

Fuel Management System

Operator's Guide

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Important Safety Messages


Integritas (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. 650I 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 650I series console or attached components should only be performed by a qualified, factory-trained technician.

Certified Programmer/Service Person: Only an TOKHEIM 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.

650I Series Fuel Management Systems Installation Guide (000-2150)
650I Series Fuel Management Systems Programming Manual (000-2142)

Introduction

The purpose of this manual is to guide installers, operators and technicians through the operation of a 650I series console. The 650I series consoles incorporate 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 650I Fuel Management System consists of an open architecture, modular console that can run multiple Fuel Management Applications simultaneously. It typically contains an 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. 650I series consoles combine the power and flexibility of computer-based open architecture with a high speed modular bus design.

Note: The 650I comes standard with an LCD touch screen display and does not accommodate for an internal printer. An internal printer and touch screen display are optional on all other systems.

Definitions and Acronyms

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

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

TS-ACI – 12 input, AC Input Module

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

AST – Aboveground Storage Tank

CARB – California Air Resources Board

TSSP-CM – Controller Module

Console – The enclosure that houses the Modules.

DHI – Dispenser Hook Isolation

TS-DIMIB – Dispenser Interface Module

DW/DWT – Double Wall/Double Wall Tank

EVR – Enhanced Vapor Recovery

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 650I 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

PC – Personal Computer

TS-PRB – Probe Module (Intrinsically Safe)

TSSP-PS – Power Supply Module

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.

TS-RLY – Relay Module

STP – Submersible Turbine Pump

TPI – Turbine Pump Interface

TS-EMS – Environmental Monitoring System

TS-EXPC – Expansion Console

USB – Universal Serial Bus

UST – Underground Storage Tank

VRM – Vapor Recovery Monitoring

XML – eXtensible Markup Language

Applications

Applications are programs designed to function as a platform for specific Inputs/Outputs. There are two different applications available to the 650I series consoles:

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.

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 (infrared and conductivity, liquid and vapor sensor)

TSP-HIS – Hydrostatic Interstitial Sensor (float switches, liquid level 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)

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. 650I consoles are not compatible with the TS-EXPC 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, USB port (for external printer only), 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. I/O ports include 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 650I series console to a TS-EXPC Expansion Console.

Optional Modules

- 2-Wire Sensor Module Provides 12 inputs for 2-wire Standard sensors.
- 3-Wire Sensor Module Provides 8 inputs and supports both 3-wire and 2-wire sensors.
- 4-20 mA Input Module Provides 8 inputs that can be used for TS-LS500 line leak detection transducers.
- 4-20 mA EXP Explosion-proof module. Otherwise the same as the 4-20 mA Input Module.
- AC Input Module Provides 12 inputs for dispenser hook signals, which are also required for LLD. This module replaces external DHI boxes.
- Probe Module Provides 12 inputs (8 in the) for LL2 probes.
- Relay Module 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.
- 10-Amp Relay Module Provides 6 relay outputs which are typically used to control the submersible pump relays to provide pump or dispenser positive shutdown upon alarm conditions.
- Input / Output Module 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 on the left side of 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 optional LCD touch screen (standard on the 650I ()) is the most commonly used user interface for the Fuel Management System. This bright 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 Preferences 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  to 

Optionally they may:

- 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 *650I Series Programming Manual* (000-2142).

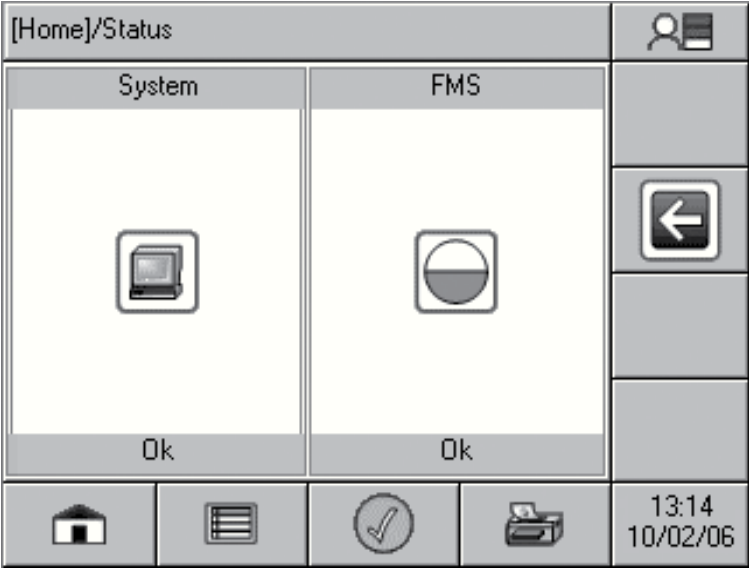
Basic Console Operation

Once the Fuel Management System has been installed, programmed and tested, you will interact with the system via the LCD touch screen and printer or the Web Browser Interface via a PC. This section of the manual will describe the operation of the console using a touch screen. Information on the Web Browser Interface can be found in later chapters.

LCD Layout

The LCD interface is designed so that a user may navigate the system with ease. Manageable applications allow the user to modify programming options by responding to on-screen commands. The following instructions will give you a good feel for the operating system functions, so that issues can be corrected efficiently without interrupting dispensing or sales.

To navigate the console, it's necessary to become familiar with the layout of the LCD and its graphical icons.

Path Bar – Shows the path/description of information displayed.		User Role – Displays the access level of the current user (determined by the password input).
Application Window – Displays the current application content.		Back – Returns you to the previous screen. Date/Time – The current date and time. This will let you configure Time/Date settings.
Main Menu – Access the Application Menu.	Status – Displays a checkmark for OK or an exclamation for alarm. If an alarms exist, pressing this will bring you to an alarms page.	Print Report – Pressing this button will take you to a menu of reports .

Home Row

The buttons along the bottom row of the LCD touch screen (see above for details) are always present and will always take you to the same location.

Navigation Buttons

The buttons on the right side of the LCD touch screen will appear when applicable and are for navigating through the various menu items in the different applications.



Application Menu : Once an application has been selected, this button will take you to the menu choices for that application.



Back : This button will take you to the previous screen.

Scroll Up : When this button appears on the right side of the screen, it indicates that more menu options are available above your current viewable threshold; pressing this button will scroll up through the options.

Scroll Down : When this button appears on the right side of the screen, it indicates that more menu options are available below your current viewable threshold; pressing this button will scroll down through the options.

Data Entry


If you are prompted to enter information, a keypad and edit buttons will be displayed.




Character Selection : Selects between upper case letters, lower case letters and numerals. *The characters on the keypad will change as you scroll through the options.*




Backspace : Deletes the previous character.



Clear : Deletes all of the data on the entry line.



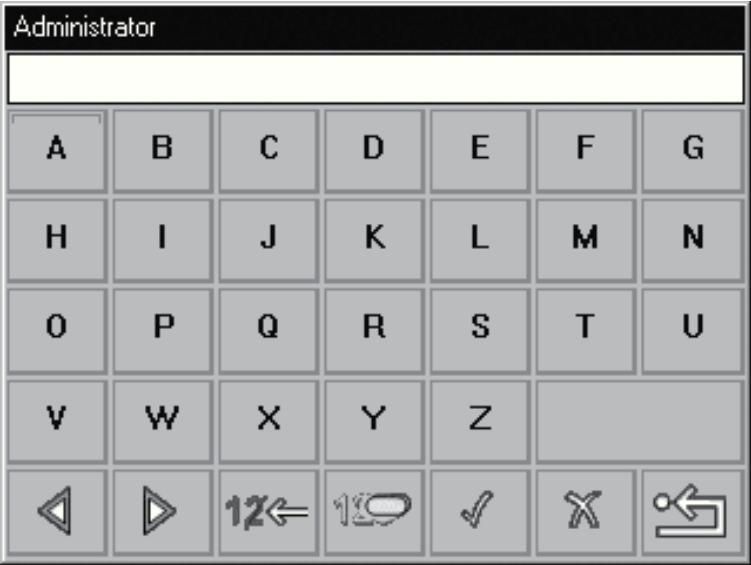
Enter : Allows the data to be accepted. When this button is pushed, the configuration will be set for the item you are changing.



Cancel : Will return to the application you were changing. No changes will be made to console settings.




Restore Default : This button will restore the original settings programmed into the console during manufacture.




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 TOKHEIM certified technician.

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.



One white bar operates at the 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.



Two white bars operates at the 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.



Three white bars operates as an ADMINISTRATOR. This level grants access to all areas of programming and setup configuration. The administrator privilege is usually reserved for TOKHEIM certified technicians.

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.

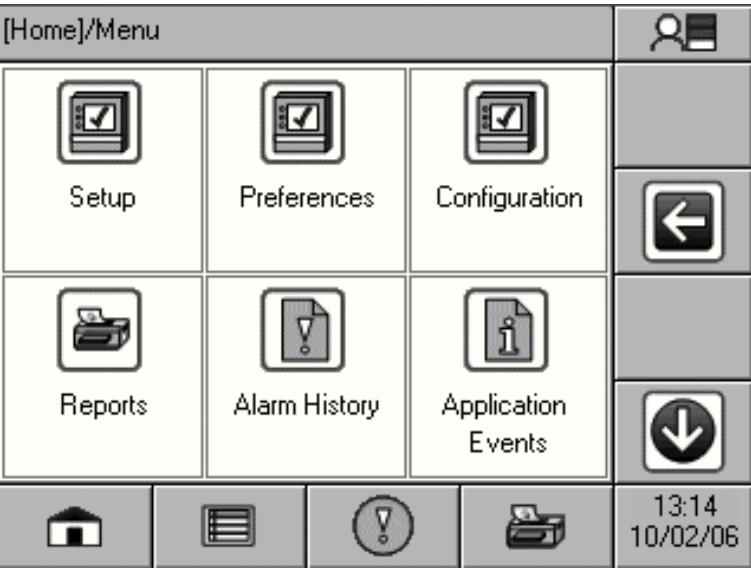
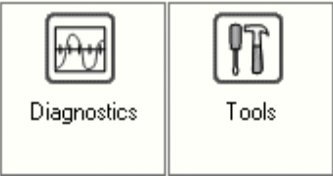
Serial Number – Located on a sticker on the left side panel (along with Model number).

Options – To see what Applications and Options the system is running, press **System Application > Application Menu** (button) > **Options** .

