



INSTALLTION/USER'S MANUAL
FOR
FTI MODEL 100 LP GAS TANK GAUGE SYSTEM
9000100

Fueling Technologies, Inc.
13434 NE 177th Place
Woodinville, Washington 98072
425-487-3464

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REVISIONS

1. Initial Draft (Revision Draft) October 8, 2001, by RCS



ATTENTION!!

READ THIS SECTION BEFORE BEGINNING INSTALLATION

A portion of this product is designed for installation in a LP Gas fuel storage tank. THIS ENVIRONMENT CONTAINS HIGHLY FLAMMABLE AND HAZARDOUS MATERIALS.

FOLLOW ALL INSTRUCTIONS AND WARNINGS CONTAINED IN THIS MANUAL. FAILURE TO DO SO COULD RESULT IN FIRE, EXPLOSION, AND/OR SERIOUS INJURY TO YOURSELF AND OTHERS AND DAMAGE TO PROPERTY.

This product and installation guide were designed to minimize the dangers of installing this product, but you, the installer, must maintain the responsibility for proper installation to minimize the risk to life and property.

This manual makes certain assumptions about the knowledge and skills of the installer. Only qualified persons with the appropriate tools and the knowledge to work in a Class I, Division 1 environment should attempt an installation.



READ AND FOLLOW ALL INSTRUCTIONS AND WARNINGS IN THIS MANUAL. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN SERIOUS PERSONAL INJURY, DEATH, FIRE, EXPLOSION, AND HEALTH HAZARDS.



THE FTI MODEL 100 TANK COMPUTER IS AN INTRINSICALLY SAFE DEVICE INTENDED TO BE USED IN A CLASS I, DIVISION 1, GROUP D HAZARDOUS LOCATION. ANY SUBSTITUTION OF PARTS MAY COMPROMISE THE SAFETY OF THE DEVICE.



THE INSTALLATION OF THE FTI MODEL 100 LP GAS TANK GAUGE SYSTEM MUST BE INSTALLED IN CONFORMANCE WITH NFPA 58, NFPA 59, NFPA 70, AND ALL APPLICABLE STATE AND LOCAL CODES.



USE ONLY THE PROVIDED CLASS 2 POWER SUPPLY TO SUPPLY POWER TO THE MASTER COMPUTER.



WARNING

USE ONLY THE BATTERY PACK PROVIDED FOR THE FTI MODEL 100 TANK COMPUTER TO SUPPLY POWER TO THE TANKCOMPUTER. REPLACE IT ONLY WITH A BATTERY PACK SUPPLIED BY FUELING TECHNOLOGIES, INC., FOR THE FTI MODEL 100 TANK COMPUTER. THE USE OF ANY OTHER POWER SOURCE WILL COMPROMISE THE SAFETY OF THE EQUIPMENT AND MAY CAUSE SERIOUS PERSONAL INJURY, DEATH, FIRE, EXPLOSION, ENVIRONMENTAL AND/OR HEALTH HAZARDS.



WARNING

DO NOT ATTACH ANY WIRES, CABLES OR MATERIAL TO THE FTI MODEL 100 TANK COMPUTER EXCEPT THAT PROVIDED BY FUELING TECHNOLOGIES, INC., FOR THAT PURPOSE. ATTACHMENT OF UNSUITABLE PARTS OR EQUIPMENT WILL COMPROMISE THE SAFETY OF THE EQUIPMENT AND MAY CAUSE SERIOUS PERSONAL INJURY, DEATH, FIRE, EXPLOSION, ENVIRONMENTAL AND/OR HEALTH HAZARDS.



WARNING

DO NOT USE THE FTI MODEL 100 LP TANK GAUGE SYSTEM FOR MONITORING ANHYDROUS AMMONIA. THE MATERIALS USED ARE NOT COMPATIBLE WITH THAT FLUID.

FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The FTI Model 100 Master Computer is also a radio transmitter and receiver operating under the FCC rules for a Part 15 Transmitter/Receiver. Its operating frequency is 916.5 MHz. Its FCC ID is PGXM100MC. Any unauthorized changes to this equipment may result in invalidating permission to operate it.

The FTI Model 100 Tank Computer is also a radio transmitter and receiver operating under the FCC rules for a Part 15 Transmitter/Receiver. Its operating frequency is 916.5 MHz. Its FCC ID is PGXM100TC. Any unauthorized changes to this equipment may result in invalidating permission to operate it.

