has been purchased and is enabled.

Software Options	
FMS	Yes
VRM	Yes
SCM	Yes
Tank Testing	Yes
SCALD Testing	Yes
Line Testing	Yes
Reconciliation	Yes

When SCALD Tests

SCALD works by collecting quiet intervals in-between dispensing. A “QI” is obtained when a thermally stable tank is idle for 20 minutes with no dispensing, no deliveries and no other movement of the probe floats. Once four QIs are collected, the console will analyze the data and either Pass, Fail, Incomplete, or Abort that test. The four QIs can be collected over a period of several days or weeks.

SCALD Results

Pass – A passing result ensures the integrity of the tank is good.

Fail – Test failure will be indicated by a Warning light and/or annunciator. Additionally, a report may print (if the console is programmed to do so, see the *TS-550/5000 evo Programming Guide p/n 000-2173*).

Abort – The result is due to variations in float level and/or product temperature that are outside the leak test threshold. This may be caused by:

- Dispensing
- Delivery
- Theft
- Loss of Probe Signal
- Rapid Temperature Change
- Product Lower than the lowest RTD (Resistance Temperature Detector)
- Pump Started

Incomplete – When the test does not collect enough data before the programmed time limit, the test is Incomplete. When it is necessary to obtain valid results for compliance reasons, start the test manually.

Reasons Why SCALD May Not Complete

- No Quiet Time
 - SCALD needs four 20 minute QIs in order to complete a test. These QIs are normally found in the early morning hours. If the site is so busy that there are no 20 minute periods of no dispensing, then SCALD will not be able to complete a test.
- Temperature Instability
 - If a site is receiving deliveries frequently and the temperature of the fuel being delivered is several degrees hotter/colder than the fuel in the tank, SCALD will not be able to collect data due to thermal instability interrupting quiet time. The temperature of the fuel cannot change more than .01° F during a 20 minute QI.
 - If a pump control relay is stuck closed and the pump is running all of the time, the temperature in the tank may be much higher than in the other tanks. Due to this high temperature and the fact that the pump is running, no QIs will be collected.

Note: On rare occasions conditions can arise that prevent SCALD from getting enough QIs to complete a test.

Viewing SCALD results

From the Quick Jump menu, select Compliance and then select Tanks.

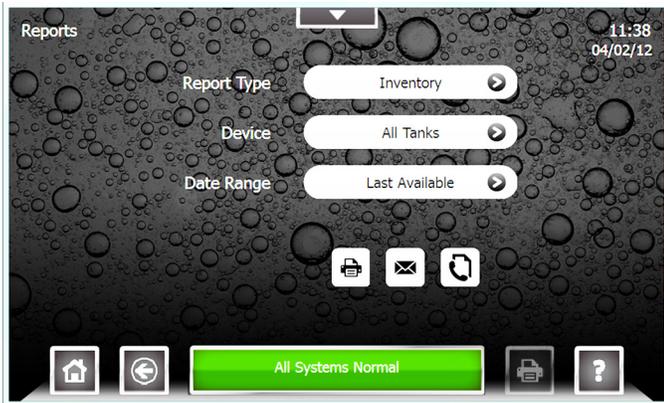
Tank Leak Test Reports

Reports that contain leak testing data and results may be printed from the console or generated/printed using TSA.

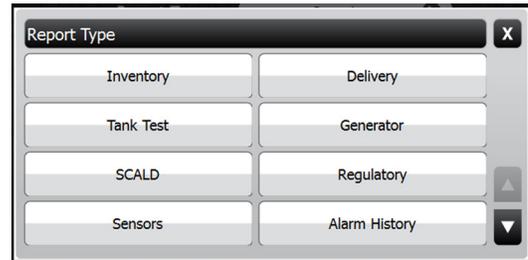
Printing Tank Leak Test Reports

LCD

1. Starting at the Home screen, open the QJM and select Reports.



2. From the Report Type menu select either the Tank Test (for static reports) or SCALD for continuous reports.



3. Select the Date Range desired.
4. Press the checkmark to start report printi

Sample Tank Leak Test Reports from Internal Printer

Site ID 1
 Site ID 2
 Site ID 3
 Site ID 4
 Site ID 5
 Date Time

Tank Test Report
 Specified Time Frame
 Volume: (gal) programmed
 Length: (in) programmed
 Temperature: (F) programmed
 TANKS
 Tank #
 Product #
 Maximum Capacity
 #.##
 Begin Time
 Date Time
 Begin Gross
 #.#
 Begin Net
 #.#
 Begin Level
 #.#
 Begin Temperature
 #.#
 Begin Water Level
 #.#
 Begin Water Vol
 #.#
 End Time
 Date Time
 End Gross
 #.#
 End Net
 #.#
 End Level
 #.#
 End Temperature
 #.#
 End Water Level
 #.#
 End Water Vol
 #.#
 Last Delivery
Test Type
 Monthly
 Threshold
 #.##
 Leak Rate
 #.##
 Result
 Pass/Fail/Abort/Incomplete
 Capacity
 #.##
Details
 Time
 Date Time
 Net Volume
 #.#
 Temperature
 #.#
 Level
 #.#
 Time
 Date Time
 Net Volume
 #.#
 Temperature
 #.#
 Level
 #.#

Site ID 1
 Site ID 2
 Site ID 3
 Site ID 4
 Site ID 5
 Date Time

SCALD Report
 Specified Time Frame
 Volume: (gal) programmed
 Length: (in) programmed
 Temperature: (F) programmed
 TANKS
 Tank #
 Product #
 Maximum Capacity
 #.##
 Started
 Date Time
 Result
 (Pass)
 Slope
 #.#####
 Status
 #.#
 Ended
 Date Time
 Vol %
 #.##
 Type
 (Monthly)

Example External Tank Leak Test Report from Web Browser Interface

Site ID 1									
Site ID 2									
Site ID 3									
Site ID 4									
Site ID 5									
Last Available									
<i>Date Time</i>									
Tank Test Report									
STATIC TEST									
TANKS									
Name	Max Capacity		Time	Gross Volume	Net Volume	Product Level	Temperature	Water Level	Water Volume
Tank #	###								
	Started	<i>Date Time</i>	##	##	##	##	##	##	##
	Ended	<i>Date Time</i>	##	##	##	##	##	##	##
	Last Delivery	<i>Date Time</i>	Test Type	(Monthly)	Leak Rate	###	Result	(Pass)	
	Threshold	<i>Programmed</i>	Capacity	###					
	Net Volume		Temperature		Level		Time		
	###		###		###		<i>Date Time</i>		
	###		###		###		<i>Date Time</i>		
	###		###		###		<i>Date Time</i>		

Site ID 1									
Site ID 2									
Site ID 3									
Site ID 4									
Site ID 5									
Last Available									
<i>Date Time</i>									
Tank Test Report									
SCALD TEST									
TANKS									
Name	Product	Max Capacity							
Tank #	Product #	###							
			Started	<i>Date Time</i>	Result	(Pass)	Slope	##	Status
			Ended	<i>Date Time</i>	Volume Quality Percent	##	Test Type	(Monthly)	###

Line Leak Testing

Overview

Line Leak Detection is available only if the option for Line Testing is enabled. This option can be ordered when purchasing the console or after the initial purchase by using the part number TS-ELLD. An AC Input, 4-20mA, and either a relay module or the use of TPI will also be required to perform Line Testing.

Line Leak Testing for all T5 series FMS consoles use software rules to automatically run tests. Tests may be started manually from the console or remotely using TSA. AutoLearn software monitors line conditions by conducting a multitude of electronic line pressure sensing tests.

Line Leak Detection is required in many areas to monitor for potentially hazardous environmental contamination. In the event of a leak, the system may provide positive pump shutdown (to prevent further contamination) and display an indicator light and on-screen description of the condition as console alarm notifications. A high intensity remote alarm may also be used if applicable. After installation, the user of the system must monitor the system to ensure that any leak alarm and pump shutdown (indicating a line leak) is dealt with promptly.

The LS500 LLD system can detect a leak from the check valve in the pump to the solenoid valve at the dispenser — assuming no other normally closed valve is in the pipeline system. This system does not detect leaks from the fuel storage tank. The LS500 should be used in applications where site conditions are in accordance with Third Party testing (as listed in the NWGLDE section of this chapter).

Terms

Piping Modulus – This is the maximum pipe capacity that may be tested in accordance with the 3rd Party Approval, regardless of pipe diameter.

Transducer – An electronic pressure sensing device placed in the line that communicates with the console..