Main (Home) Menu Options

The Main Menu button will take you to the Home/Menu screen where you can select from several different options. The first six are displayed; use the Down button to see the rest of the choices.

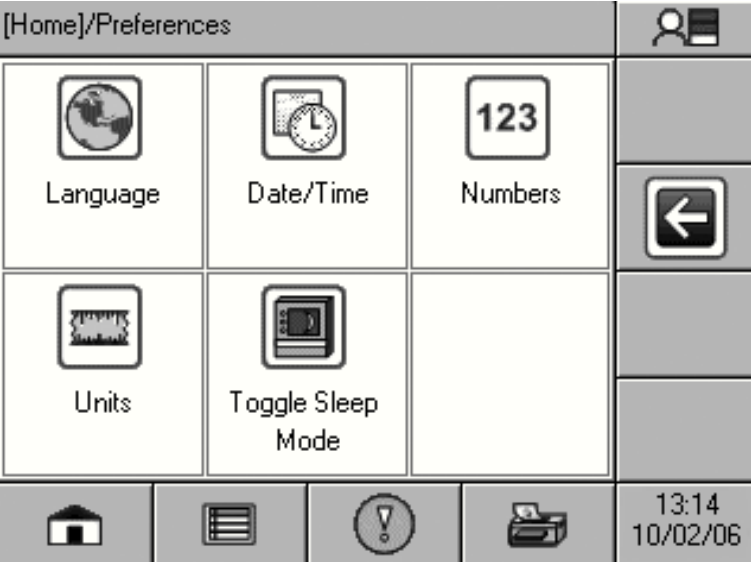
- Setup Performing console setup and programming (Administrator Use Only).
- Preferences Configure the way information will be displayed.
- Configuration Set certain system parameters.
- Reports Print various reports when an optional printer is attached.
- Alarm History Displays a list of alarms that have occurred.
- Application Events Displays a list of all application events.
- Diagnostics Functions to check and test the operation of the system.
- Tools For resetting and controlling the console.



Preferences Menu

Use the Preferences Menu to configure:

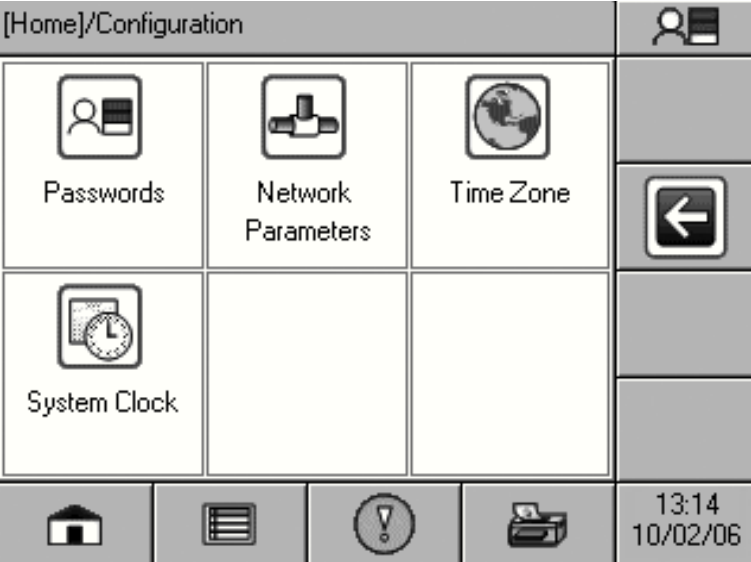
- Language Displayed language for console applications.
- Date/Time Set the date/time formats.
- Numbers Format the way numbers will be displayed.
- Units Select from different units of measurement.
- Sleep Mode Turn the screen saver mode off and on.



Configuration Menu

Use the Configuration Menu to configure:

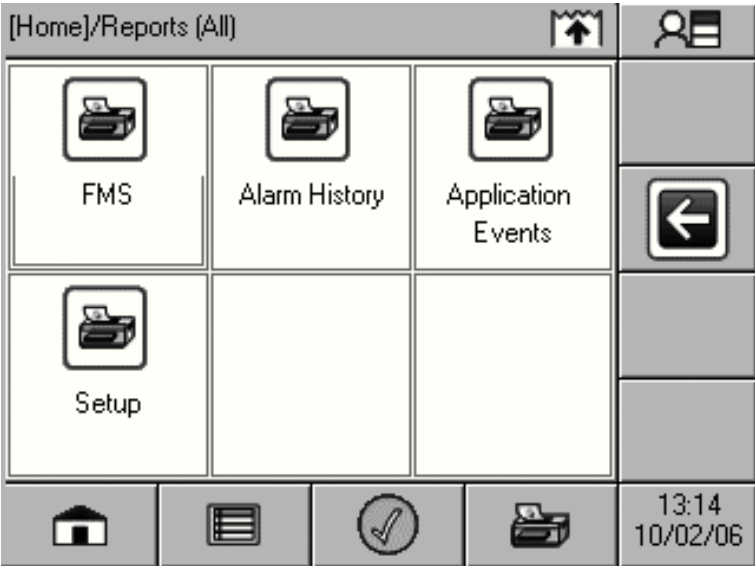
- Passwords Set the passwords for all access levels (Administrator Use Only).
- Network Parameters Configure IP connection settings (Ethernet connection).
- Time Zone Set the system’s time zone.
- System Clock Set the system date and time.



Reports Menu

Use the Reports Menu to generate a variety of reports and access report menus for all available applications.

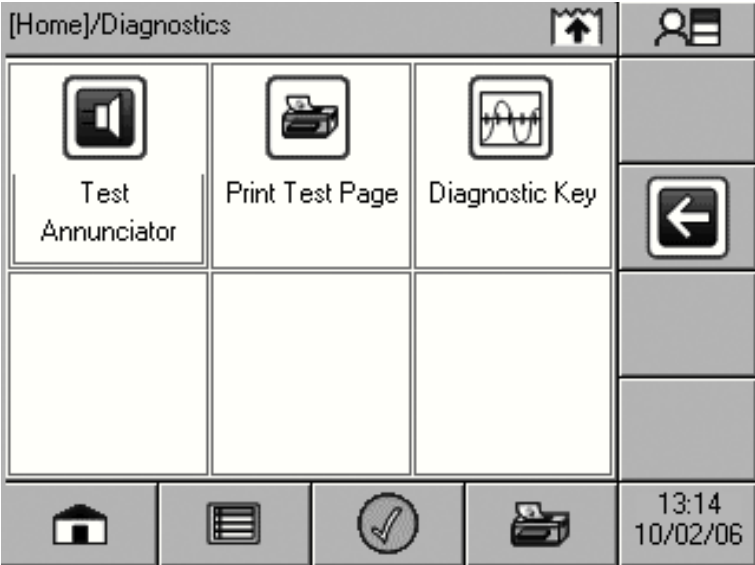
- Alarm History Print a history of alarms.
- FMS Access the FMS reports menu.
- System Print system status reports.



Diagnostics Menu

Use the Diagnostics Menu to test the operation of certain components of the system.

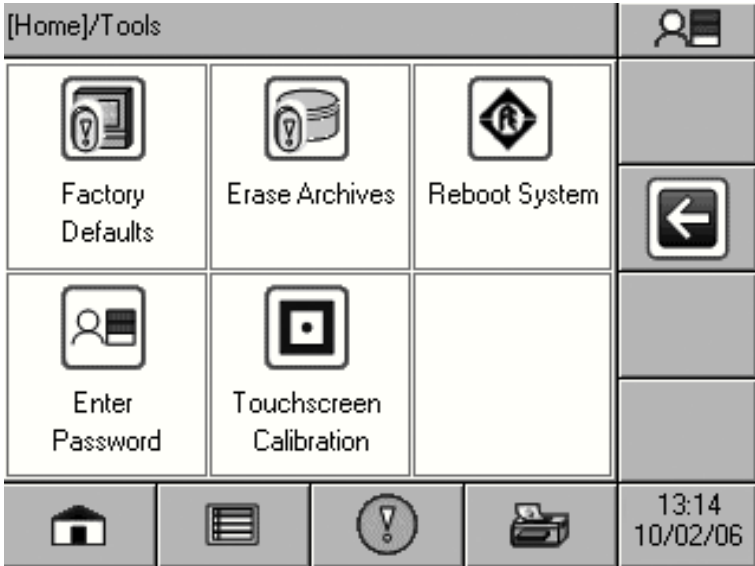
- Test Annunciator Tests the operation of the internal alarm.
- Print Test Page Sends a test page to any optional printer.
- Diagnostic Key Enters Diagnostic Mode (Certified technician access only).



Tools Menu

Use the Tools Menu to perform various resets of the system and perform certain control functions.

- Factory Defaults Restore the factory setup defaults and erase all historical data.
- Erase Archives Maintains all setup parameters but erases history.
- Reboot System Cycles power to the system, all data is retained.
- Enter Password Change the current access level.
- Touch Screen Calibration Recalibrate the operation of the touch screen.



Fuel Management System Application

The **Fuel Management Systems** application provides inventory management, optional tank and line leak detection features and sensor monitoring. Select **FMS** in the Application window of the Home screen.

FMS Inventory Summary Menu

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

FMS Inventory Detail Menu

Selecting a single tank will show the **FMS Inventory Detail** for that tank, which will provide detailed information on product volume, level, temperature and ullage space available. 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.