1. Introduction

1.1. Scope

This manual contains instructions and warnings for the installation of the FTI Model 100 LP Gas Tank Gauge System by Fueling Technologies, Inc. (FTI). Specifications for the sensor are listed elsewhere in this manual.

Do not use the FTI Model 100 System in anhydrous ammonia. The materials used are not compatible with that fluid.

1.2. Damage Claims

In the event that equipment shipped to you is damaged upon receipt please take the following steps:

- (a) Notify FTI by calling our office at (425) 487-3464.
- (b) Notify shipper of damage claim.
- (c) Document damages (photographs are preferable).



WARNING

UNDER NO CIRCUMSTANCES SHOULD DAMAGED EQUIPMENT BE INSTALLED.

1.3. Return Shipping

Obtain a Return Tracking Number and instructions from FTI by calling our office at (425) 487-3464. **FTI is not liable for damages that occur as a result of shipping.**

2. Product Description

2.1. The System

The FTI Model 100 Tank Gauge System is composed of a single Master Computer and one or more Tank Gauges. The Master Computer is located in a controlled environment such as that provided by a building or a hutch. The Tank Gauges, composed of a Tank Computer, a hanger assembly, and a probe, are installed in and on top of the LP Gas Tanks whose contents are monitored. The Tank Computers, which are battery powered, communicate with

the Master Computer via a radio link. The Master Computer may communicate with a Host Computer via RS-485 or telephone. The System works equally well for all LP Gases.

2.2. The Master Computer

The Master Computer is composed of an ARM 7 central processing unit with a Radio and a Telephone modem. The system memory is non-volatile and does not change when power is removed. The modem is a 2400/2400 modem for communications with a Host system. It is also equipped with an RS-485 port for communications with a local Host. The Radio is a two-way, half-duplex system used to communicate with the tanks. There is no wiring between the Master Computer and the tanks.

2.3. The Flange Feed Through Kit

This kit contains a custom two inch, three hundred pound, blind flange with a high pressure feed through cable assembly installed, a flange gasket and mounting bolts. This is used to bring necessary intrinsically safe wiring outside the tank.

2.4. The Hanger Assembly

The Hanger Assembly is a mechanical and electronic assembly mounts to, and hangs from, the Feed Through Flange. This hanger assembly contains the support device for the assembly, a small circuit board containing a temperature sensor and connectors for wiring from the feed throughs and the load cell, a universal joint, the load cell and a mechanical connection for the probe. The circuitry feeding the in tank wiring is intrinsically safe.

2.5. The Probe

The probe is a sealed, extruded aluminum tube (welded ends) with temperature sensors in the hollow and open center. There are three temperature sensors. The probe's weight is about one pound per foot of length. The probe will withstand pressures well in excess of 2,000 psi without collapse. The probe is available for installation in tanks of various diameters (horizontal tanks) and depths (vertical tanks) from as little as two feet to as much as eighteen feet.

2.6. The Tank Computer

The Tank Computer is a battery powered, intrinsically safe device driven by an 8 bit RISC processor and measures temperature and fluid level using the sensors located in the tank. For safety reasons, the Tank Computer must only be powered by the battery pack provided by FTI for that purpose. The Tank Computer communicates with a Master Computer using the

two way, half duplex radio link. The Tank Computer is mounted on a bracket to the outside of the flange bolts.

2.7. Active Repeaters

To be added later.

2.8. Passive Repeaters

Where needed, a passive repeater may be used to obtain better RF signals inside a building or hutch. This antenna is mounted on a glass window and provides a 3 dB increase in field strength (about a 50 % improvement) inside the building.

3. Abbreviations Used

The following are abbreviations used in this document:

FTI – Fueling Technologies, Inc.

V or v – Volts

mv – Millivolts

A or a – amperes

ma – Milliampères

RS-485 – Recommended Standard 485 published by the Electronics Industry Association

RF – Radio Frequency

MHz – Mega hertz

KHz – Kilo hertz

psi – pounds per square inch (a measurement unit for pressure)

AC – Alternating Current

DC – Direct Current

m – Meter

ft – feet

in – inches

4. Related FTI Documents

4000027 – Control Drawing (Copy included in this manual)

9000072 – Site Configuration and Information Disk (Installation)

9000110 – Customer Site Information Form

5. Site Preparation and Planning



CAUTION

THIS MANUAL DOES NOT CONTAIN INSTRUCTIONS FOR MODIFICATION OF TANKS TO ADD THE REQUIRED TWO INCH OPENING. A COMPETENT TANK MANUFACTURING OR TANK MODIFICATION FIRM SHOULD BE USED IF THAT TASK IS NECESSARY.