Certifications – 3rd Party Approvals

TS-LS500 AutoLearn Pressurized Electronic Line Leak Detection as of May 19th, 2006 has been approved by a third party for leak detection of rigid and flexible piping.

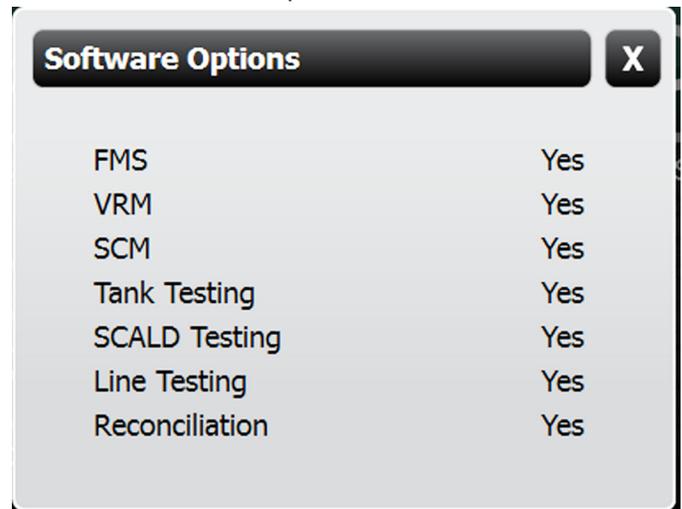
National Work Group Leak Detection Evaluations (NWGLDE)

This data can be referenced on the abbreviated version of the 3rd Party Certification performed by Ken Wilcox Associates, located on the NWGLDE site: <http://nwglde.org/>.

Line Leak Testing Requirements

To perform Line Leak testing, the Line Leak software must be enabled. To verify that the Line Leak software is enabled:

1. Starting at the Home Screen, open the Quick Jump Menu.
2. Select Utilities from the QJM then select System.
3. Press the Software Options Button.



4. Under Software Options, a Line Testing row will appear. A "Yes" in the Enabled column indicates that the software has been purchased and is enabled.

Test Cycles & Types

Once installed, calibrated and enabled, the LS500 will start a cycle of tests after the hook signal becomes inactive (i.e. a nozzle is hung up). The transducers then monitor line pressure to ensure that pressure is sufficient to proceed with the cycle. A Gross (3.0 GPH) Leak Test will begin immediately following the pressure test, if these options are enabled in setup.

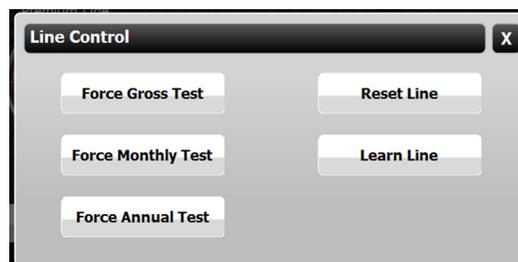
When the Gross Test is complete with a pass result, the system will wait 30 minutes prior to monitoring the line for thermal stability. When it determines that the line is stable, another Gross Test will be performed directly followed by a Monthly (0.2 GPH) Leak Test. When the Monthly Test is complete with a pass result, the system then monitors the line for thermal stability once again. When that the line is stable, another Gross Test will be performed followed by an Annual (0.1 GPH) Leak Test. When the Annual Test is complete with a pass result, the system then waits 45 minutes prior to restarting the cycle again.

Test Type	Description
Pressure Up	A pressure up test will monitor line pressure from a static line to when the pump is turned on.
Dispenser Pressure	Dispenser pressure is tested with the hook applied to ensure that line pressure does not drop too low while dispensing. This feature can be enabled/disabled in the programming.
Catch Pressure	When the dispenser hook is dropped and the pump turns off, line pressure decay is monitored and compared to a learned decay. This test will not cause the pump to shut down — alarm only.
Gross (3.0 GPH) Leak	The Gross Test will begin after every dispense when the line is enabled or after every 45 minutes of quiet time (no dispensing or pump running) following a line pressure test. In ideal conditions, this test will take approximately 5 minutes to complete. In the event of a failure, the system will attempt to run the test again after 5 minutes. After two failures an indicator light and alarm will turn on and the pump will be shutdown. A dispense or pump shutdown by another application during this test will cause an Abort Alarm. This test can be enabled/disabled in the programming.
Thermal Wait Time	Before initiating a precision test, the LS500 will monitor the line for thermal variations. Testing for thermal variations takes 1½ to 10 hours of inactivity.
Monthly (0.2 GPH) Leak	If this option is enabled in the programming, the test will follow a thermal wait period and line pressure test. In the event of a failure, the system will attempt to run the test again without waiting. Upon three failures, an indicator light and alarm will turn on and the pump will shutdown if programmed. A dispense or pump shutdown by another application during this test will cause an Abort alarm. This test can be enabled/disabled in the programming.
Annual (0.1 GPH) Leak	If a line is learned and not enabled within a preset amount of time, then the console will show a warning that the line is not enabled. This is to show that the line is not being monitored for leaks.
Line Learned but Not Enabled	This is a continuous test that runs in the background. An alarm will occur if line pressure drops too fast.
Sudden Pressure Loss	The LS500 will detect all hook signals (if wired properly) and the time that they remain active. If the hook signal is active for too long, the console will indicate this condition with an alarm light and sound.
Extended Pump Run	If line pressure exceeds the maximum allowable pressure, the pump will shut down and an alarm will light and sound. This test will run continuously when the line is enabled.
High Pressure	

How to Manually Start Line Leak Tests

This procedure requires User level privileges.

1. Starting at the Home Screen, open the Quick Jump Menu.
2. Select Lines from the QJM.
3. Select the line to test.
4. Select Line Control.



5. Select the Test Type, either Force Gross, Force Annual or Force Monthly.

Note: For the system to run a monthly or annual test, the line must be thermally stable. In unstable conditions, the system may cycle the submersible pump in an effort to stabilize the line before a test can be completed. This may require 40 minutes or more of line conditioning time

Line Test Results

Pass – A passing result ensures that the line is free of leaks; any variation in product stability is within permissible thresholds.

Fail – Test failure will be indicated by an alarm light and/or annunciator. Additionally, a report may print (if the console is programmed to do so, see the *TS-550/5000 evo Programming Guide p/n 000-2173*).

Abort – There may not be an indication of an abort for some tests. If a line is disabled manually or automatically by another application, a test is manually initiated in the middle of a cycle or a dispense occurs, then the test cycle will abort the results for the current test.

Incomplete – If there aren't at least two hours of inactivity before a precision test, it may result in an incomplete test.

Pump Shutdown – Failing the maximum number of tests consecutively will shut the pump down. A single catch pressure test failure or pressure up test failure will also shut the pump down.

Note: All conditions must be physically corrected to clear alarm conditions. To clear alarms after correcting the problem, go to lines/control and click reset alarm. Alarms will clear automatically when conditions permit.

Example Line Leak Test Reports from Internal Printer

```

Site ID 1
Site ID 2
Site ID 3
Site ID 4
Site ID 5
Date Time

Line Leak Report
Specified Time Frame

'TYPE' TEST

Line #
'Type' Leak Test 'Result'
Date Time
.....
    
```

Line Leak Test Reports

Reports that contain leak testing data and results may be printed from the console or generated/printed using TSA.

Printing Tank Leak Test Reports

LCD

1. Starting at the Home Screen, Open the Quick Jump Menu.
2. Select Reports.



3. From the Report Type menu select either Lines Gross, Lines Monthly, or Lines Annual.
4. Select the desired line or all lines.
5. Select a date range.
6. Select a report delivery method (print, email, or fax) to generate the report.