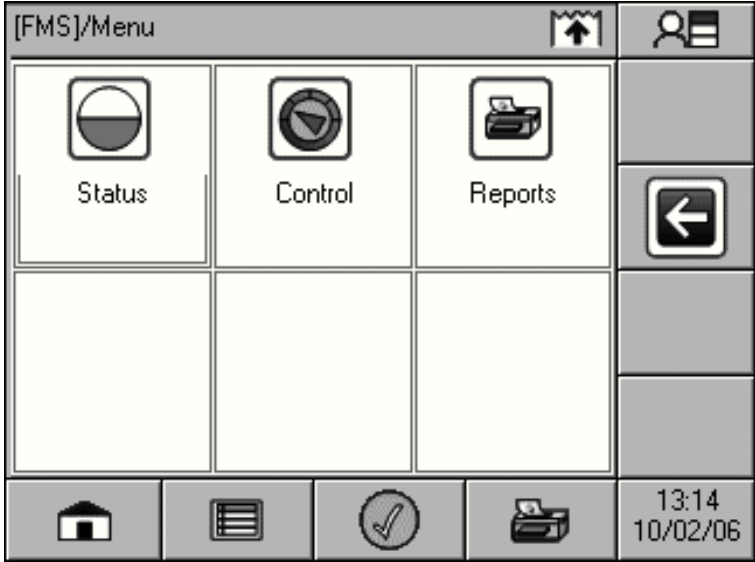
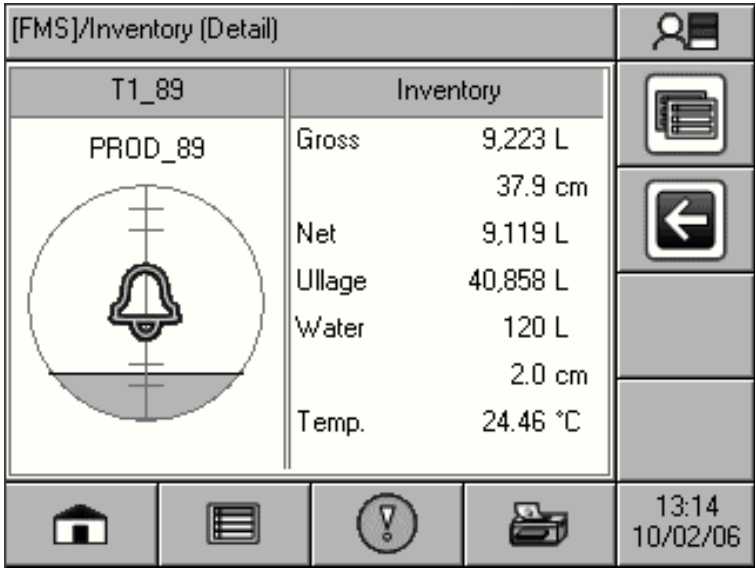
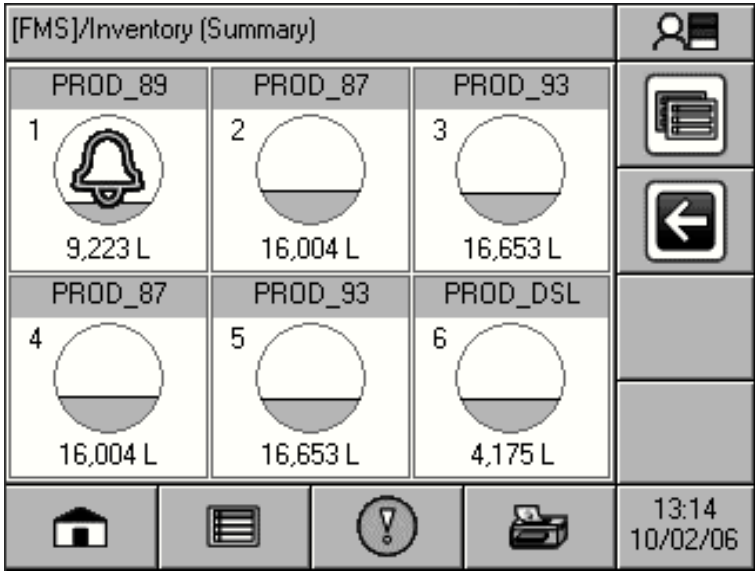
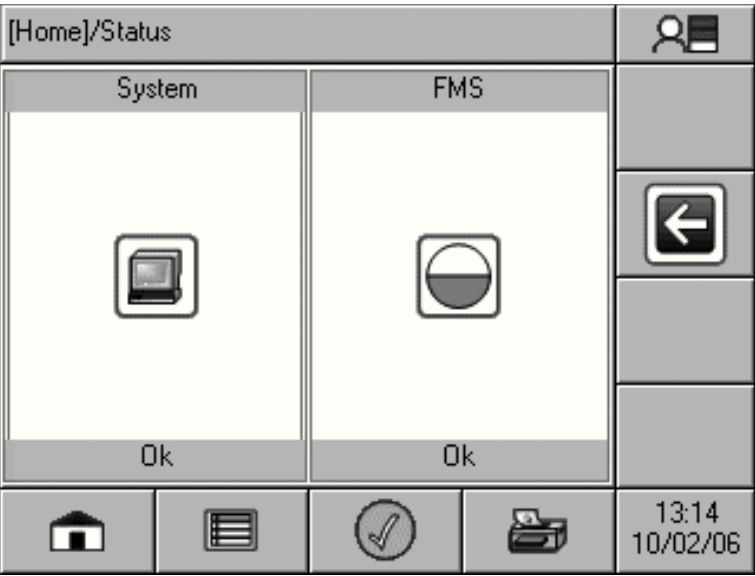
FMS Application Menu

Pressing the **Application Menu** button will display the **FMS Menu** . From here you will be able to view various FMS information, execute certain control functions and print reports.

Status Displays the current status of all devices (tanks, line, sensors and others).

Control Allows you to start and monitor tank and line tests as well as learn lines and sensors.

Reports Prints various FMS related reports.



Printing Reports

Internal Printer

An internal printer is optional on 650I50/5000 FMS consoles, but not available on the 650I () console. It is an impact style printer that uses standard printer paper and has a replaceable ribbon cartridge. For paper loading and ribbon replacement 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. *For a list of approved printers, refer to Appendix A.*

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

Pressing the print button from the Home screen will bring up a list of some of the Applications that are running on the system. Select the Application that you want to print from and a list of available reports for that Application will be displayed. If you are already inside of an Application, then its report options will be displayed immediately. There are some screens, like the Inventory Summary, where selecting the print button will not provide additional options, like date range.



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.

System 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.

FMS Reports

Report Description	
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 **FMS> Control** menu. 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 TOKHEIM 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

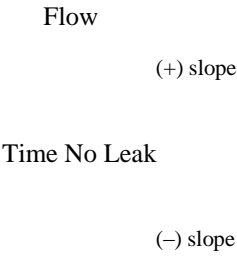
Terms

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.

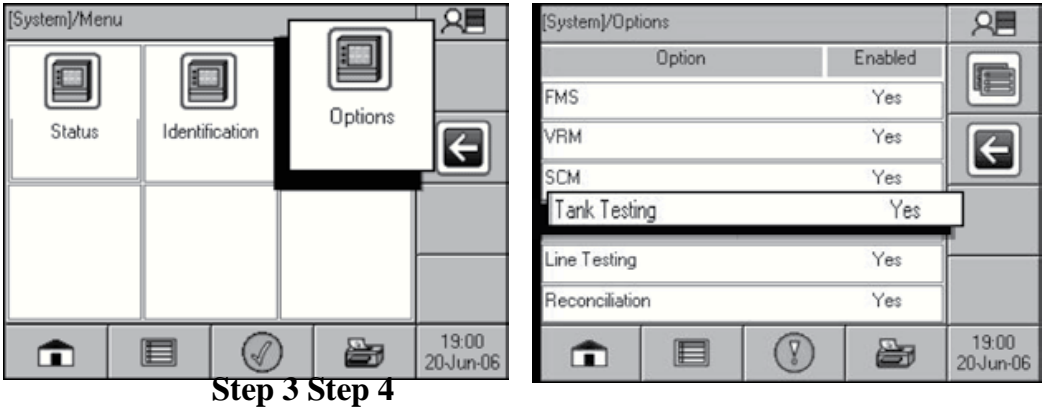
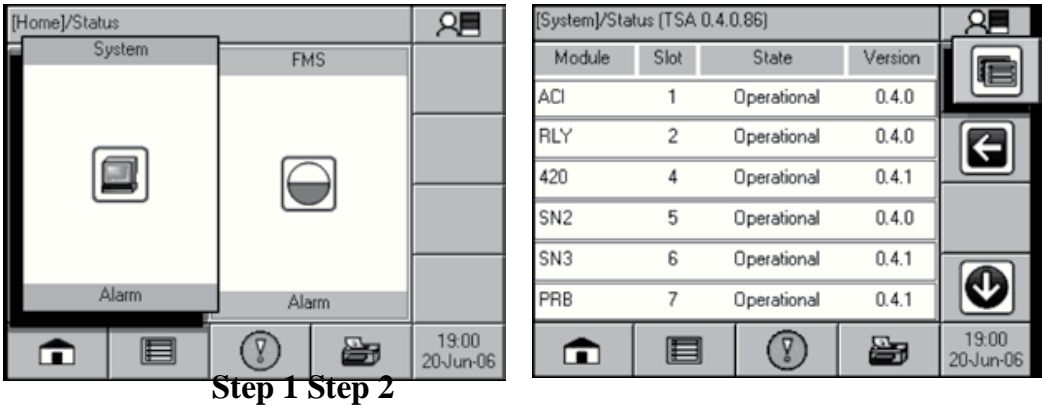


Tank Testing Requirements

Static Tank Testing is available only if the option for Tank Testing is enabled. This option can be ordered when purchasing the console or after initial purchase by using the part number TS-TT. The software option includes both Static and SCALD (continuous) leak testing. For 650I and consoles, Static Tank Testing is included as standard programming. SCALD is an option.

To perform tank testing, the Tank Testing software must be enabled. To verify that the software is enabled:

- 1. Starting at the Home/Status screen, press the System Application button.
- 2. Press the Application Menu button.
- 3. Press the Options button.
- 4. Under Option, a Tank Testing row will appear. A “Yes” in the Enabled column indicates that the software has been purchased and is enabled.



Test Types

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

- 0.1 GPH Annual Leak Test 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 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

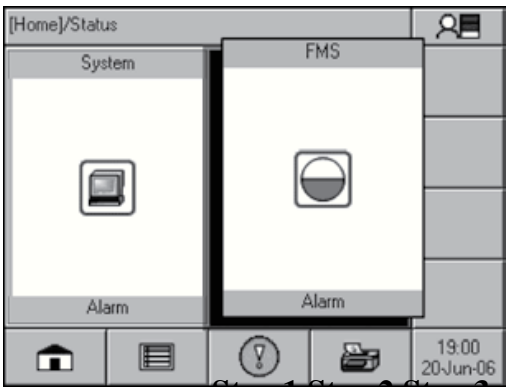
Tank and environmental conditions play an important role in passing results. Consider the following items when scheduling or manually forcing a static leak test:

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.