5.1. Planning and Locating the Master Computer

The Master Computer must be located in a controlled environment where the temperature is between 0 and 50°C (32 to 122°F) and the relative humidity is less than 95 percent, non-condensing. This may be in a building or an equipment hutch.

The Master requires the use of a standard grounded 120 VAC outlet (three pin) with sufficient space around it to permit the wall transformer power supply to be plugged into the outlet. Current required is less than 1/8 amp. The Master does not require a dedicated circuit or a non-interruptible power supply although one may be used if desired.

The Master should be located where access by personnel is possible and the access is acceptable to the owner. The location should also be within five feet of the grounded AC outlet.

The Master Computer's radio system requires RF access to the tanks. RF access means there must be a path for the radio signals to get to and from the tanks. If the building or hutch containing the Master is not metal, there is little problem. If the building or hutch is metal, a window approximately in line with the radio signals must be provided. This window may be of glass, wood, plastic or some other non-conductive material. There should not be any major vertical partitions or walls of metal within three feet of the antenna. See the section on planning radio paths below.

The Master Computer is equipped with a modem for communicating with a Host system. This modem is a standard 2400/2400 modem (CCITT V.22 and V.22bis). If this modem is to be used, the Master needs a RJ-11 plug equipped phone line. A six foot cable is provided for connecting the RJ-11 on the Master to the RJ-11 at the phone outlet. If a six foot cable is not

long enough, a cable of any length may be used. These cables are commercially available at various electronics outlets and are not sold by FTI. While there is no restriction on the length of the cable, the cable must not be routed outside the building or hutch containing the Master.

5.2. Radio Path Planning

The FTI Model 100 Tank Gauge System does not require the use of wiring to and from tanks; just one of its significant features. It uses radio signals to transfer data and commands to and from the tanks to the Master Computer. This use of radio signals requires some planning, however.

For planning purposes, the maximum range of the radio system should be considered to be no more than 500 feet. Under the best of circumstances the range can be as much as 2,000 feet but it is best not to use this number when planning the installation.

The radio path should be free of obstacles such as hills, buildings or heavily forested areas. A few trees or bushes, a small building, or even a metal fence will not hurt the signal. But, the radio path should be as close to a clear line of sight as possible. As mentioned above, the Master Computer must have RF access to the radio signals. A window should be located approximately in the line of sight where a metal building or hutch is used to house the Master.

If these conditions cannot be met, the use of active repeaters and/or passive repeaters, both available from FTI, should be considered. By using repeaters, the range over which the System can operate can be substantially extended and the radio path may go around or over obstacles. If a passive repeater is used, the repeater should be mounted on a glass window and the Master Computer should be located within three meters of the repeater.

The radio system operates on the frequency of 916.5 MHz. Operation on this frequency does not require a license and the equipment is certified by the FCC. As a practical matter, the system will not experience interference from cellular base stations, paging towers or commercial radio and TV antennas located nearby. If located near a very, very high power military (or similar) radio or radar system, a slight reduction in the maximum range of the system might occur under unusual conditions. The systems described in this paragraph are those who generally operate continuously (not periodic).

The radio system can experience interference from devices certified by the FCC and operating in the frequency range of 900 to 930 MHz. Usually these devices operate only periodically (as does the FTI system). Because of their periodic nature, they and the FTI system can share the frequency band and as a practical matter usually may be ignored.

5.3. Hazardous Areas

The LP Gas Code (NFPA 58) defines the area within 15 feet of any tank, any fill opening, or any point where the LP Gas is dispensed, loaded, vented, or the like as hazardous. Areas within 5 feet are Class I, Division 1, Group D. Areas within 5 to 15 feet are Class I, Division 2, Group D. Do not install a building, a hutch, the Master Computer, or any active repeaters in a hazardous area.

The Tank Computer, the Hanger Assembly and the Probe are intrinsically safe and, thus, may be installed in a Division 1 or 2 area. Again, repeaters and the Master Computer may not be installed in a Division 1 or 2 area.