Example Line Leak External Test Reports from Web Browser Interface

Site ID 1		
Site ID 2	Last Available	Date Time
Site ID 3		
Site ID 4	Line Leak Report	
Site ID 5		
GROSS TEST		
Name	Result	Test Date
Line #	Daily Total = #	
	Gross Leak Test 'Result'	Date Time
MONTHLY TEST		
Name	Result	Test Date
Line #	Daily Total = #	
	Monthly Leak Test 'Result'	Date Time
ANNUAL TEST		
Name	Result	Test Date
Line #	Daily Total = #	
	Annual Leak Test 'Result'	Date Time

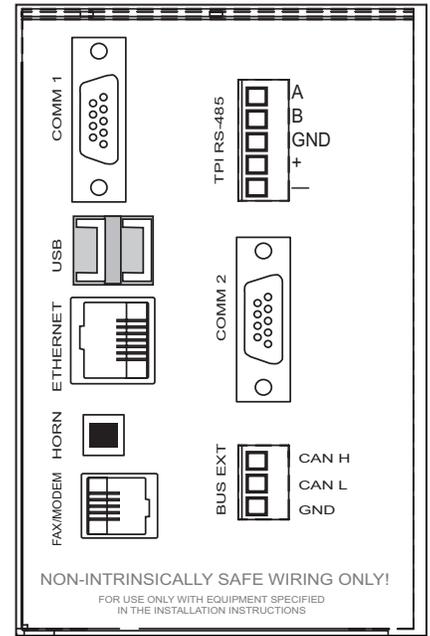
Web Browser Interface

One of the most powerful advantages of a T5 series console is its standard Ethernet port and ability to communicate with a web browser via web pages using standard XML (eXtensible Markup Language) protocols. The Web Browser Interface allows the Fuel Management System to directly connect to a PC through a local area network or high speed internet connection. Using Web Browser Interface, your console can be accessed from a PC with a web browser program (like Microsoft Internet Explorer version 6.0 or later). Contact your local Franklin Fueling Systems distributor for more information if you are not using this feature.

Using the Web Interface

To access the console using a remote PC you will need to know the IP address that has been assigned to it. This address should be provided by the installer. For direct connections not part of a network, the default IP address is 192.168.168.168. On your PC, open your internet browser and, in the address bar, enter the IP address of the console. The words Loading Page should appear in the upper left hand corner and data will begin to be transferred. You will probably want to bookmark (or add) this page to your Favorites in your browser.

Once the home page is loaded, you can navigate through the various web pages created by the console to view fuel management and compliance data, generate reports that can be printed from your PC and access control functions for starting tank and line tests and dealing with alarms. The information found in TSA (Tank Sentinel AnyWare) is the same data that can be accessed from the LCD touch screen.



Communication Ports

Navigating Pages

The Navigation Bars provide a list of pages that can be viewed. Clicking on each Primary choice will take you to a different page and update the list of Secondary Navigation choices. The current choice is always highlighted. On occasion, a third Navigation Bar will appear. The Data Window displays the appropriate information and the Action Bar allows you to perform certain control functions like generating reports and starting leak tests.

Home – Status Page

Primary Navigation Bar –
Displays top level navigation choices. The current choice is highlighted.

Secondary Navigation Bar –
Displays submenu choices dependent on Primary selection. The current choice is highlighted.

Access Level – Displays the current access level.

Data Window – Displays the appropriate data depending on what page is being viewed.

Action Bar – Lists possible actions that can be performed. Actions are dependent on Primary/Secondary choices.

TANKS														
Image	Manifold ID	Tank ID	Name	Product	Alarms	Level	Gross Volume	Net Volume	Ullage	Water Level	Temperature	Density	Net Dens	Mass
		1	Tank #1	Kerosene	0	1,330.34	284.92	284.92	231.88	0.00	60.00			544.00
		2	Tank #2	Regular	0	531.59	259.78	259.78	135.81	2.26	60.00			416.50
		3	Tank #3	Paraffinic	0	771.53	771.53	771.53	100.14	2.26	60.00			348.16

Available Pages

The following web pages can be browsed to in order to access data and perform various control functions. Some of the pages are dependent on the version of console and the options installed. Several pages and functions are access level controlled. If the Auto Refresh action is listed on the Action Bar of a page, then the data on the page does not refresh automatically. Click **Refresh** on your browser to update the page or click on **Auto Refresh** to do this continuously.

Home

Web Page	Description
Status	Displays alarm status for all applications.
Alarms	Shows a detailed list of all active Alarms and Warnings.
Reports	Generate Alarm and Application Event reports.
Configuration	Edit the access level passwords and IP information. (Administrator Only)
Registration	View the installed options.

System

Web Page	Description
Status	Lists the installed modules, their current status and version.
Alarms	Any active System Alarms and Warnings are displayed.
Reports	Generate System specific reports.

FMS

Web Page	Description
Status	Third Navigation line appears. Choose the device to show status of.
Tanks	Inventory information and tank alarm status.
Lines	Status of pump, line tests, learn mode and line pressure.
Sensors	Displays the description and status of all installed sensors.
Alarms	Lists all active FMS alarms and the date and time they occurred.
Control	Start line and tank tests, learn lines and sensors and auto configure sensors.
Compliance	Displays compliance information for all FMS tanks, lines and sensors.
Reports	Generate various FMS reports like Inventory, Delivery, Leak Tests, Regulatory.

Setup/Config

This menu is limited to administrator access only, and should only be used by a certified technician. See your Franklin Fueling Systems distributor for assistance.

Preferences

Modify the way that data is displayed, change the units of measure and adjust the Auto Refresh rate. These settings are stored on your PC and apply to its use only

How to Manually Start Leak Tests Using Web Browser Interface

1. Open your web browser and connect to the site.
2. On the Primary Navigation Bar, select **FMS**.
3. On the Secondary Navigation Bar, select **Control**.
4. Select **Tanks** or **Lines** depending on what type of test you wish to start.

Tank Leak Tests

1. Check the box next to the Tank(s) you want to test.
2. From the drop-box, select the type of test (**Monthly** or **Annual**) you want to perform for each tank, .
3. Click on **Start Leak Tests** on the Action Bar.

Line Leak Tests

1. Press the button for **Force Gross Leak Test** under the line you wish to test.

Routine Maintenance

As an end user/owner, there is a limited amount of maintenance that you may need to perform on the console. To keep the unit in good, serviceable condition, follow the procedures outlined below.

Warning  **Do not attempt to open the console unless you are a certified Franklin Fueling Systems technician. Electrical hazards exist and injury or death may occur if the console interior is accessed by unauthorized personnel.**

Console Care

Carefully wipe the outer areas of the console with a soft, damp cloth to remove any residue or build-up. Some chemicals may damage the protective cover on the LCD display. Avoid spraying the console with anything directly. Cords and cables routed from the inside and bottom of the console could contain electrical energy. Use caution in these areas to avoid shock. Ensure that data communications and electrical energy lines are segregated so that electrical interference will not be induced into data transmission lines, or erroneous data returns could result.

LCD Touch Screen

Calibration

If the touch screen does not appear to be accurately registering “touches,” it may need to be calibrated. To calibrate the touch screen function of the display, you must first access the calibration application*.

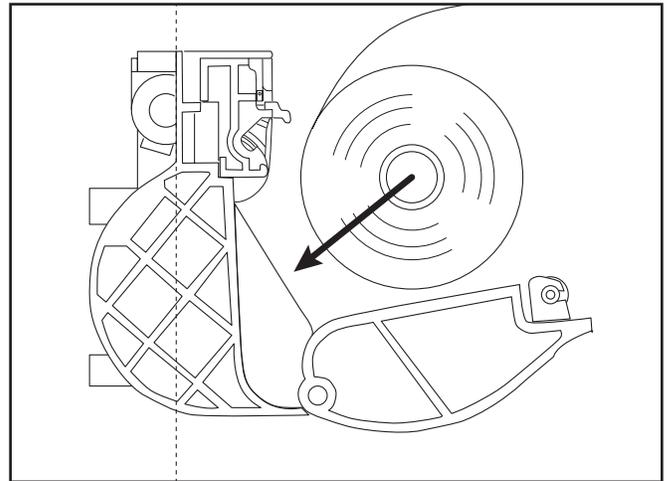
1. From the **Quick Jump Menu**, select **Utilities** and then select **Tools / Calibrate TouchScreen**.
2. You will be asked if “you are sure,” answer **Yes**.
3. Follow the on-screen instructions to complete the calibration process.

* **Note** - If you are unable to navigate to the Tools menu to calibrate you can reboot the TS-550/5000evo and wait for the Loading Status Bar to be full and press and hold the LCD touch screen for ten seconds. This will run the touch screen calibration.

Internal Printer

To Change Printer Paper

1. Lift up on the green panel to open the printer and load paper. Make sure the roll is oriented as shown.



Load Paper



Do NOT load paper from door,



Do NOT have paper wound loosely



Paper Loaded Correctly

2. Close the printer door.
3. 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)

List of Alarms and Troubleshooting

For all alarms conditions, the troubleshooting steps provided in this chapter are suggested actions to take in the event of an alarm. Follow all site policy procedures set by local governing agencies in the case of a spill, leak, or malfunction. If the steps provided by this manual or the site policy are followed and the system still requires additional support, contact Franklin Fueling Systems Technical Services.

Alarms are listed in sections for System Alarms, VRM Alarms, FMS Alarms, SCM Alarms, Wire Sensor Alarms, LLD Alarms, TPI Alarms, Printer Alarms and Miscellaneous Alarms.