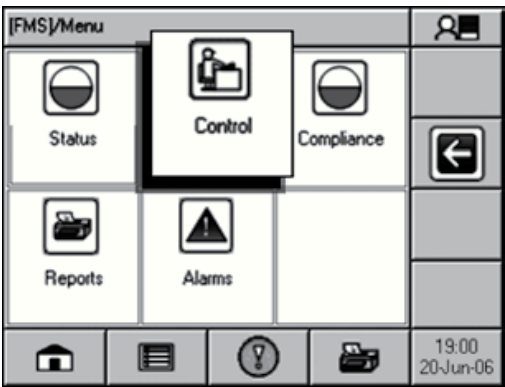
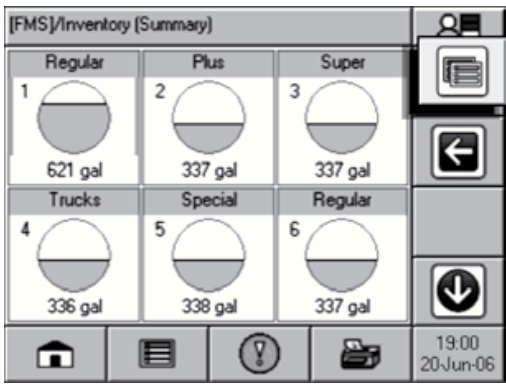
How to Manually Start Static Tests

This procedure requires User level privileges.

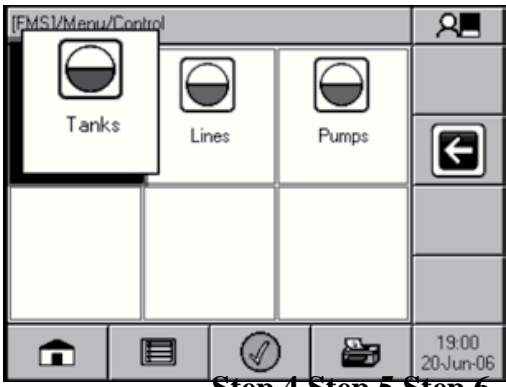
- 1. Starting at the Home/Status screen, press the FMS application button.
- 2. Press the Application Menu button.
- 3. Press the Control button.



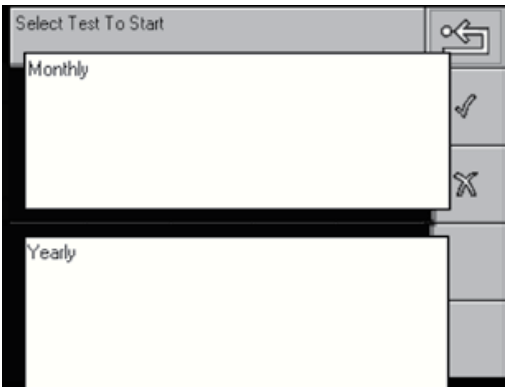
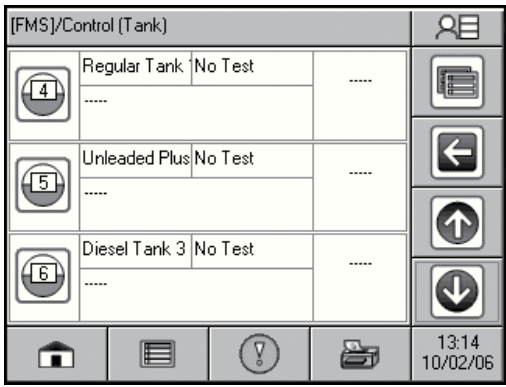
Step 1 Step 2 Step 3



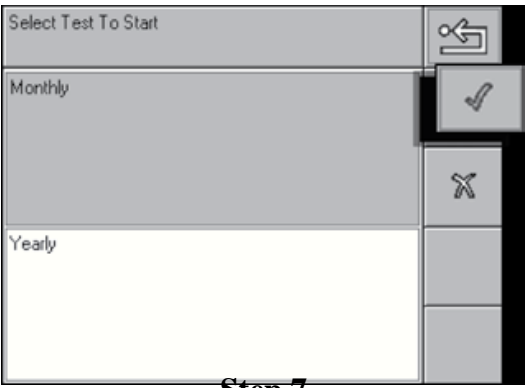
- 4. Press the Tanks button.
- 5. Select the tank that will be tested. If the tank does not appear on the screen, use the Scroll Down button to view more options.
- 6. Press the Test Type and choose either Monthly or Yearly.



Step 4 Step 5 Step 6



- 7. Press the Checkmark button to start the test.



Step 7

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 650I Programming Guide - p/n 000-2142).

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:

- Dispersed Probe Signal
- Rapid Temperature Change
- 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 650I50/5000 systems or TS-SCALD for 650I/608 systems (650I/608 systems have Static Testing standard, but require the TS-SCALD option to perform SCALD testing). The TS-TT option includes both Static and SCALD testing.

Why Continuously Test the Integrity of the 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 Integrity Tests determine whether there is a leak.

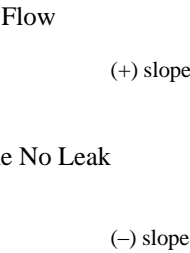
Since SCALD continuously runs statistical tank leak tests during the inactive periods between product deliveries and dispensing, it is particularly useful for:

- 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.

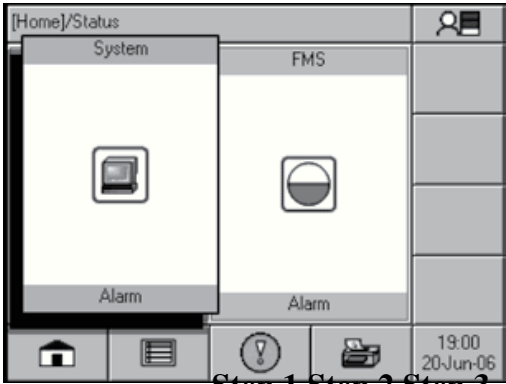
Slope (Tank Testing Reports) – A ratio of the calculated rate of change to the time the rate is measured. Slope is affected by leaks and by many other sources of interference. A negative slope or decrease indicates loss of product volume. A positive slope or increase indicates a rise in product volume.



SCALD Testing Requirements

TOKHEIM SCALD testing is not yet listed with NWGLDE for 650I series FMS consoles. To perform SCALD testing, the SCALD software must be enabled. To verify that the software is enabled:

1. Starting at the Home/Status screen, press the System Application button.
2. Press the Application Menu button.
3. Under Option, Tank Testing will appear. A “yes” in the Enabled column indicates that the software has been purchased and is enabled.



[System]/Status (TSA 0.4.0.86)			
Module	Slot	State	Version
ACI	1	Operational	0.4.0
RLY	2	Operational	0.4.0
420	4	Operational	0.4.1
SN2	5	Operational	0.4.0
SN3	6	Operational	0.4.1
PRB	7	Operational	0.4.1

[System]/Options	
Option	Enabled
FMS	Yes
VRM	Yes
SCM	Yes
Tank 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 650I Programming Guide - p/n 000-2142)

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:

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

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 then 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.

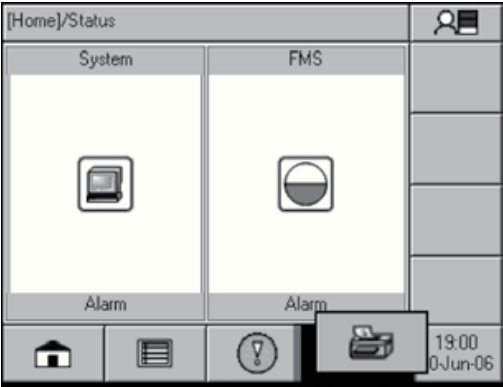
Note: On rare occasions conditions can arise that prevent SCALD from getting enough QIs to complete a test.

Tank Leak Test Reports

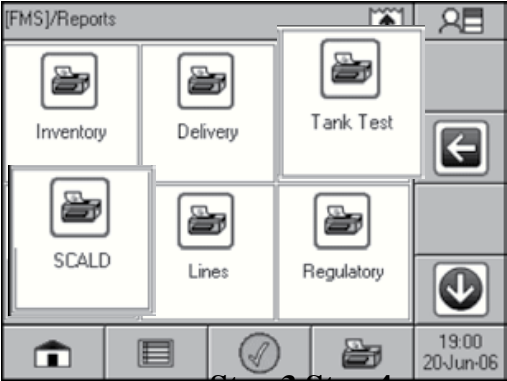
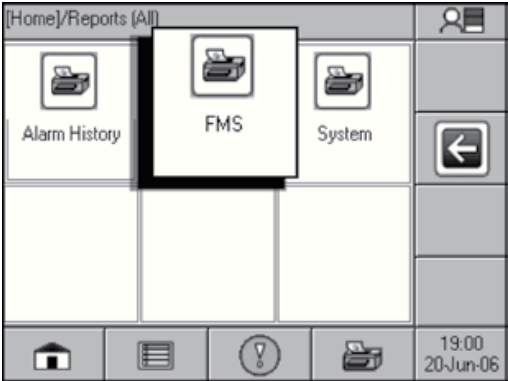
Reports that contain leak testing data and results may be printed from the console or generated/printed using TSA.

Printing Tank Leak Test Reports LCD

1. Starting at the Home/Status screen, press the Reports button.
2. Press the FMS button.
3. Press either the Tank Test (for static reports) or SCALD for continuous reports.
4. Select the Date Range desired.
5. Press the checkmark to start report printing.



Step 1 Step 2



Step 3 Step 4



Example Tank Leak Test Reports from Internal Printer

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

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

Tank Test Report SCALD Report

Specified Time Frame Specified Time Frame

Volume: (gal) programmed
Length: (in) programmed
Temperature: (F) programmed
TANKS

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

Tank #
Product #
Maximum Capacity

Started
Date Time
Result
(Pass)
Slope

Status

Ended
Date Time
Vol %

Type
(Monthly)

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
##

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									
Date Time									
Tank Test Report									
STATIC TEST									
TANKS									
Name Max Capacity Time Gross									
Volume Net Volume Product									
Level Temperature Water									
Level Water Volume									
Tank # #.##									
Started									
Date Time									
#.# #.# #.# #.#									
Ended									
Date Time									
#.# #.# #.# #.#									
Last Delivery									
Date Time									
Test Type									
(Monthly)									
Leak Rate									
#.##									
Result									
(Pass)									
Threshold									
Programmed									
Capacity #.##									
Net Volume Temperature Level Time									
#.## #.# #.# #.#									
Date Time									
#.## #.# #.# #.#									
Date Time									
#.## #.# #.# #.#									
Date Time									

Site ID 1									
Site ID 2									
Site ID 3									
Site ID 4									
Site ID 5									
Last Available									
Date Time									
Tank Test Report									
SCALD TEST									
TANKS									
Name Product Max Capacity									
Tank # Product # #.##									
Started									
Date Time									
Result									
(Pass)									
Slope									
#.#									
Status									
#.##									
Ended									
Date Time									
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. Relay, AC Input and 4-20mA Modules will also need to be ordered and installed, if not initially purchased with the console. The 650I and FMS consoles do not have line leak detection capabilities.

