

# SSI Technologies - Application Note FT-AN4

## Fluid-Trac® 3-Wire Liquid Level Sensor Interface to Microprocessor-controlled Fuel Gauges/Digital Instrumentation

### Fuel Gauges/Digital Instrumentation Application

This application note covers the Fluid-Trac® 3-wire liquid level sensor used as a replacement for a standard 33-240 Ohm resistive float sender, reed-switch tube sensor, or capacitive tube sender to interface with microprocessor-controlled fuel gauges or digital instrumentation. (I.e. electronic dashes).

### Traditional float sender

Some fuel monitoring systems consist of three components – a liquid level sender; a microprocessor and a fuel gauge or digital instrumentation. The liquid level sender measures the level of fuel in the tank. The liquid level sender sends the information to microprocessor which then sends the data to the fuel gauge or digital instrumentation to display the signal generated level.

One common liquid level sender is a 33-240 Ohm resistive float sender. It consists of a float attached to an actuating arm (rod) with a variable resistor (potentiometer) mounted at the end of this rod. These devices tend to be inaccurate especially when used in irregular shaped tanks.

The resistive float sender interfaces with the microprocessor-controlled fuel gauge or digital instrumentation via a wiper that slides across the resistive material of the potentiometer. The resistance of the float sender changes with the float's position.

### Fluid-Trac® Ultrasonic Liquid Level Sensor



The Fluid-Trac® 3-wire liquid level sensor replaces the traditional resistive float sender as a more robust and accurate liquid level sensor in fuel monitoring systems with stationary or mobile fuel tanks with  $\leq 32$  inch depths.

The Fluid-Trac® 3-wire liquid level sensor uses ultrasonic technology to generate a high frequency sound wave that reflects off the fuel. The time for the echo to reflect off of the fuel surface and return to the liquid level sensor is used to calculate the level of the fuel inside the fuel tank. The distance from the sensor to the fuel is calculated, using the speed of sound. This measured distance is then compared to a strapping table (tank profiling software) and converted into a voltage that the microprocessor uses to drive the fuel gauge or digital instrumentation to indicate the correct liquid level.

The Fluid-Trac® family of 3-wire liquid level sensors offers a wide variety of input and output options which enables them to interface with many different microprocessor-controlled fuel gauges or digital instrumentation.

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## Fluid-Trac® 3-Wire Liquid Level Sensor Interface to Microprocessor-controlled Fuel Gauges/Digital Instrumentation

Fluid-Trac® 3-wire liquid level sensors can interface with either 12 V (automotive applications) or 24 V (large diesel engines, construction, industrial, marine applications) input voltage supplies.

The Fluid-Trac® 3-wire liquid level sensor has a fully programmable voltage output. The output can be programmed to be either a ratiometric or non-ratiometric voltage within a 0.5 Vdc to 4.5 Vdc range.

The Fluid-Trac® 3-wire liquid level sensor is more accurate than resistive float senders with a distance accuracy of +/- 2.5% full scale span.

The Fluid-Trac® 3-wire liquid level sensor is mounted on top of the fuel tank. It mounts to the same opening as the resistive float sender. It is non-contacting (no float arm inside the fuel tank) and does not have any moving parts to wear out. The resistive float sender's wiper slides across a resistive strip that can wear out over time which may result in intermittent or even a complete loss of the signal to the fuel gauge or digital instrumentation.

The Fluid-Trac® 3-wire liquid level sensor operates in temperature ranges from -40°C to +85°C and is programmable with a digital filtering to reduce error caused by liquid sloshing in mobile fuel tanks.

The Fluid-Trac® 3-wire liquid level sensor is not affected by corrosive fuel additives or low sulfur fuels.

### Electrical Interface

The Fluid-Trac® 3-wire liquid level sensor's programmable features allow it to interface with microprocessor-controlled fuel gauges or digital instrumentation in a wide variety of applications.

The Fluid-Trac® 3-wire liquid level sensor can be factory programmed to work with a 5 Volt regulated microprocessor control module. When the Fluid-Trac® 3-wire liquid level sensor is programmed for a ratiometric voltage output range of 0.5 V to 4.5 V, it emulates a 30-240 ohm resistive float sender.

The Fluid-Trac® 3-wire liquid level sensor can also be programmed for use by the microprocessor for error detection of tank volumetric levels. The 0.5 Vdc to 4.5 Vdc voltage output would be set for "in range" values instead of as "full" or "empty" indicators. An error will be indicated anytime the voltage output was < 0.5 Vdc or > 4.5Vdc.

The Fluid-Trac® 3-wire liquid level sensor has an internal feedback system to allow for non-ratiometric outputs. It can be factory programmed to work with non-regulated input voltage microprocessor control modules.

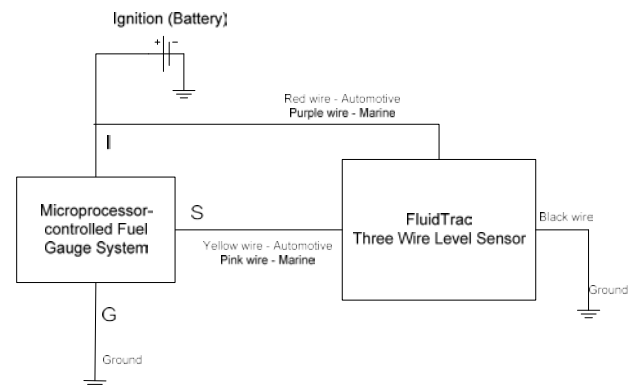


Figure 1. Fluid-Trac® 3-Wire Ratiometric Interface to Microprocessor-controlled Fuel Gauge

### Mounting

The Fluid-Trac® 3-wire liquid level sensor can mount in a variety of ways. Common mounting styles are either 1 3/16" machine threaded or the standard SAE 1810 5-bolt pattern. When mounting the Fluid-Trac®, it is necessary to place the Fluid-Trac® level sensor's face parallel to the liquid level (preferably in the center of the tank) and with no obstructions in the beam path to the liquid.