System Alarms

Displayed Alarm / Warning	Device	Description	Recommended Actions
2-Wire Sensor Module is Offline	Slot	2-Wire Sensor Module is offline due to unknown causes.	Follow safety procedures before working inside of the console. Visually verify a steady, green "Run" light. If a red "Err" light is flashing or steady, try to reboot the system. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
2-Wire Sensor Module Setup Error	None	Programming errors made during setup of the 2-Wire Sensor Module.	Verify 2-Wire Sensor Module programming parameters. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
2-Wire Sensor module number mismatch	Slot	2-Wire Sensor Modules detected does not match the number programmed.	At startup check that the number of 2-Wire Sensor Modules installed matches the number programmed under System Configuration > Modules Expected. On machines that are in service: Check for a flashing green light or no light at all on the 2-Wire Sensor Module and contact FFS Technical Services for support.
3-Wire Sensor Module is Offline	Slot	3-Wire Sensor Module is offline due to unknown causes.	Follow safety procedures before working inside of the console. Visually verify a steady, green "Run" light. If a red "Err" light is flashing or steady, try to reboot the system. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
3-Wire Sensor Module Setup Error	None	Programming errors made during setup of the 3-Wire Sensor Module.	Verify 3-Wire Sensor Module programming parameters. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
3-Wire Sensor Module Mismatch	Slot	3-Wire Sensor Modules detected does not match the number programmed.	At startup check that the number of 3-Wire Sensor Modules installed matches the number programmed under System Configuration > Modules Expected. On machines that are in service: Check for a flashing green light or no light at all on the 3-Wire Sensor Module and contact FFS Technical Services for support.
4-20mA Module is Offline	Slot	4-20mA Module is offline due to unknown causes.	Follow safety procedures before working inside the console. Visually verify a steady green "Run" light. If a red "Err" light is flashing or steady, try to reboot system. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
4-20mA Module Number Mismatch	Slot	4-20 mA Modules detected does not match the number programmed.	Check that the number of 4-20mA Modules installed matches the number programmed under System Configuration > Modules Expected. Check for a flashing green light or no light at all on the 4-20mA Module and contact FFS Technical Services for support
4-20mA Module Setup Error	None	Programming errors made during setup of the 4-20mA Module.	Verify 4-20mA Module programming. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept.
4-20mA Input Error	Channel/ANA	Errors have been detected in the an analog input channel	If the input is not being used, set the programming to reflect proper input type. If the input is being used as an analog signal, inspect the wiring and redo connections.
AC Input Module is Offline	Slot	AC Input Module is offline due to unknown causes.	Follow safety procedures before working inside of the console. Visually verify a steady green "Run" light. If a red "Err" light is flashing or steady, try to reboot system. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
AC Input module number mismatch	Slot	AC Input Modules detected does not match the number programmed.	Check that the number of AC Input Modules installed matches the number programmed under System Configuration > Modules Expected. Check for a flashing green light or no light at all on the AC Input Module and contact FFS Technical Services for support.
AC Input Module Setup Error	None	Programming errors made during setup of the AC Input Module.	Verify AC Input Module programming parameters. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
AC Input Alarm	None	An input on the AC input module has been configured as an alarm and is active.	Check the programming and voltage inputs for the specified Input channel on the AC Input module.

Displayed Alarm / Warning	Device	Description	Recommended Actions
Controller Module is Offline	Slot	Controller Module is offline due to unknown causes.	Follow safety procedures before working inside the console. Visually verify a steady green "Run" light. If red "Err" light is flashing or steady try to reboot system. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
DIM module number mismatch	Slot	DIM modules detected does not match the number programmed.	Check that the number of DIM Modules installed matches the number programmed under System Configuration > Modules Expected. If problem persists, contact FFS Technical Services for support
Internal Error #1	System	There is an internal buffer error occurring in the gauge.	Contact FFS Technical Services for support
Invalid Configuration	None	The configuration that has been loaded is not valid.	Verify the file type of the configuration which is being uploaded
Invalid Registration	None	The registration that is loaded is not valid.	If you have upgraded the site before, use the upgrade tool to restore the former registration. If you have not upgraded the site before, contact FFS Technical Services for support.
IO Input Alarm	None	An input on the Input/Output module has been configured as an alarm and is active.	Check the programming and voltage inputs for the specified Input channel on the IO module.
IO Module is offline	Slot	The IO Module is not communicating with the Console	Inspect the IO module for error lights. If green light is flashing, recover the module. If the lights are off: Power down, remove/re-seat the module and power back up. If problem persists, contact FFS Technical Services for support
IO module number mismatch	Slot	IO Modules detected does not match the number programmed.	Check that the number of IO Modules installed matches the number programmed under System Configuration > Modules Expected. Check for a flashing green light or no light at all on the IO Module and contact FFS Technical Services for support.
IS Barrier Violation	None	Non-Intrinsically Safe module placed in IS area; or IS Barrier is removed.	Check the module configuration to ensure that a module has not been improperly placed. Power down and then remove/re-seat the IS barrier. If problem persists contact FFS Technical Services for support
LON module number mismatch	Slot	Lon Modules detected does not match the number of Lon Modules programmed.	Check that the number of LON Modules installed matches the number programmed under System Configuration > Modules Expected. If problem persists, contact FFS Technical Services for support. Also check that the Node ID does not conflict with another Node ID in the network
Power Supply Input Alarm	None	An input on the Power Supply has been configured as an alarm and is active.	Check the programming and voltage inputs for the specified Low Voltage Input channel on the Power Supply module.
Power Supply Module number mismatch	Slot	Power Supply Modules detected does not match the number programmed.	Check that the number of Power Supply Modules installed matches the number programmed under System Configuration > Modules Expected. Check for a flashing green light or no light at all on the Power Supply Module and contact FFS Technical Services for support
Power Supply Module is Offline	Slot	Power Supply Module is offline due to unknown causes.	Follow safety procedures before working inside the console. Visually verify a steady green "Run" light. If red "Err" light is flashing or steady try to reboot system. If the condition still exists, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
Power Supply Module Setup Error	None	Errors in the setup of the listed module.	The console may need to be reprogrammed.
Printer Module Number Mismatch	Slot	Printer Modules detected does not match the number programmed.	Check that the number of Printer Modules installed matches the number programmed under System Configuration > Modules Expected. If problem persists, contact FFS Technical Support.
Probe Module is Offline	Slot	Probe Module is not communicating with the console.	Follow safety procedures before working inside the console. Visually verify a steady green "Run" light. If red "Err" light is flashing or steady, re-seat module and reboot system. If the condition still exists, contact Franklin Fueling Systems' Technical Support for help on this issue.
Probe Module Number Mismatch	Slot	Probe Modules detected does not match the number of Probe Modules programmed.	Check that the number of Probe Modules installed matches the number programmed under System Configuration > Modules Expected. Check for a flashing green light or no light at all on the Probe Module and contact FFS Technical Services for support.
Probe Module Setup Error	None	Programming errors made during setup of the Probe Module.	Verify Probe Module programming parameters. If the condition still exists, contact Franklin Fueling Systems' Technical Support for help on this issue.
Relay Module is Offline	Slot	Relay Module is offline due to unknown causes.	Follow safety procedures before working inside the console. Visually verify a steady green "Run" light. If red "Err" light is flashing or steady try to reboot system. If the condition still exists, contact Franklin Fueling Systems' Technical Support for help on this issue.

Displayed Alarm / Warning	Device	Description	Recommended Actions
Relay module number mismatch	slot	Relay Modules detected does not match the number programmed.	Check that the number of Relay Modules installed matches the number programmed under System Configuration > Modules Expected. Check for a flashing green light or no light at all on the AC Input Module and contact FFS Technical Services for support.
Relay Module Setup Error	None	An error exists in the Relay Module configuration	Inspect the Relay Module setup configuration for possible errors. Pay particular attention to if the module is configured for 10amps or not.
Secondary Containment Monitor Setup Error	None	An error exists in the configuration of the Secondary Containment Monitoring Setup.	Inspect the Secondary Containment Monitor setup configuration for possible errors.
Set Date and Time	None	System detected an issue with the date and time	Check and set the system date and time.
System bus error	Slot	Data transfer errors occurred in the System Bus.	Upgrade to the latest version of firmware available at: www.franklinfueling.com
System Setup Error	None	There is an error in the Setup configuration.	Inspect the System setup configuration for possible errors.