Line Leak Testing for all 650I 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.

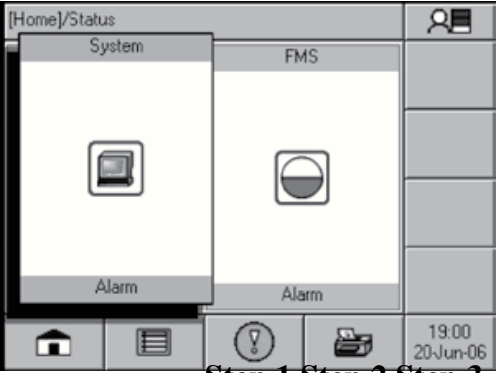
National Work Group Leak Detection Evaluations (NWGLDE)

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/> .

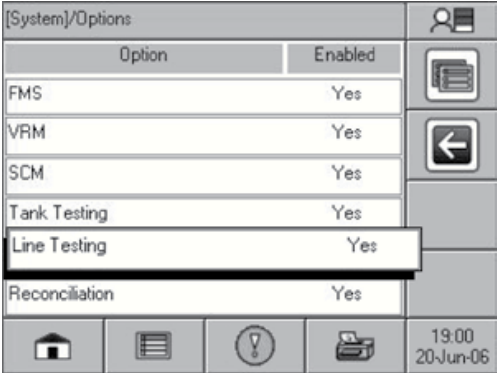
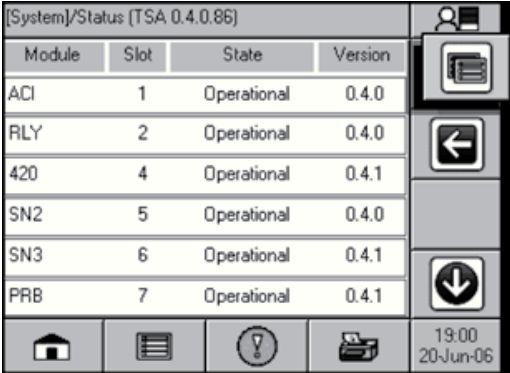
Line Leak Testing Requirements

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/Status screen, press the System Application button.
2. Press the Application Menu button.
3. Under Option, a Line Testing row will appear. A “Yes” in the Enabled column indicates that the software has been purchased and is enabled.



Step 1 Step 2 Step 3



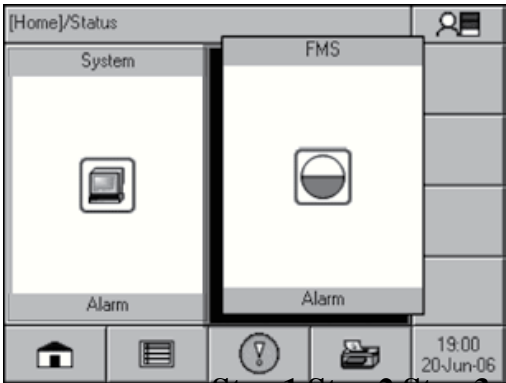
Test Cycles & Types

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.

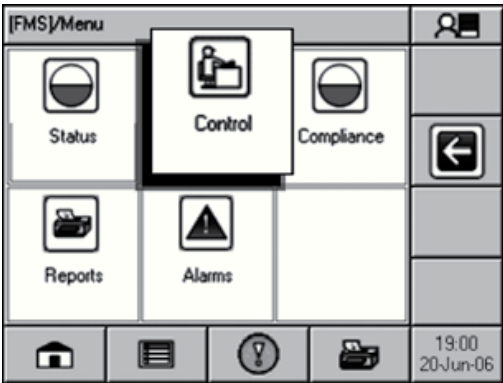
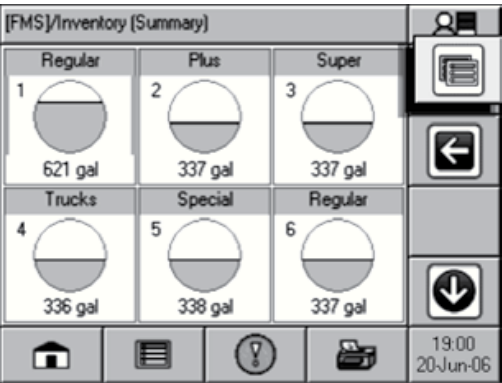
Test Type Description	
Pressure Up	A pressure up test will monitor line pressure from a static line to when the pump is turned on.
Dispenser Pressure	Dispenser pressure is tested with the hook applied to ensure that line pressure does not drop too low while dispensing. This feature can be enabled/disabled 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. The Gross Test will begin after every dispense when the line is enabled or after every 45 minutes of quite 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.
Gross (3.0 GPH) Leak	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. 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.
Thermal Wait Time	
Monthly (0.2 GPH) Leak	
Annual (0.1 GPH) Leak	
Line Learned but Not Enabled	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.
Sudden Pressure Loss	This is a continuous test that runs in the background. An alarm will occur if line pressure drops too fast.
Extended Pump Run	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.
High Pressure	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.

How to Manually Start Line Leak Tests

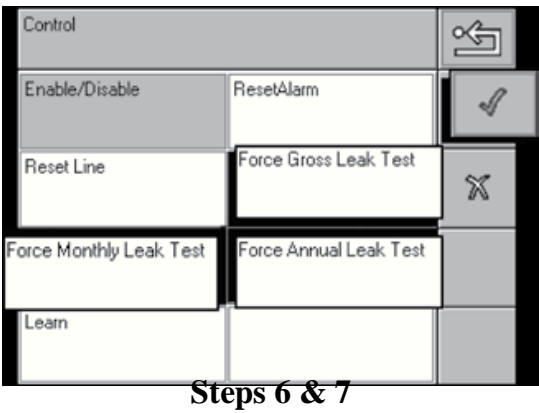
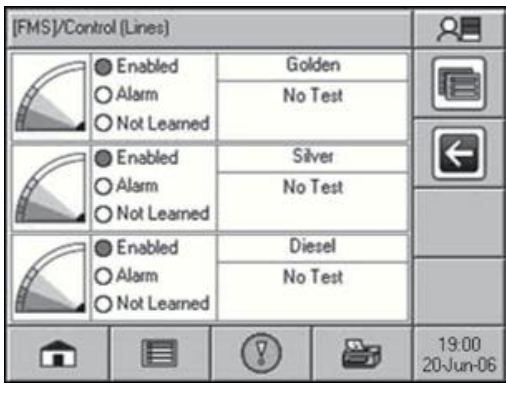
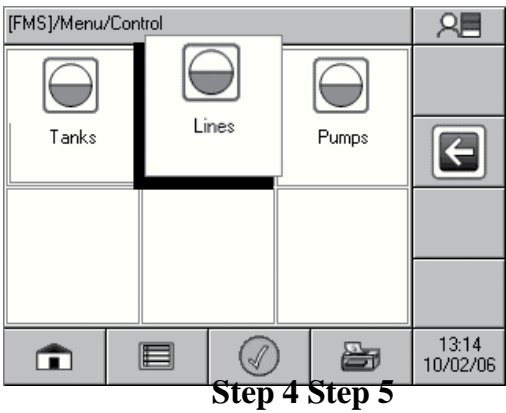
- This procedure requires User level privileges.
1. Starting at the Home/Status screen, press the FMS application button.
 2. Press the Application Menu button.
 3. Press the Control button.



Step 1 Step 2 Step 3



- 4. Press the Lines button.
- 5. Select the line that will be tested. If the line does not appear on the screen, use the Scroll Down button to view more options.
- 6. Press the Test Type, either Force Gross, Force Annual or Force Monthly.
- 7. Press the Checkmark button to start the test.



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 650I Programming Guide - p/n 000-2142).

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.

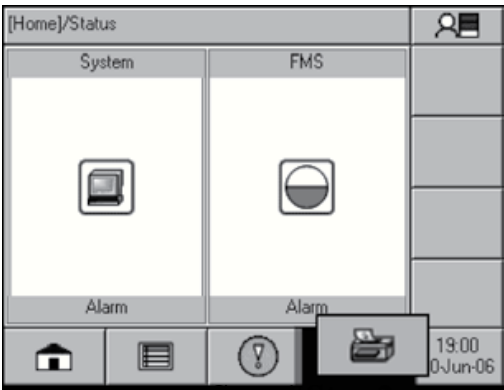
Line Leak Test Reports

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

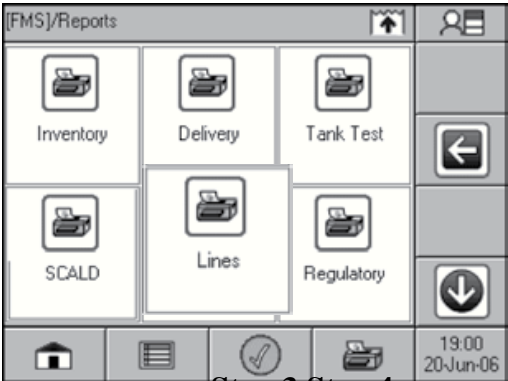
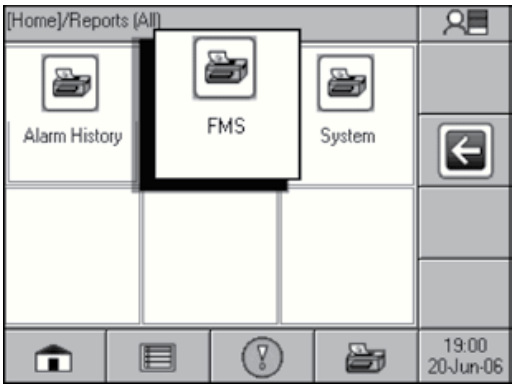
Printing Tank Leak Test Reports

LCD

- 1. Starting at the Home/Status screen, press the Reports button.
- 2. Press the FMS button.
- 3. Press the Line Test row.
- 4. Select the Time Option desired.
- 5. Press the checkmark to start report printing.