5.4. The Tank

Caution: Any existing tanks which has or have had product stored in them must be pumped dry and purged before opening the tank to outside atmosphere. Be sure no gas vapors are present before the installation of the Remote Tank equipment is to begin.

Tanks must have an available ASA standard two inch steel pipe opening. The float and temperature probe lengths must be ordered for the correct diameter tank.

Install a two inch diameter by six inch long pipe riser into the existing two inch opening on the tank. Use sealing compounds as required for leak proof seal of pipe threads.

Install the eight hole flange onto the two inch diameter riser. Use sealing compounds as required for leak proof seal of pipe threads. A special modified riser cap and cable is also provided.

A measurement in inches is required from the top of the newly installed riser to the inside bottom of the tank. This information must be recorded for each tank and later entered into the Remote Master for each tank number. This is used for the fluid level reference point and the measurement should be as accurate as possible.

5.5. Battery Life

The Tank Computer is powered by a battery pack provided by FTI that is intrinsically safe. These battery packs have a life of about two years in normal conditions. For reasons of safety, they must be replaced only with battery packs supplied by FTI for use in the FTI Model 100 Tank Computer. The use of any other battery will cause an extreme hazard to life and property.

The FTI Model 100 Tank Gauge System monitors the voltage of the batteries and provides a warning at end of battery life.

5.6. Tool and Material Requirements

Multiple sizes of screws drivers, nut drivers, open end wrenches, and pipe wrenches. Socket set with ratchets and extensions for $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ size drives. Possibly a lifting device could be required if a large man hole (access cover) has to be removed/replaced or modified.

In order to mount and seal pipe threads, a pipe joint compound that is UL Recognized or Listed for use with Propane and Butane must be used. **The use of an unsatisfactory compound can result in a leak and a hazard to life and property.** If you are not aware of acceptable compounds, contact FTI.

6. Installation

6.1. Tank Equipment

Caution: Tanks must be dry and purged. Be sure no gas vapors are present before beginning the installation

If necessary, remove the two inch plug.

Properly seal, install and tighten the six inch long riser pipe.

Properly seal, install and tighten the eight hole lower flange plate.

Using a weighted string line (plum bob) obtain the distance from the top of the lower flange plate to the bottom of the tank (inside dimension) in inches. Measure the string line as accurately as possible and record this distance along with the tank identification on the Site Information Sheet (see below).

The temperature probe assembly is used to measure the fluid temperature at three different levels inside the tank at about the 5%, 35% and 65% levels. Note the small connector and wires on the temperature probe assembly. Use care during installation of the temperature probe and the float probe as not to cause damage to either the wires or the connector. This connector will plug into the hanger assembly in a later step.

Install the gasket provided with the Flange Feed Through Kit.

Remove the probe assembly for the tank from its shipping container and slide the flat end first into the riser pipe. Do not dent or bend the float tube because this can cause inaccurate readings.

There are two sets of holes drilled at the top of the probe. The top set of holes will be used to pin the float probe to the hanger assembly. Insert a Phillips Screwdriver in the lower set of holes. Slowly lower the float probe assembly allowing the screwdriver's shaft to rest on the top of the riser flange. This allows the installer to use both hands to finish connecting the hanger assembly.

Record the Probe Assembly serial number (with the tank identification) on the Site Information Sheet.

Connect the Hanger Assembly to the Feed Through Flange using the bolts provided with the Feed Through Flange Kit. Plug the connector from the Feed Through Cable into the circuit board on the Hanger Assembly.

Remove the cotter pin and cloves pin from the hanger bracket assembly. Align the top set of holes in the float probe with the holes in the hanger assembly and then reinstall the cloves and cotter pins.

Connect the cable from the temperature probe to the circuit board located on the hanger bracket assembly.

Remove the previously installed screwdriver and slowly lower the new assembly into the tank. Do not drop this assembly because permanent damage to the float sensor will occur.

The flange is equipped with pressure tight electrical feed throughs rated to withstand 1,500 psi.

Check to insure the flange gasket and all bolt holes are aligned. Wait to install the bolts and nuts until after a dry run test can check out the probe installation.

6.2. Installing Repeaters

To be added later.

6.3. The Tank Computer

The Tank Computer is shipped mounted to its mounting bracket. Record the serial number of the Tank Computer on the Site Information Sheet in the location for the tank number where it will be installed.