FMS Alarms

Displayed Alarm / Warning	Device	Description	Recommended Actions
Alpha volume correction error	Tank	This error is caused by a programming mistake in the Special Products section.	Verify Special Product Alpha volume correction program parameters. Contact FFS Technical Services Department for assistance.
Annual Compliance Alarm	Any	The device listed has gone out of compliance	Pass a test or clear the alarm on the device.
Annual Compliance Warning	Any	The device listed has 7 days before it will go into a compliance alarm	Pass a test or clear the alarm on the device.
API volume correction error	Tank	This error is caused by a programming mistake in the Special Products section.	Verify Special Product API volume correction program parameters. Contact FFS Technical Services Department for assistance.
Correction table error	Tank	Level and Volume mismatch detected in Correction table programming.	Verify that all levels and volumes are entered accurately into the Correction Table programming.
Density float error	Tank	A communication error has occurred involving the density float.	Verify programming and contact FFS Technical Services for support.
Density error	Tank	The density of the product is not within specifications.	Enter setup and verify the information under density in the probe programming.
Float height error	Tank	This error could indicate that the wrong float type is installed or that a programming error has occurred.	Review probe programming for proper float type, number of floats in the tank. (This would be an idea time to clean the probe and floats).
Float Missing	Tank	Probe detects a lesser number of floats than programmed.	Review probe programming for correct number of floats. If correct then inspect probe shaft, floats, and float magnets. With the probes out of the tank, this would be an idea time to clean the probe and floats. If pressures meets requirements specified, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
FMS configuration error	None	Conflicts exist within FMS Application programming.	Verify FMS setting are correct in accordance with the site specifications.
High product level	Tank	Product level exceeded High limit set. Possible close to tank overflow condition	Acquire an accurate product level. If actual product level in tank does not match the consoles displayed current level, verify programming is correct.
High high product level	Tank	Product level exceeded High High limit set. Possible tank overflow condition.	Acquire an accurate product level. If actual product level in tank does not match the consoles displayed current level, verify programming is correct.
High product volume	Tank	The specified tank has reached the programmed High Product Volume.	Check product volume and compare to the programmed High Volume alarm Limit in the setup menu. Acquire an accurate product level and compare to the ATG. If levels differ, verify programming is correct. If alarm persists, contact FFS Technical Services for support.
High High product volume	Tank	The specified tank has reached the programmed High High Product Volume.	Check product volume and compare to the programmed High High Volume alarm Limit in the setup menu. Get an accurate product volume and compare to the ATG. If levels differ, verify programming is correct. If alarm persists, contact FFS Technical Services.

Displayed Alarm / Warning	Device	Description	Recommended Actions
High water level	Tank	Water level exceeded High limit set.	Verify programmed level. If water is too high consult you local site policy procedures for corrective actions.
High Water/Phase Sep	Tank	Water/Phase Separation has exceeded the High Limit set.	Remove Water/Phase Separated product form the tank.
Level error	Tank	Product level exceeds tank diameter due to an error in console of programming.	Verify tank, offset, and probe programming.
Line monitor disabled	Line	Specified line is not enabled, so line leak test will not be performed.	Verify line programming. If necessary enable line.
Low battery	Tank	Backup battery is low.	See Installation Guide for replacement instructions.
Low product volume	Tank/ Manifold	Product volume below Low limit set. The tank/manifold specified may be near empty.	Acquire an accurate product volume. If actual product volume in tank does not match the consoles displayed current volume, verify programming.
Low low product volume	Tank/ Manifold	Product volume below Low Low limit. The tank or manifold specified may be near empty.	Acquire an accurate product volume, and if does not match the consoles displayed current volume, verify programming.
Mag installation error	Sensor	The specified TSP-DMS has an installation error	Check the installation of the TSP-DMS, the sensor must be plumb. If installation is correct, then try to relearn the sensor. If the problem persist, the sensor may need to be replaced
Mag product alarm	Sensor	The specified TSP-DMS has detected product.	Inspect the sump for the presence of product.
Mag sensor configuration error	Sensor	An error has been detected in the configuration of the specified TSP-DMS.	Enter into the setup and inspect the TSP-DMS setup.
Mag sensor data error	Sensor	There is an error with the reported data from the specified TSP-DMS	Inspect wire connections at the Mag sensor. If the problem persists, contact FFS Technical Services for support.
Mag sensor float height error	Sensor	The float height has exceeded the limits as learned.	Inspect wire connections at the Mag sensor. If the problem persists, contact FFS Technical Services for support.
Mag sensor float missing	Sensor	The specified TSP-DMS is not reporting the level information for one or more float.	Inspect the Mag sensor for damage and redo the connections. If the Problem persists, contact FFS Technical Services.
Mag sensor missing	Sensor	The console is not receiving any information from the specified TSP-DMS.	Inspect wire connections at the Mag sensor. If the problem persists, contact FFS Technical Services.
Mag sensor not learned error	Sensor	The specified TSP-DMS was not properly learned.	Enter into the Control > Mag Sensor screen and have the console learn the sensor.
Mag sensor synchronization error	Sensor	The console is receiving incomplete or improperly timed data from the specified TSP-DMS	Inspect wire connections at the Mag sensor. If the problem persists, contact FFS Technical Services.
Mag water alarm	Sensor	The specified TSP-DMS has detected water.	Inspect the sump for water.
Mag water warning	Sensor	The TSP-DMS has detected water above the preset limit.	Inspect the sump for water.
Manifold Delivery Detected	Tank	A delivery has been detected on the specified manifold.	This is not an alarm and should only be a concern if there was not a delivery to the site at the specified date and time.
Manifold Gross Leak Detected	Tank	A leak in the specified manifolded tanks has been detected via a SCALD test. Suspect possible leak.	Review Tank Leak Test History and programming. Refer to page 22 for instructions on manually starting line leak tests.
Manifold Leak Detected	Tank	A leak in the specified manifolded tanks has been detected via a SCALD test. Suspect possible leak	Review Tank Leak Test History and programming. Refer to page 22 for instructions on manually starting line leak tests.
Manifold low product volume	Tank	The specified manifold has reached the programmed Low Product Volume	Check product volume and compare to the programmed Low Volume alarm Limit in the setup menu. Acquire an accurate product volume and compare to the ATG. If levels differ, verify programming is correct. If alarm persists, contact FFS Technical Services for support.
Manifold low low product volume	Tank	The specified manifold has reached the programmed Low Low Product Volume	Check product volume and compare to the programmed Low Low Volume alarm Limit in the setup menu. Acquire an accurate product volume and compare to the ATG. If levels differ, verify programming is correct. If alarm persists, contact FFS Technical Services for support.
Manifold Leak Detected	Tank	A leak in the specified manifolded tanks has been detected via a SCALD test. Suspect possible leak.	Review Tank Leak Test History and programming. Refer to page for instructions on manually starting line leak tests.