Step 1 Step 2



Step 3 Step 4



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

.....

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 650I 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 TOKHEIM 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.

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

Access Level – Displays the current access level.

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.

Tank Sentinel AnyWare – Tank Status – Microsoft Internet Explorer

FileEditViewFavoritesToolsHelp

BackForwardStopHomeSearchFavoritesPrintMail

Addresshttp://192.168.168.168/tank_status.htmlGoLinks

Joe's Cafe - Guest access level

Franklin Fueling Systems

Tank Status

HomeSystemFMSSetupPreferences

StatusAlarmsControlComplianceReports

TanksLinesSensors

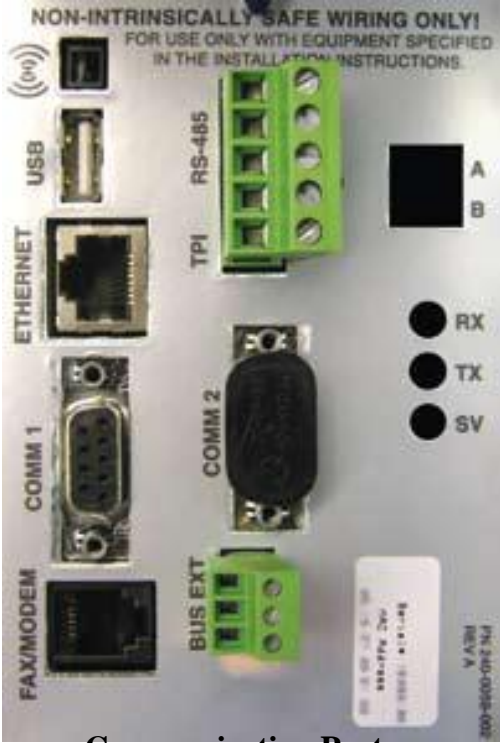
Auto Refresh08/24/2006 16:50:39

TANKS													
Image	Manifold ID	Tank ID	Name	Product	Alarms	Level	Gross Volume	Net Volume	Ullage	Water Level	Temperature	Max Capacity	Capacity %
		1	Tank 1	Product 1		12.30	484.89	480.84	408.14	0.00	71.85	940.03	51.58

Tank Sentinel AnyWare 0.5.1.0 Copyright © 2004-2006 Franklin Fueling Systems. All rights reserved.

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.



Communication Ports

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 TOKHEIM distributor for assistance.

Preferences

Modify the way that data is displayed, change the units of measure and adjust the Auto Refresh rate. There are two levels of preferences:

Preference Description	
Personal	These settings are stored on your PC and apply to its use only.
System	Adjusts the way data is displayed by default for all Web Browser Interface and touch screen users.

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 TOKHEIM 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

Contrast Adjustment

The contrast of the touch screen can be adjusted if needed, but should only be done so by a certified technician. Contact your TOKHEIM distributor for assistance.

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 **Home Menu** , go to **Main Menu > Down >Tools > Touch Screen Calibration** .
2. You will be asked if “you are sure,” answer **Yes** .
3. Follow the on-screen instructions to complete the calibration process.

Internal Printer

Changing Paper

1. Open the front of the printer door by pulling its lower tab towards you.
2. Lift the empty paper cartridge from the holder arms.
3. Place a new roll on the holder arms with the “tail” to the bottom and away on the roll.
4. Use scissors to cut a paper “tail” for a clean and square edge.
5. Using gentle pressure, feed the paper into the feed slot while pressing the Path Bar on the display several times to advance the paper through the printer (or by selecting the paper icon on the display).
6. Make sure the paper feeds straight into the printer. Misfed paper can jam the printer and cause damage to the printer mechanism and printer ribbon.
7. Close the front printer door and let the paper feed through the output slot on the door.
8. Rip the paper square and test the printer for proper operation.

Ink Ribbon Replacement

1. Open the front printer door by pulling its lower tab towards you.
2. Gently pull the paper out of the feed slot and place it out of the way.
3. Pull outward on the black ribbon cartridge to remove it from the assembly.
4. Place a new cartridge with ribbon above the print head, into position. Put the right end in first, then snap it in place.
5. Feed the paper into the feed slot while pressing the Path Bar on the display several times to advance the paper through.
6. Close the front printer door and let the paper feed through the output slot on door.
7. Rip the paper square and test the printer for proper operation.

Ink Ribbon Replacement

Appendix A – Compatible Printers

650I Series Fuel Management Systems – Hewlett Packard Compatible Printers

650I series consoles come equipped with a standard Type-A USB socket located on the bottom (650I50/5000) or side (650I) of the console near the other communications ports. The 650I series consoles utilize Printer Control Language (PCL) version 3 or higher protocol developed by Hewlett Packard (HP) to print to external printers. The following is a list of some printers available from HP that are both USB and PCL 3 or higher compatible:

Below are listed some of the HP printers known to work with the 650I series FMS.

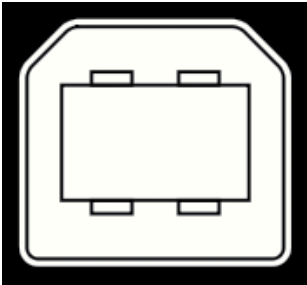
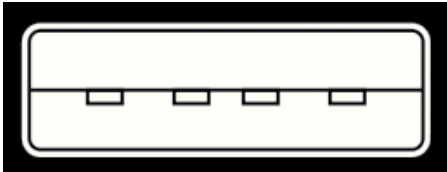
- LaserJet**
1160 Series
1320 Series
2420/30 Series
2820/40 All-In-One
3050/50/55 All-In-One
3380/90 All-In-One
4240n
4250 Series
4345/50 MultiFunction Printer
4350 Series
4730 Series
5200 Series
8150 Series
9040/50 Series
9500 MultiFunction Printer

- DeskJet**
460 Series
5440 Series
5650 Series
5940 Series
6520/40 Series
6620 Series
6940 Series
6980 Series
9800 Series

- OfficeJet**
5610 Series
6210 Series
6310 Series
7210 Series
7310 Series
7410 Series
9110 Series
9120 Series
9130 Series

Cable Installation

1. Insert the Type A Plug into the 650I series console’s USB port.
2. Insert the Type B Plug into the external printer.



Type A Plug Type B Plug

- OfficeJet Pro**
K550 Series
K850 Series
- Business InkJet**
1200 Series
2300 Series
2800 Series
- Color LaserJet**
2605 Series
3000 Series
3800 Series
4700 Series
5550 Series
9500 Series
- Other HP printers not listed should still work with the 650I series FMS if they:**
- Have a USB connection
 - Are compatible with PCL 3 or higher printer language (Refer to your printer’s specifications).
- Important Note**
- Do not use printers with a power save feature
 - Start the printer before starting the console

Appendix B – Alarm Table

Note: Refer to Safety Instructions outlined in this manual prior to performing any maintenance on or inside the console.

Note: If at any time while troubleshooting a Warning or Alarm this guide does not correct the issue, contact FFS Technical Services.

Warning  Always remove power from the console prior to installing or removing a module or performing any maintenance while the console door is open.

System

Displayed Warning	Description	Recommended Actions	Reference Source
2-Wire Sensor Module Is Offline	The specified 2-Wire Sensor Module listed with the alarm has experienced a problem or may not be recognized by the Controller Module.	Cycle power to the console. Visually verify that the green ‘RUN’ light on the applicable 2-Wire Sensor Module is on continuously after the system boot is complete.	Installation Guide** / Applicable Bulletins*
2-Wire Sensor Module Number Mismatch	The number of expected 2-Wire Sensor Modules does not equal the number of 2-Wire Sensor Modules installed.	Verify the physical number of 2-Wire Sensor Modules installed and compare with the number of 2-Wire Sensor ‘Modules Expected’ in the programming.	General Setup in Programming Manual** / Applicable Bulletins*
3-Wire Sensor Module is Offline	The specified 3-Wire Sensor Module listed with the alarm has experienced a problem or may not be recognized by the Controller Module.	Cycle power to the console. Visually verify that the green ‘RUN’ light on the applicable 3-Wire Sensor Module is on continuously after the system boot is complete.	Installation Guide** / Applicable Bulletins*
3-Wire Sensor Module Number Mismatch	The number of expected 3-Wire Sensor Modules does not equal the number of 3-Wire Sensor Modules installed.	Verify the physical number of 3-Wire Sensor Modules installed and compare with the number of 3-Wire Sensor ‘Modules Expected’ in the programming.	General Setup in Programming Manual** / Applicable Bulletins*
4-20mA Input Module Error	Input amperages have exceeded their thresholds—this Error applies to the 4-20mA Input Module listed with the alarm.	Troubleshoot external 4-20mA device and wiring from the module and channel of the 4-20mA Input Module listed with the alarm.	Applicable Equipment Guide(s)*
4-20mA Input Module is Offline	The specified 4-20mA Input Module listed with the alarm has experienced a problem or may not be recognized by the Controller Module.	Cycle power to the console. Visually verify that the green ‘RUN’ light on the applicable 4-20mA Input Module is on continuously after the system boot is complete.	Installation Guide** / Applicable Bulletins*
4-20mA Input Module Number Mismatch	The number of expected 4-20mA Input Modules does not equal the number of 4-20mA Input Modules installed.	Verify the physical number of 4-20mA Input Modules installed and compare with the number of 4-20mA Input ‘Modules Expected’ in the programming.	General Setup in Programming Manual** / Applicable Bulletins*
AC Input Module is Offline	The specified AC Input Module listed with the alarm has experienced a problem or may not be recognized by the Controller Module.	Cycle power to the console. Visually verify that the green ‘RUN’ light on the applicable AC Input Module is on continuously after the system boot is complete.	Installation Guide** / Applicable Bulletins*
AC Input Module Number Mismatch	The number of expected AC Input Modules does not equal the number of AC Input Modules installed.	Verify the physical number of AC Input Modules installed and compare with the number of AC Input ‘Modules Expected’ in the programming.	General Setup in Programming Manual** / Applicable Bulletins*
IO Input Alarm	The input senses either voltage present or no voltage. This alarms when input voltage is not as programmed	Verify that programming parameters meet site specification. Check all wiring associated with the input at fault.	Installation Guide** / Applicable Bulletins*
IO Module Number Mismatch	The number of expected IO modules does not equal the number of IO modules installed	Verify the physical number of IO modules installed and compare with the number of IO modules programmed.	Installation Guide** / Applicable Bulletins*