Remove the Feed Through Wiring Shield from the assembly. Install but do not tighten the two flange bolts and use these to hold the mounting bracket in place for a dry test of the tank computer. Connect each color labeled wire to the correct labeled feed through on the Feed Through Flange.

Remove the front cover of the Tank Computer and plug the two wire battery cable into the circuit board. Replace the front cover.

6.4. The Master Computer

Locate the Master Computer within five feet of the planned and grounded AC outlet and plug the wall power supply into the outlet. Insure an appropriate RF path for the Master Computer and all the tank units it will service.

Connect the Master Computer to the telephone line using the provided ten foot RJ-11 equipped cord.

6.5. Initializing the Master Computer

Complete the Customer Site Information Form and send to Fueling Technologies by facsimile. Receive the Site Configuration and Information Disk from Fueling Technologies and install that information in the Master Computer (See document 9000110 for how to perform this operation).

Wait for thirty-five minutes. The Master will receive two or more information packets from the active tanks during this period. Verify the readings from the "dry" tanks is acceptable.

6.6. Complete Tank Closure

Install the remaining flange bolts through the Feed Through Flange and tighten them appropriately. [ed: Do we have to use a torque wrench??]

7. Replacing the Battery Pack

Remove the front cover of the Tank Computer box. Disconnect the cable from the old battery pack on the Tank Computer's main circuit board. Remove the screws holding the mounting bracket for the electronics in the Tank Computer box and remove the assembly.

Remove the screw holding the battery pack from the mounting bracket. Replace the old battery pack with a new one attaching it to the mounting bracket in a manner identical with the only one. Use only FTI part number 2500201 as a replacement.

Mount the bracket holding the electronics in the box as before, connect the cable from the new battery pack to the Tank Computer's main circuit board. Replace and tighten the front cover using all four screws.

Recalibration of a tank computer is not necessary following battery replacement.

8. Specifications

8.1. Master Computer

Wall Transformer AP5819 (FTI P/N 2500200)

120 VAC at 120 ma maximum input

7 VDC at 900 ma maximum output

Three wire output at 6 ft (7 VDC, Signal Ground, and Safety Ground)

Console

7 VDC at 250 ma input

16 Key Keyboard

2 Line by 20 Character LED Backlit LCD

One RS-485 Connector (DB-9)

6 inches (depth) by 7 inches (width) by 2 inches (height) – 1 lb

Antenna extends 3 inches above the unit.

Modem

CCITT V.22 and V.22bis, Bell 212/103

US FCC Part 68 Certified

Canadian CS-03 Certified

RJ-11 connector and six foot cable

Radio

916.5 MHz, -10 dBm to -98 dBm Transceiver

FCC Part 15 (Intentional Radiator) Certified

Canadian RSS-212 Certified

Environment

Operating: 0 to 50°C (32 to 122°F), 0 to 95% RH, Non Condensing

Storage: -40 to 60°C (-40 to 150°F), 0 to 95% RH, Non Condensing

Do not store in damp or wet conditions.

8.2. Tank Computer

Processor

8 bit RISC Engine with Non-volatile Memory
Equipped for Intrinsic Safety

Radio

916.5 MHz, -10 dBm to -98 dBm Transceiver
FCC Part 15 (Intentional Radiator) Certified
Canadian RSS-212 Certified

Battery Pack

Lithium Polycarbon Mono Fluoride Battery with safety circuits
Equipped for Intrinsic Safety

**USE BATTERY PACK PROVIDED BY FTI ONLY! THE USE OF ANOTHER
BATTERY PACK MAY RESULT IN EXPLOSION AND/OR FIRE AND
DANGER TO LIFE AND PROPERTY.**

Environment

Operating: -40 to 60°C (32 to 140°F), 0 to 100% RH, Condensing
Storage: -50 to 70°C (-58 to 158°F), 0 to 100% RH, Condensing
200 v/m electric field at any frequency operating
Storage or operation at very cold temperatures can effect battery life

8.3. Hanger Assembly and Probe

Vertically Compensated

Environment

Operating and Storage: -50 to 70°C (-58 to 158°F), 0 to 100% RH, Condensing in water
or LP Gas vapors (not submerged)
200 v/m electric field at any frequency operating
Pressure: Up to 1,250 psi

9. Control Drawing