Displayed Alarm / Warning	Device	Description	Recommended Actions
Manifold Theft Detected	Tank	The specified manifold has entered Sentinel Mode and detects product leaving the tank that exceeds the programmed theft limits.	Verify programming and accurate level/volume readings.
Modem Error	None	Indicates that a modem malfunction has occurred.	Try to recycle power on the console. Verify modem programming. If the alarm does not clear, contact Franklin Fueling Systems' Technical Services Dept. for support on this issue.
Monthly Compliance Alarm	Any	The device listed has gone out of compliance	Pass a test or clear the alarm on the device.
Monthly Compliance Warning	Any	The device listed has 7 days before it will go into a compliance alarm.	Pass a test or clear the alarm on the device.
Net error	Tank	Product net levels exceed tank diameter	Verify tank, product offset and probe programming
No data available	System	A communication issue has occurred between the probe and the console	Check for proper probe programming at the console and inspect wire connections at the probe. If the problem persists, contact FFS Technical Services for support.
No probe detected	Tank	The Console is not receiving any communication from the probe.	Check for proper probe programming at the console and inspect wire connections at the probe. If the problem persists, contact FFS Technical Services for support.
Probe synchronization error	Tank	Communication between the probe and the Console is either incomplete or ill timed.	Check for proper probe programming at the console and inspect wire connections at the probe. If the problem persists, contact FFS Technical Services for support.
Product volume error	Tank	The Product Volume as reported by the probe has exceeded the limits of the tank.	Check for proper probe and tank programming at the console. If programming is correct, inspect the probe to ensure that the float is not stuck in the riser or is otherwise obstructed.
RTD table error	Tank	RTD distance error; Special Probe programming error.	Verify correct RTD programming. If issue still exists, inspect wiring to probe. If the condition still exists, contact Franklin Fueling Systems' Technical Services for support.
System memory error	System	The system has detected a low memory situation.	Contact FFS Technical Services for support.
Tank Gross Leak Detected	Tank	Tank Gross leak test detected tank. Suspect possible leak.	Review tank leak test history and programming. Refer to page 22 for instructions on manually starting line leak tests.
Tank Leak Detected	Tank	Tank leak detected. Suspect possible leak.	Review tank leak test history and programming. Refer to page 22 for instructions on manually starting line leak tests.
Tank Product Density High Limit Exceeded	Tank	The Product Density exceeds the programmed high limit.	Verify programming if correct this alarm may be an indication of improper density of the fuel.
Tank Product Density Low Limit Exceeded	Tank	The Product Density has exceeded the programmed low limit.	Verify programming if correct this alarm may be an indication of improper density of the fuel.
Tank SCALD Leak Detected	Tank	SCALD leak test detected tank leak. Suspect possible leak.	Review Tank Leak Test History and programming. Refer to page 17 for more information on SCALD tests.
Tank Delivery Detected	Tank	A delivery has been detected on the specified tank.	This is not an alarm and should only be a concern if there was not a delivery to the site at the specified date and time.
Tank Water/Phase Sep Float Disabled	Tank	The Phase Separation Water Float has been disabled in setup	Verify Phase Separation Water Float level and enable the float in setup.
Tank Theft Detected	Tank	Product used in Sentinel Mode exceeds theft limit set. Suspect theft, and then verify theft limit in programming.	Verify theft limit in programming. Also obtain an accurate product level and compare to inventory.
Temperature error	Tank	Special Probe RTD temperature error detected.	Verify correct RTD table programming. If problem still exists, suspect wiring or faulty probe.
Ullage error	Tank	Ullage reported has exceeded tank capacity.	Check for proper probe and tank programming at the console. If programming is correct, inspect the probe to ensure that the float is not stuck in the riser or obstructed. Bring the probe inside and wire directly to the gauge to eliminate possible problems with the field wiring.
Unstable probe	Tank	LL Liquid Level probes can send inconsistent data back to console.	Check for proper probe programming at the console and inspect wire connections at the probe. If the problem persists, contact FFS Technical Services for support.
Water volume error	Tank	Water volume has exceeded tank capacity.	Check for proper probe and tank programming at the console. If programming is correct, inspect the probe to ensure that the colored water float is on the bottom.

Displayed Alarm / Warning	Device	Description	Recommended Actions
SCM Alarms			
Containment Not Learned	SCM	The learning process has not been completed.	Refer to Secondary Containment Monitoring Installation and User's Guide 000-0528 for more information.
Containment Program Error Detected	SCM	An error has been detected in the containment programming.	
Containment Program Error Warning	SCM	An error has been detected in the containment programming	
Containment Pump Request Ignored	Engineering	The containment called for the STP to turn on but has not seen an increase in vacuum level.	
Failed to Hold Vacuum	SCM	The rate of vacuum decay faster than the learned rate.	
Failed to Reach Target Vacuum	SCM	6"hg could not be reached in the learned time.	
Low Vacuum	SCM	The vacuum level has dropped below 1"hg.	
Low Vacuum And Pump Request Ignored	Engineering	Low vacuum level due to Pump Request Ignored.	
Not Configured	SCM	Containment programming has not been completed	
Unstable Vacuum	SCM	Vacuum level is fluctuating at a rate that is inconsistent with the learned parameters.	
Vacuum Sensor Failed	SCM	The 4-20mA vacuum transducer has failed and is no longer detected	
Vacuum Too High	SCM	The vacuum level has reached above 10"hg	

Displayed Alarm / Warning	Device	Description	Recommended Actions
Wire Sensor Alarms			
SN2 Sensor On	ChannelSN2	Sensor shows alarm status.	Inspect location for presence of liquid. In the case of a leak, follow site policy procedures. If no liquid is present, and alarm still exists, sensor may be tripped on error. Check wiring continuity from sensor to console. Test sensor at console, trip sensor on purpose. Verify console terminal wiring. If issue still exists, inspect wiring to sensor. Contact Franklin Fueling Systems' Technical Services for support.
SN2 Fuse Blown	ChannelSN2	2-Wire Sensor Module fuse blown due to unknown causes.	The fuses on the Sensor boards are non-serviceable per UL listing standards. The module must be replaced if the fuse is blown.
SN3 Data Error	ChannelSN3	Console has received erroneous data from sensor.	Check wiring continuity from sensor to console. Test sensor at console, trip sensor on purpose. Verify console terminal wiring. If issue still exists, inspect wiring to sensor. If the condition still exists, contact Franklin Fueling Systems' Technical Services for support.
SN3 Dry Well	ChannelSN3	Monitoring well is dry.	Visually verify that the alarm is correct.
SN3 Fuse Blown	ChannelSN3	3-Wire Sensor Module fuse blown due to unknown causes.	The fuses on the Sensor boards are non-serviceable per UL listing standards. The module must be replaced if the fuse is blown.
SN3 High Brine	ChannelSN3	Brine solution has tripped high level brine sensor.	Verify actual level of solution and sensor installed location.
SN3 Low Brine	ChannelSN3	Brine solution has tripped low level brine sensor.	Verify brine level and sensor location.
SN3 ID Error	ChannelSN3	Discriminating sensor is given an improper ID.	Verify sensor programming and Auto configuration.
SN3 No Signal	ChannelSN3	Console is not receiving data from a discriminating sensor.	Verify programming of sensor type and wiring connection.
SN3 Product	ChannelSN3	Discriminating sensor has detected product present at location.	Visually inspect location carefully for presence of liquid. In the case of a leak, follow site policy procedures. If no liquid is present, and alarm still exists, sensor may be tripped on error. Check wiring continuity from sensor to console.
SN3 Pwr Short	Slot	3-Wire sensor malfunction.	If a 2-Wire sensor is used on a 3-wire module ensure that the red /pwr terminal is not used. If a 3-wire sensor is used, disconnect wires and see if alarm clears. If alarm clears inspect shorts in wiring. If alarm stays at PWR short replace module. Contact Franklin Fueling Systems' Technical Services Dept. for support.
SN3 Sensor On	ChannelSN3	Discriminating sensor shows alarm status.	Inspect location for presence of liquid. In the case of a leak, follow site policy procedures. If no liquid is present, and alarm still exists, sensor may be tripped on error. Check wiring continuity from sensor to console. Test sensor at console, trip sensor on purpose. Verify console terminal wiring. If issue still exists, inspect wiring to probe. If the condition still exists, contact Franklin Fueling Systems' Technical Services for support.
SN3 Sump Full	ChannelSN3	3-wire sensor detected sump full of liquid.	Inspect location for presence of liquid. In the case of a leak, follow site policy procedures. If in alarm with no liquid is present, sensor may be tripped on error. Check wiring continuity from sensor to console.
SN3 Sync Error	ChannelSN3	3-wire sensor data signals not in sync with module.	Verify correct wiring and re-make the connections. Verify sensor type.
SN3 Vapor	ChannelSN3	3-wire discriminate sensor detecting vapors at location.	Visually inspect area for product presence. Verify the vapor level has been calibrated correctly.
SN3 Water	ChannelSN3	3-wire discriminate sensor detecting water at location.	Visually inspect area for water presence.