System

Displayed Warning	Description	Recommended Actions	Reference Source
IS Barrier Violation	The system has received an indication that there is a Non-Intrinsically Safe module installed in the IS area or that the IS barrier has been removed.	Visually verify that all modules are installed on the correct side of the IS Barrier.	Installation Guide** / Applicable Bulletins*
Low Battery	Backup Battery should be replaced. Replace the backup battery with an exact replacement from TOKHEIM.		Installation Guide** / Applicable Bulletins*
Modem Error	The number of expected Modem Modules does not equal the number of Modem Modules installed.	Verify the physical number of Modem Modules installed and compare with the number of Modem ‘Modules Expected’ in the programming.	General Setup in Programming Manual** / Applicable Bulletins*
Power Supply Module is Offline	This warning is only possible if there is a TS-EXPC expansion console connected. Failure to recognize the expansion console’s PSM.	Cycle power to the console. Visually verify that the green ‘RUN’ light on the module is on continuously after the system boot is complete.	Installation Guide** / Applicable Bulletins*
Printer Paper Jam	Paper feed error. Paper or debris is stuck in the printer.	Visually inspect the printer for the problem. Correctly route the paper through the printer to clear this warning.	Installation Guide** / Applicable Bulletins*
Probe Module is Offline	The specified Probe Module listed with the alarm has experienced a problem or may not be recognized by the Controller Module.	Cycle power to the console. Visually verify that the green ‘RUN’ light on the applicable Probe Module is on continuously after the system boot is complete.	Installation Guide** / Applicable Bulletins*
Probe Module Number Mismatch	The number of expected Probe Modules does not equal the number of Probe Modules installed.	Verify the physical number of Probe Modules installed and compare with the number of Probe ‘Modules Expected’ in the programming.	General Setup in Programming Manual** / Applicable Bulletins*
Relay Module Number Mismatch	The number of expected Relay Modules does not equal the number of Relay Modules installed.	Cycle power to the console. Visually verify that the green ‘RUN’ light on the applicable Relay Module is on continuously after the system boot is complete.	Installation Guide** / Applicable Bulletins*
Relay Module is Offline	The specified Relay Module listed with the alarm has experienced a problem or may not be recognized by the Controller Module.	Verify the physical number of Relay Modules installed and compare with the number of Relay ‘Modules Expected’ in the programming.	General Setup in Programming Manual** / Applicable Bulletins*
Relay Module Setup Error	This alarm is an indication that all channels have been enabled. With all six (6) 2A relay channels in use, 10A channels seven (7) and eight (8) may not be enabled.	Verify Relay Module programming. Module Setup in	Programming Manual**

* Bulletins and Equipment Guides can be found on TOKHEIM’s web site - <http://www.TOKHEIM.com>

** The *650I Series Installation Guide* (p/n 000-2150) and the *650I Series Programming Manual* (000-2142) can be found on TOKHEIM’s web site - <http://www.TOKHEIM.com>

FMS

Tank/Manifold Alarms

Displayed Alarm	Description	Recommended Actions	Reference Source
Correction Table Error	Correction points for the special tank listed with the alarm were not entered or were entered incorrectly.	Verify that the correction table points for the tank listed with the alarm are entered sequentially in ‘Special Tanks’ Programming.	Special Tanks Setup in Programming Manual** / Manufacturers’ Tank Chart***
Manifold Gross Leak Detected	The manifold listed with the alarm has failed a Gross Leak Test.	Review manifold leak test history and programming. It may be necessary to manually start a Gross Leak Test to keep the manifold in compliance.	Tank Leak Tests - Type and Frequency
Manifold Leak Detected	The manifold listed with the alarm has failed a Monthly Leak Test.	Review manifold leak test history and programming. It may be necessary to manually start a Monthly Leak Test to keep the manifold in compliance.	Tank Leak Tests - Type and Frequency
Manifold SCALD Leak Detected	The manifold listed with the alarm has failed a SCALD Leak Test.	Review manifold leak test history and programming. It may be necessary to manually start a SCALD Leak Test to keep the manifold in compliance.	Tank Leak Tests - Type and Frequency
Manifold Theft Detected	Product level in the manifold listed with the alarm has dropped below the programmed Theft Limit.	Verify that the programmed Theft limit is correct. Verify that the values of product loss on the console correspond with actual product loss in the tank.	Manifolds Setup in Programming Manual**
No Data Available	SCALD software has not observed enough ‘quiet time’ to complete one or more test intervals.	Allow enough time for SCALD to complete a test.	Tank Leak Tests - Type and Frequency
Tank Gross Leak Detected	The manifold listed with the alarm has failed a Gross Leak Test.	Review manifold leak test history and programming. It may be necessary to manually start a Gross Leak Test to keep the tank in compliance.	Tank Leak Tests - Type and Frequency
Tank Leak Detected	The tank listed with the alarm has failed a Monthly Leak Test.	Review tank leak test history and programming. It may be necessary to manually start a Monthly Leak Test to keep the tank in compliance.	Tank Leak Tests - Type and Frequency
Tank SCALD Leak Detected	The tank listed with the alarm has failed a SCALD Leak Test.	Review tank leak test history and programming. It may be necessary to manually start a SCALD Leak Test to keep the tank in compliance.	Tank Leak Tests - Type and Frequency
Tank Theft Detected	Product level in the tank listed with the alarm has dropped below the programmed Theft Limit.	Verify that the programmed Theft Limit is correct. Verify that the values of product loss on the console correspond with actual product loss in the tank.	Tanks Setup in Programming Manual**

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*** If the tank is not listed as a standard tank in Appendix A: Standard Tanks Table (in the *650I Series Programming Manual* (p/n 000-2142)), use the tank chart from the manufacturer to create a custom correction table.

FMS

Probe Alarms

Displayed Alarm	Description	Recommended Actions	Reference Source
Float Height Error	A float on the probe listed with the alarm is being monitored at a varying height outside of thresholds. Causes can include broken float and programming, or mistakenly associating a gasoline and diesel float.	Verify Probe programming. Visually inspect that the probe float type matches the type of product. Inspect magnet and probe shaft for cracks or debris and clean if necessary.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
Float Missing	A float on the probe listed with the alarm has not been detected or the probe was programmed with the incorrect number of floats.	Verify the ‘number of floats’ in Probe programming. Number of floats must match number of floats installed. Float must be lower than 5" from the bottom of the probe head.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
High Water Level	The water float on the Tank/Manifold listed with the alarm is above the programmed High Water Level Limit.	Verify that the programmed limit is correct. Verify that the Water Level values on the console correspond with the actual water level in the tank.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
High Product Level	The product float on the Tank/Manifold listed with the alarm is above the programmed High Product Level Limit. Tank may be close to an overfull condition.	Verify that the programmed limit is correct. Verify that the Gross Product Level values on the console correspond with actual product level in the tank.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
High High Product Level	The product float on the Tank/Manifold listed with the alarm is above the programmed High High Product Level Limit. Tank may be near an overfull condition.	Verify that the programmed limit is correct. Verify that the Gross Product Level values on the console correspond with actual product level in the tank.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
Low Product Level	The product float on the Tank/Manifold listed with the alarm is above the programmed Low Product Level Limit. Tank may be close to an empty condition.	Verify that the programmed limit is correct. Verify that the Gross Product Level values on the console correspond with actual product level in the tank.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
Low Low Product Level	The product float on the Tank/Manifold listed with the alarm is above the programmed Low Low Product Level Limit. Tank may be near an empty condition.	Verify that the programmed limit is correct. Verify that the Gross Product Level values on the console correspond with actual product level in the tank.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
No Probe Detected	This alarm indicates a communication error between the console and the probe listed with the alarm.	Verify Probe programming. Inspect the probe wiring from the probe module to the probe.	Probes Setup in Programming Manual**) / Installation Guide**
Probe Synchronization Error	This alarm indicates a communication error between the console and the probe listed with the alarm.	Verify Probe programming. Inspect the probe wiring from the probe module to the probe.	Probes Setup in Programming Manual**) / Installation Guide**
RTD Table Error	The RTD Table programmed for the probe listed with the alarm is incorrect.	Verify the RTD Table programming.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
Temperature Error	This alarm indicates a temperature sensor error or failure inside the probe shaft of the probe listed with the alarm.	Verify the RTD Table programming. Visually inspect probe shaft for defects and cracks.	Probes Setup in Programming Manual**) / Applicable Equipment Guide*
Unstable Probe	This alarm indicates TOKHEIMsistent data from the probe listed with the alarm.	Inspect the probe wiring from the probe module to the probe. Verify that the product in the tank is both physically and thermally stable.	Installation Guide**) / Applicable Equipment Guide*

* Bulletins and Equipment Guides can be found on TOKHEIM’s web site - <http://www.TOKHEIM.com>

** The *650I Series Installation Guide* (p/n 000-2150) and the *650I Series Programming Manual* (000-2142) can be found on TOKHEIM’s web site - <http://www.TOKHEIM.com>

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Line/Manifold Alarms

Displayed Alarm	Description	Recommended Actions	Reference	Source
Dispenser Test Failed	Line pressure must be above 12 psi when the pump is on; and above 7.5 psi while dispensing product.		Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
Extended Hook Signal	A hook signal has been active for more than four hours.		Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
Failed to Catch Pressure	Line pressure has dropped below 12 psi when the pump turned off.		Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
Failed to Pressure Up	Line pressure remained below 12 psi when the pump turned on.		Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
Gross Leak Detected	The product line listed with the alarm has failed a Gross Leak Test.		Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
Monthly Leak Test Failed	The product line listed with the alarm has failed a Monthly Leak Test.		Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
Annual Leak Test Failed	The product line listed with the alarm has failed a Precision Leak Test.		Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
High Pump Pressure	Line pressure has exceeded 50 psi.	Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.		Applicable Equipment Guide*
Line is Not Configured	The line listed with the alarm is not configured in ‘Lines’ programming, or the line is not properly mapped.		Programming details are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Lines Setup in Programming Manual** / Applicable Equipment Guide*
Line Disabled	The input channel for the 4-20mA module connected to the line listed with the alarm is not configured.		Verify programming of the 4-20mA Module connected to the line listed with the alarm.	Module Setup in Programming Manual** / Applicable Equipment Guide*
Not Enabled	The product line listed with the alarm is not enabled in the programming.		Programming details are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
Not Learned	The product line listed with the alarm has not been learned.		Programming details are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*
Pressure Transducer Failed	This alarm indicates a communication error between the console and the pressure transducer listed with the alarm.		Verify the wiring and operation of the transducer connected to the line listed with the alarm.	Applicable Equipment Guide*
Program Error Detected	Firmware failed to function properly. Upload the current firmware release. Applicable Bulletins*			
Pump Request Ignored	The signal sent by the 4-20mA channel did not receive confirmation to turn on the pump listed with the alarm.		Verify 4-20mA and Relay Module programming.	Module Setup in Programming Manual** / Applicable Equipment Guide*
Sudden Pressure Loss	Line pressure has dropped from above 12 psi to below 5 psi within five seconds.		Details of this test are summarized in <i>LS500 Installation/User Guide</i> (p/n 000-2145); see this guide for troubleshooting.	Applicable Equipment Guide*