Displayed Alarm / Warning	Device	Description	Recommended Actions
Line Leak Detector (LLD) Alarms			
0.1 GPH Compliance Expired	Line	A 0.1 gph test has not been completed within the last 365 days.	Verify that no pertinent alarm conditions have been reoccurring. Ensure that there is enough time to pass the test.
0.2 GPH Compliance Expired	Line	A 0.2 gph test has not been completed within the last 30 days.	Verify that no pertinent alarm conditions have been reoccurring. Ensure proper seating pressure. If Firmware revision is older than 1.7.4.5535, upgrade to make use of the Statistical Line Leak Detection enhancement.
3 GPH Compliance Expired	Line	The required daily 3GPH test has not been completed.	Check for continuous pump on conditions that could be caused by a sticky handle switch or relay.
Air in Line	Line	Air has been detected in the line.	Purge all air from the line starting at the furthest dispenser and working in toward the STP. Verify tightness of lines and investigate other sources for air infiltration.
Dispensing Pressure Test Failed	Line	Pressure during dispensing dropped below 7.5 psi. This is seen as a catastrophic leak during dispensing.	Inspect all sumps for product. Use a pressure gauge to test line pressure during dispensing. See "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145. Contact Franklin Fueling Systems' Technical Services Dept. for support.
Extended Hook Signal	Line	A hook signal has been detected for more than 60 minutes with the line pressure staying the same.	Check for voltage to the AC-Input module. If issue still exists contact Franklin Fueling Systems' Technical Services Dept. for support.
Failed to Catch Pressure	Line	The pump OFF pressure has dropped below 7 psi within 1 second after the pump was turned off	Inspect all sumps for product. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.
Failed to Pressure Up	Line	The Line has called for the pump to turn on but did not see the pressure increase	Inspect all sumps for product. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.
Gross Leak Detected	Line	The console has detected a line leak greater than 3gph.	Inspect all sumps for product. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.
High Pump Pressure	Line	The Pump Off pressure has stayed above 49 psi for 3 consecutive times.	Inspect all sumps for product. Ensure that no other check valves are used within the system. Observe multi-point line pressure readings during pump on and off using a pressure gauge in the line. If line pressure is high, there may be a blockage in the line. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.
Line is not configured	Line	Specified line is not configured, therefore line leak test will not be performed.	Verify line programming. If necessary configure line.
Line Not Learned	Line	Specified line not learned.	Complete learn process, if any learn alarms occur follow the proper procedure. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.
Line Program Error Detected	Line	An error has been detected in the programming of the specified line.	Verify programming of line under the setup menu.
Line Pump Request Ignored	Engineering	The line has called for the pump to be turned on but another application is currently using the STP	Verify that other applications are operating properly. Contact Franklin Fueling Systems' Technical Services Dept. for support.
Marginal Pass of Gross Leak Test	Line	The last passed gross test detected a leak just under the 3gph threshold.	Verify there is no sign of leaks within any of the sumps. Run additional tests. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.
Monthly Leak Test Failed	Line	The Console has detected a line leak greater than 0.2gph.	Inspect all sumps for product. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.
Not Enabled	Line	Line testing has not been enabled.	Verify no other alarm is present then enter the line control menu and enable the line testing feature.
Precision Leak Test Failed	Line	0.1 GPH Line leak test failed.	Follow site policy on line leak procedures.
Pressure Transducer Fail	Line	The transducer is not being detected by the console.	Inspect the wiring to the specified transducer and the channel it terminates at. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.
Sudden Pressure Loss	Line	During a 45 minute quiet period the pressure was seen to drop by a 2 times the learned 3gph slope.	Inspect all sumps for product. Refer to "LS500 Auto Learn Line Leak Detection Installation & User's Guide" FFS 000-2145 for more information.

Displayed Alarm / Warning	Device	Description	Recommended Actions	
TPI Alarms				
Capacitor Failing	TPI	The STP controller is reporting a capacitor failure.	Refer to the applicable Smart controller Installation guide for details.	
Clogged Intake	TPI	The STP controller has reported a dry run condition but the associated tank shows a product level above the intake.	Ensure proper programming of the TPI and calibration of the Smart Controller. If correct, check for an obstruction on the PMA.	
Communication Failure	TPI	Communication from the TPI to the STP controller has failed. The Console is seeing the controller but the controller is not responding to commands.	Verify all wiring connections. Call FFS Technical Services Department for support.	
Controller Type Error	TPI	The programmed controller type does not match what the console is detecting.	Verify proper programming of the TPI as well as the Smart controller type and address.	
Dry Tank	TPI	The STP Controller has reported a dry run condition and the tank level is at or below the programmed intake.	Ensure proper programming of the TPI and calibration of the Smart Controller. If correct, add fuel.	
Extended Run	TPI	The STP controller is reporting an extended run condition.	Refer to the applicable Smart Controller Installation guide for details.	
Hardware Fault	TPI	The STP controller is reporting is reporting a hardware fault condition.		
High Temperature	TPI	The STP controller is reporting a high temperature condition.		
Locked Rotor	TPI	The STP controller is reporting a locked rotor rating.		
Not Calibrated	TPI	The STP controller is reporting that it has not been calibrated.		
Open Circuit	TPI	The STP controller is reporting an open circuit condition.		
Over Speed	TPI	The STP controller is reporting an over speed condition.		
Over Voltage	TPI	The STP controller is reporting an over voltage condition.		
Pump Communication Fail	TPI	Communication from the TPI to the STP controller has failed.		Check all wiring connections and ensure that there is power supplied to the Smart Controller.
Pump In Water	TPI	The water level has risen to within 3 inches of the programmed intake level.		Ensure proper programming of the TPI and calibration of the Smart Controller. If correct, have water removed from the tank
Relay Fault	TPI	The STP controller is reporting a relay fault error.	Refer to the applicable Smart Controller Installation guide for details.	
Short Circuit	TPI	The STP controller is reporting a short circuit condition.		
Unbalanced Load	TPI	The STP controller is reporting an unbalanced load condition.		
Unbalanced Voltage	TPI	The STP controller is reporting an unbalanced voltage condition.		
Under Voltage	TPI	The STP controller is reporting a voltage level under 200VAC.		
Under Load	TPI	The STP controller is reporting an underload condition.		
Unknown Fault	TPI	The STP controller is reporting an unknown fault code.	Check fault condition on Smart controller and contact FFS Technical Services for more information	

Printer Alarms

Check Printer	Printer	Printer is out of paper, or the printer door is open.	Make sure the printer has paper, and the printer door is closed completely.
Printer Head Temperature	Printer	Print head high temperature persists for at least 2 minutes	Printer will resume printing and the alarm will clear after a short cool-down period. Keep the console area cool and ventilated. If the alarm does not clear, contact FFS Technical Support.
Printer Motor Temperature	Printer	Printer motor has exceeded temperature limit	Allow printer to cool. Keep the console area cool and ventilated. If the alarm does not clear, contact FFS Technical Support.

Appendix C – Third Party Certifications

Issue Date: November 22, 1995
Revision Date: February 28, 2006

Franklin Fueling Systems

TS-750, TS-1000, TS-1001, TS-2001, TS-5, TS-608, TS-550, TS-5000
(INCON Magnetostrictive Probe)

AUTOMATIC TANK GAUGING METHOD

Certification	Leak rate of 0.2 gph with PD = 95.7% and PFA = 4.3%. Leak rate of 0.1 gph with PD = 99.9% and PFA = 0.1%.
Leak Threshold	0.1 gph for leak rate of 0.2 gph. 0.05 gph for leak rate of 0.1 gph. A tank system should not be declared tight if the test result indicates a loss or gain that equals or exceeds this threshold.
Applicability	Gasoline, diesel, aviation fuel, fuel oil #4. Other liquids with known coefficients of expansion and density may be tested after consultation with the manufacturer.
Tank Capacity	Maximum of 30,000 gallons for leak rate of 0.2 gph. Maximum of 15,000 gallons for leak rate of 0.1 gph. Tanks less than 95% full may be tested. Minimum product level required based on tank diameter is as follows: 48" dia/min 12"; 64" dia/min 14"; 72" dia/min 15"; 96" dia/min 17.5"; 126" dia/min 21.5". For other tank diameters, see evaluation report.
Waiting Time	Minimum of 4 hours 9 minutes between delivery and testing for leak rate of 0.2 gph. Minimum of 5 hours 18 minutes between delivery and testing for leak rate of 0.1 gph. None between dispensing and testing. There must be no delivery during waiting time
Test Period	Length of the test is determined automatically based on quality of test data. Average data collection time during evaluation was 6 hours, 51 minutes for leak rate of 0.2 gph. Average data collection time during evaluation was 5 hours 44 minutes for leak rate of 0.1 gph. Test data is acquired and recorded by system's computer. Leak rate is calculated from data determined to be valid by statistical analysis. There must be no dispensing or delivery during the test.
Temperature	Probe contains 5 thermistors to monitor product temperature. At least one thermistor must be submerged in product during testing.
Water Sensor	Must be used to detect water ingress. Minimum detectable water level in the tank is 0.208 inch. Minimum detectable water level change is 0.011 inch.
Calibration	Thermistors and probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.

Comments

Not evaluated using manifolded tank systems. Therefore, this certification is only applicable when there is a probe used in each tank and the siphon is broken during testing.

Tests only portion of tank containing product.

As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected. EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

TS-1000 and TS-1001 can support up to 4 tanks.

TS-2001 can support up to 8 tanks.

TS-5 can support up to 12 tanks.

TS-608 can support up to 8 tanks.

TS-550 and TS-5000 can support up to 72 tanks.

TS-750 can support up to 4 tanks, but does not provide fuel logistics, remote monitoring and other business management options available with TS-1000, TS-1001 and TS-2001.

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Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494
Dates of Evaluation: 08/05/92, 09/05/97,
05/14/98, 08/21/02, 01/18/06

From the National Work Group on Leak Detection (NWGLDE) web site. 20 Feb. 2007.

<http://www.nwglde.org/evals/franklin_fueling_c.html>

Franklin Fueling Systems

**TS 750, 1000, 1001, 2000, 2001 with SCALD 2.0, TS-5, TS-608, TS-550, TS-5000
(INCON TSP-LL2 Magnetostrictive Probe)**

CONTINUOUS IN-TANK LEAK DETECTION METHOD (CONTINUOUS AUTOMATIC TANK GAUGING)

Certification	Leak rate of 0.2 gph with PD > 99% and PFA < 1%.
Leak Threshold	0.10 gph for single and manifolded tank systems. A tank system should not be declared tight and a message printed for the operator, if the test results indicate a loss or gain that exceeds this threshold.
Applicability	Gasoline, diesel, aviation fuel, fuel oil #4. Other liquids with known coefficients of expansion and density may be tested after consultation with the manufacturer.
Tank Capacity	Maximum of 49,336 gallons for single tanks and for all tanks manifolded together. Tank must be between 14 and 93.5% full.
Throughput	Monthly maximum of 257,818 gallons.
Waiting Time	None between delivery and data collection when difference between product in tank and product delivered is 6.0 degrees F or less.
Test Period	Data collection time ranges from 5 to 28 days. Data sampling frequency is > 1 per second. System collects data at naturally occurring product levels without interfering with normal tank operation, and discards data from unstable periods when system performs test.
Temperature	Average for product is determined by a minimum of 5 thermistors.
Water Sensor	Must be used to detect water ingress. Minimum detectable water level in the tank is 0.208 inch. Minimum detectable change in water level is 0.011 inch.
Calibration	Thermistors and probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.
Comments	System reports a result of "pass" or "fail". Evaluated using both single and manifolded tank systems with probes in each tank. Tests only the portion of the tank containing product. As product level is lowered, the leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected. EPA leak detection regulations require testing of the portion of the tank system which routinely contains product. TS 750, 1000 and 1001 can support up to 4 tanks. TS 2000 and 2001 can support up to 8 tanks. TS 5 can support up to 12 tanks. TS 608 can support up to 8 tanks. TS 550 and 5000 can support up to 48 tanks. TS 750 and 2000 do not provide fuel logistics, remote monitoring and other business management options available with TS 1000, 1001, and 2001.

The database for evaluation of the system includes sites with vapor recovery and blending dispensers.

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Evaluator: Ken Wilcox Associates
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Dates of Evaluations: 07/11/2003, 03/18/06

From the National Work Group on Leak Detection (NWGLDE) web site. 20 Feb. 2007.

<http://www.nwglde.org/evals/franklin_fueling_e.html>

Franklin Fueling Systems

TS-LS500 Series (for Rigid and/or Flexible Piping)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification	Leak rate of 3.0 gph at 10 psi* with PD = 100% and PFA = 0%. Leak rate of 0.2 gph at operating pressure with PD = 100% and PFA = 0%. Leak rate of 0.1 gph at 1.5 times operating pressure* with PD = 100% and PFA = 0%. *Since leak rate varies as a function of pressure, this leak rate and pressure were certified using an equivalent leak rate and pressure, in accordance with an acceptable protocol.
Leak Threshold	1.5 gph for leak rate of 3.0 gph. 0.1 gph for leak rate of 0.2 gph. 0.05 gph for leak rate of 0.1 gph. A pipeline system should not be declared tight if the test result indicates a loss that equals or exceeds this threshold.
Applicability	Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, kerosene. Other liquids may be tested after consultation with the manufacturer.
Specification	On pressurized rigid, flexible, or combination rigid and flexible pipelines, system can perform 3.0 gph, 0.2 gph, and 0.1 gph tests. Tests are conducted at operating pressure.
Pipeline Capacity	Maximum of 312.2 gallons for steel and fiberglass pipelines (examples: 480 feet of 4 inch line; 671 feet of 3 3/8 inch line). Maximum of 95.4 gallons for flexible pipelines (examples: 260 feet of 3 inch line; 1040 feet of 1 1/2 inch line). Maximum of 415.8 gallons for combination rigid and flexible pipelines (the capacity of the flexible component cannot exceed 95.4 gallons).
Waiting Time	None between delivery and testing. None between dispensing and testing for leak rate of 3.0 gph. Depending on temperature stability, 1 1/2 to 10 hours between dispensing and testing for leak rates of 0.2 gph and 0.1 gph.
Test Period	Response time is 1 to 2 minutes for leak rate of 3.0 gph. Minimum of 25 minutes for leak rate of 0.2 gph. Minimum of 34 minutes for leak rate of 0.1 gph. Test data are acquired and recorded by a microprocessor.
System Features	Permanent installation on pipeline. Automatic testing of pipeline every 45 minutes for leak rate of 3.0 gph. Automatic testing of pipeline when pump has been idle for 2 hours for leak rate of 0.2 gph. Automatic testing of pipeline when pump has been idle for 3 1/2 hours for leak rate of 0.1 gph. Pump shutdown, indicator light and alarm activation if leak is declared for 3.0 gph and 0.2 gph tests.
Calibration	System must be checked annually and, if necessary, calibrated in accordance with manufacturer's instructions.

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From the National Work Group on Leak Detection (NWGLDE) web site. 20 Feb. 2007.

<http://www.nwglde.org/evals/franklin_fueling_e.html>

Franklin Fueling Systems

Secondary Containment Monitoring (SCM) Incon TS-SCM and EBW AS-SCM

CONTINUOUS INTERSTITIAL TANK SYSTEM MONITORING METHOD (PRESSURE/VACUUM)

Certification:

Certified as equivalent to European leak detection standard EN 13160-2, Part 2, as a Class I leak detection system.

Operating Principle:

System uses vacuum generated by the turbine pump to continuously maintain a partial vacuum within the interstitial space of double-walled tanks and double-walled piping.

System is designed to activate a visual and acoustic alarm, and optional turbine pump shutdown before stored product can escape to the environment.

System is capable of detecting breaches in both the inner and outer walls of double-walled tanks and double-walled piping.

Alarm Condition:

System alarms when a liquid or air leak occurs which causes the interstitial vacuum to decrease (pressure to increase) and the system is unable to maintain minimum vacuum.

System will also alarm if the interstitial vacuum level decreases at a rate exceeding manufacturer's allowable values.

Allowable values are based on an "AutoLearn line leak algorithm." The unit will record two curves (up curve and down curve) while a calibrated leak orifice is connected to the interstitial space being monitored. The "up" curve is learned while the vacuum pump is on and evacuating the interstice. The "down" curve is learned when the vacuum pump is off and interstitial vacuum is decaying. During normal operation when the vacuum level is between the upper and lower limits, the system is continuously comparing vacuum decay rates to the learned curves stored in memory.

Applicability:

Underground double-walled tank, connected double-walled piping, and other connected interstitial spaces storing gasoline, gasohol, diesel, heating oil #2, kerosene, aviation fuel, motor oil, water.

EN13160-2 requires the use of separate monitoring systems for separate USTs.

Manufacturer's Specifications:

Alarm will activate when interstitial vacuum decreases to approximately 1 psi vacuum (approx. 2"Hg).

Normal operating vacuum for the system is between 2"Hg and 6"Hg.

System does not restrict the vacuum source to 85±15 liters/hour flow rate at the "Alarm On" vacuum level.

Volume of monitored interstitial space must not exceed 8 m³ (2114 gal) for tanks and 10 m³ (2642 gal) for piping.

When monitoring double-walled tanks, the system does not require a liquid stop valve, a condensate trap or liquid sensors. Since the vacuum line is connected to the pump siphon port, any liquid in the vacuum line will be returned to the tank.

Suction line must be located at lowest point of interstitial space.

Calibration:

Functional and operational safety tests should be performed in accordance with manufacturer's instructions.

Initial calibration with known leak is performed at system installation, using an orifice supplied by the manufacturer.

Comments:

Interstitial space is tested continuously.

Vacuum source is the submerged turbine pump siphon port.

Presence of a water table above the leak point will allow water to enter the interstice rather than air or vapor.

The water would be detected in the same manner as fuel.

This system may not be compatible with all secondarily contained tanks and/or piping. Always consult with the tank and/or piping manufacturer and the manufacturer's applicable recommended installation practices before installing this system, or damage may be caused to the tank or piping by its use.

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<http://www.nwglde.org/evals/franklin_fueling_e.html>

INCON[®]



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