* Bulletins and Equipment Guides can be found on TOKHEIM’s website - <http://www.TOKHEIM.com>

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Special Product Alarms

Displayed Alarm	Description	Recommended Actions	Reference Source
Alpha Volume Correction Error	These Alarms refer to temperature correction coefficients used by the console to calculate Net Volume. When these values are entered too high or too low, an alarm condition will occur.	Verify that the Volume in the Correction Type matches the specifications of the product used in ‘Special Products’ Programming. These values should be listed in the product manufacturer’s Spec Sheets.	Special Products in Programming Manual** / Applicable Product Literature***
API Volume Correction Error	These Alarms refer to temperature correction coefficients used by the console to calculate Net Volume. When these values are entered too high or too low, an alarm condition will occur.	Verify that the Volume in the Correction Type matches the specifications of the product used in ‘Special Products’ Programming. These values should be listed in the product manufacturer’s Spec Sheets.	Special Products in Programming Manual** / Applicable Product Literature***
Level Error	The level of the product float on the probe listed with the alarm has exceeded a possible level according to the programming.	Verify that the following parameters are programmed correctly according to site specifications: Correction Table, Gradient, Probe Type, and Product Offset.	Probes Setup in Programming Manual** / Applicable Equipment Guide*
Net Error	The net volume of the product float on the probe listed with the alarm has exceeded a possible volume according to the programming; related to Volume Correction.	Verify that the following parameters are programmed correctly according to site specifications: Correction Table, Gradient, Probe Type, and Product Offset.	Special Products in Programming Manual** / Applicable Product Literature***
Product Volume Error	The volume of the product float on the probe listed with the alarm has exceeded a possible volume according to the programming.	Verify that the following parameters are programmed correctly according to site specifications: Correction Table, Gradient, Probe Type, and Product Offset.	Probes Setup in Programming Manual** / Applicable Equipment Guide*
Ullage Error	The Ullage level on the tank/manifold listed with the alarm has exceeded a possible level according to the programming.	Verify that the following parameters are programmed correctly according to site specifications: Correction Table, Gradient, Probe Type, and Product Offset.	Special Products in Programming Manual** / Applicable Product Literature***
Water Volume Error	The Water Volume on the tank/ manifold listed with the alarm has exceeded a possible level according to the programming.	Verify that the following parameters are programmed correctly according to site specifications: Correction Table, Gradient, Probe Type, and Product Offset.	Special Products in Programming Manual**/ Applicable Product Literature***

* Bulletins and Equipment Guides can be found on TOKHEIM’s web site - <http://www.TOKHEIM.com>

** The *650I Series Installation Guide* (p/n 000-2150) and the *650I Series Programming Manual* (000-2142) can be found on TOKHEIM’s web site - <http://www.TOKHEIM.com>

*** If the tank is not listed as a standard tank in Appendix A: Standard Tanks Table (in the *650I Series Programming Manual* (p/n 000-2142), use the tank chart from the manufacturer to create a custom correction table.

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Sensor Alarms

Displayed Alarm	Description	Recommended Actions	Reference Source
SN2 Fuse Blown	The fuse on the channel of the 2-Wire Sensor Module listed with the alarm is blown.	Replace the 2-Wire Sensor Module***** or use another channel on the module for that sensor.	Applicable Service Bulletins* / Sensors Setup in Programming Manual
SN2 Sensor On	The 2-Wire Sensor listed with the alarm is in alarm position.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 Dry Well	The Monitoring Well Sensor listed with the alarm is not sensing water in the monitoring well.	Verify that there is no water in the monitoring well. This condition may be normal if no ground water exists.	Applicable Equipment Guides**
SN3 Fuse Blown	The fuse on the channel of the 3-Wire Sensor Module listed with the alarm is blown.	Replace the 2-Wire Sensor Module***** or use another channel on the module for that sensor.	Applicable Service Bulletins* / Sensors Setup in Programming Manual
SN3 Sensor On	The 3-Wire Sensor listed with the alarm is in alarm position.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 Sync Error	A communications error has occurred between the console and the 3-Wire Sensor listed with the alarm.	Check wiring, sensor operation and location conditions. Attempt to re-configure sensors with the ‘Configure’ button in Sensors > Control .	Sensors Setup in Programming Manual / Applicable Equipment Guides**
SN3 No Signal	A communications error has occurred between the console and the 3-Wire Sensor listed with the alarm.	Check wiring, sensor operation and location conditions. Attempt to re-configure sensors with the ‘Configure’ button in Sensors > Control .	Sensors Setup in Programming Manual / Applicable Equipment Guides**
SN3 ID Error	The 3-Wire Sensor listed with the alarm has been programmed incorrectly.	Verify that the 3-Wire Sensor is programmed to match the type of sensor.	Sensors Setup in the Programming Manual / Applicable Equipment Guides**
SN3 Data Error	A communications error has occurred between the console and the 3-Wire Sensor listed with the alarm.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 Pwr Short	The power wires of the 3-Wire Sensor listed with the alarm have shorted.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 High Brine	The 3-Wire Sensor listed with the alarm is indicating a High Brine solution level near the sensor.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 Low Brine	The 3-Wire Sensor listed with the alarm is indicating that a Low Brine solution near the sensor.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 Product	The 3-Wire Sensor listed with the alarm is indicating that product is present near the sensor.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 Sump Full	The 3-Wire Sensor listed with the alarm is indicating that the sump near the sensor is full of a liquid.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 Vapor	The 3-Wire Sensor listed with the alarm is indicating that vapor is present near the sensor.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**
SN3 Water	The 3-Wire Sensor listed with the alarm is indicating that water is present near the sensor.	Check wiring, sensor operation and location conditions.	Applicable Equipment Guides**

* Bulletins and Equipment Guides can be found on TOKHEIM’s website - <http://www.TOKHEIM.com>

** The *650I Series Installation Guide* (p/n 000-2150) and the *650I Series Programming Manual* (000-2142) can be found on TOKHEIM’s website - <http://www.TOKHEIM.com>

*** If the tank is not listed as a standard tank in Appendix A: Standard Tanks Table (in the *650I Series Programming Manual* (p/n 000-2142), use the tank chart from the manufacturer to create a custom correction table.

**** Only use the product manufacturer’s specifications sheet to accurately set volume correction parameters.

***** Fuses on Sensor Modules are NOT field replaceable; the module must be replaced.

Appendix C – Third Party Certifications

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

<div>Integritas</div> <div>650I, 650I50, 650I000</div> <div>(TOKHEIM Magnetostrictive Probe)</div> <div>AUTOMATIC TANK GAUGING METHOD</div>	
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.

Issue Date: July 27, 2006

Integritas

(TOKHEIM 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.

Issue Date: May 19, 2006

Integritas

TS-LS500 Series

(for Rigid and/or Flexible Piping)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification	<p>Leak rate of 3.0 gph at 10 psi* with PD = 100% and PFA = 0%.</p> <p>Leak rate of 0.2 gph at operating pressure with PD = 100% and PFA = 0%.</p> <p>Leak rate of 0.1 gph at 1.5 times operating pressure* with PD = 100% and PFA = 0%.</p> <p>*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.</p>
Leak Threshold	<p>1.5 gph for leak rate of 3.0 gph.</p> <p>0.1 gph for leak rate of 0.2 gph.</p> <p>0.05 gph for leak rate of 0.1 gph.</p> <p>A pipeline system should not be declared tight if the test result indicates a loss that equals or exceeds this threshold.</p>
Applicability	<p>Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, kerosene.</p> <p>Other liquids may be tested after consultation with the manufacturer.</p>
Specification	<p>On pressurized rigid, flexible, or combination rigid and flexible pipelines, system can perform 3.0 gph, 0.2 gph, and 0.1 gph tests.</p> <p>Tests are conducted at operating pressure.</p>
Pipeline Capacity	<p>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).</p> <p>Maximum of 95.4 gallons for flexible pipelines (examples: 260 feet of 3 inch line; 1040 feet of 1 ½ inch line).</p> <p>Maximum of 415.8 gallons for combination rigid and flexible pipelines (the capacity of the flexible component cannot exceed 95.4 gallons).</p>
Waiting Time	<p>None between delivery and testing.</p> <p>None between dispensing and testing for leak rate of 3.0 gph.</p> <p>Depending on temperature stability, 1½ to 10 hours between dispensing and testing for leak rates of 0.2 gph and 0.1 gph.</p>
Test Period	<p>Response time is 1 to 2 minutes for leak rate of 3.0 gph.</p> <p>Minimum of 25 minutes for leak rate of 0.2 gph.</p> <p>Minimum of 34 minutes for leak rate of 0.1 gph.</p> <p>Test data are acquired and recorded by a microprocessor.</p>
System Features	<p>Permanent installation on pipeline.</p> <p>Automatic testing of pipeline every 45 minutes for leak rate of 3.0 gph.</p> <p>Automatic testing of pipeline when pump has been idle for 2 hours for leak rate of 0.2 gph.</p> <p>Automatic testing of pipeline when pump has been idle for 3½ hours for leak rate of 0.1 gph.</p> <p>Pump shutdown, indicator light and alarm activation if leak is declared for 3.0 gph and 0.2 gph tests.</p>
Calibration	<p>System must be checked annually and, if necessary, calibrated in accordance with manufacturer's instructions.</p>

Issue Date: November 17, 2005

Integritas

Secondary Containment Monitoring (SCM)
TOKHEIM 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.

