FIFOTRACK ULTRASONIC FUEL SENSOR USER GUIDE

V1.3

Model: TUB01

Version: V1.3

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Document History

Version	Revision Date	Author	Detail
V1.1	Oct 15, 2016	Vito Hu	Initial Version
V1.2	June 16, 2020	Vito Hu	Installation way updated
V1.3	Oct 12, 2020	Vito Hu	Add descriptions of fuel theft threshold value smaller than 3cm

Contents

1 Product Overview

The ultrasonic fuel sensor is a relatively new technology for fuel monitoring. According to the sound burst return time from bottom-surface-bottom reflections, the sensor can convert ultrasonic wave signals into height data of fuel level. Compare with the traditional capacitive fuel sensor, the ultrasonic fuel sensor doesn't need to drill a hole on fuel tank during installation. Besides, it can provide same 98-99% accuracy as the capacitive fuel sensor.

- Safe and easy installation, no need drill a hole
- 98-99% High accuracy
- Stable performance, designed for vehicle environment under temperature -30℃ ~75℃
- IP67 protection
- Guided by both paper and video manuals.
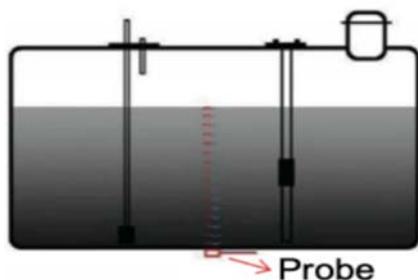
2 Applied Model

Ultrasonic fuel sensor (hereinafter to be referred as "sensor") is connected to tracker via RS232 port, it is applied for

⊙ A300/A500/A600/A700/S60

3 Basic Description & Specification

Items	Description
Sensor probe dimension	Diameter ø33mm, height 12.7mm
Working voltage	9 ~ 36VDC
Fuel level measurement range	Default 0-100cm (0-3cm is blind zone)
	0-400 cm (0-6cm is blind zone), optional, price different
Accuracy	98-99%
Measurement resolution	0.1mm
Protection rank	IP67
Applicable liquid	Gasoline, diesel, water, etc
Maximum power consumption	0.36W/12VDC

Working temperature	-30℃ ~75℃
Storage temperature	-40°C ~85°C
Working humidity	5%~ 90%
Signal output type	RS232
Cable length	8m

4 Package Parts

Standard Package				
Probe	8m extension cable	Fuse	Couplant	Grease
Steel clamp	Probe holder	Ring gasket	Rubber pad	
Optional Parts				
Digital indicator				

5 Installation

5.1 Tools Preparation Before Installation

Before installation, the below parts are needed:

Package of sensor	Insulating tape	Rag
Slotted screwdriver	Power bank (9-36V)	Abrasive paper
Multimeter		

5.2 Vehicle Preparation Before Installation

1	Fuel level in the tank over 50%	The fuel level in the tank should be over 50%. It is important for next step of checking correct installation position.
2	Vehicle parking requirement	Make sure the vehicle is parking on horizontal ground. Otherwise, the digital indicator can't display correct code and fuel level value.
3	Prepare time for installation	Need to prepare at least 2 hours for first time installation

5.3 Choose Installation Position

Installation position should keep distance from fuel input tube, output tube, fuel-return tube, fuel float ball, baffle, etc. It's better to install on a flat area in the center of the fuel tank's bottom. For the tank below, It is proper to install the probe on the yellow area.
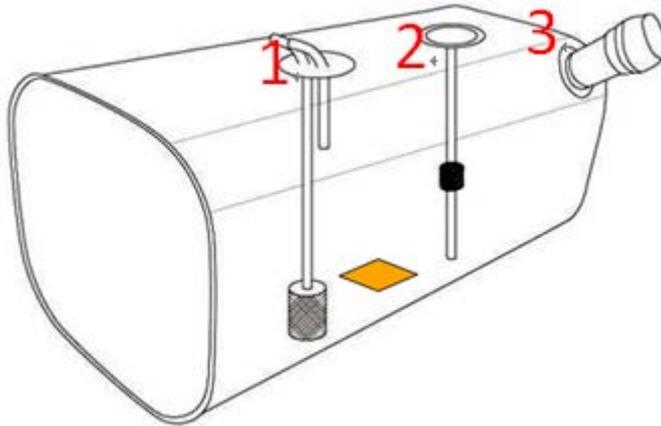
If it is a cylindrical tank, you should choose the area that is closest to the ground.
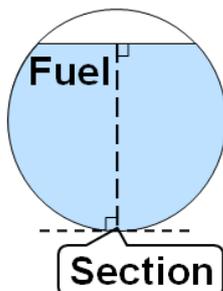
5.4 Check Installation Position by Digital Indicator

Step 1: Clear the installation position area with abrasive paper

Step 2: Connect the probe to the display, then power on the display by power bank or vehicle's battery (9-36V), as shown below:

Step 3: Put the couplant on the surface of the senor (the side without the label).
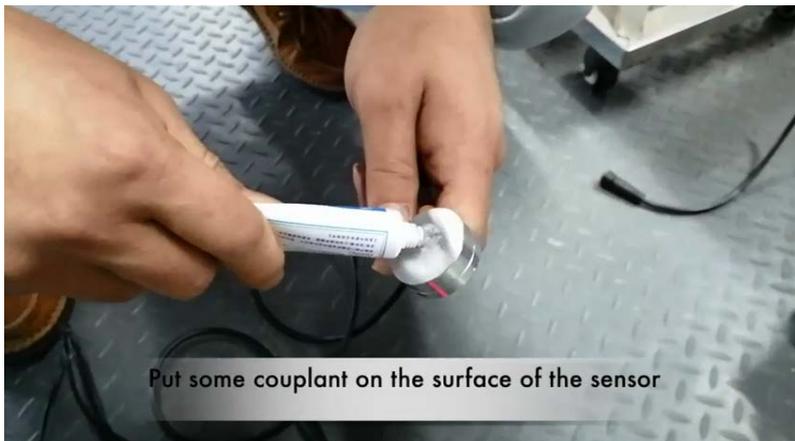
Step 4: Stick the sensor on the center of the installation area and hold it, check the results from digital indicator according to the following **5.3 code instruction of digital indicator.**

Check the output data
Make sure the code is ok according to the digital indicator instruction.

Check the output data
Make sure the code is ok according to the digital indicator instruction.

Step 5: If the code result is ok, mark a round installation spot on the fuel tank.

5.3 Code Instruction of Digital Indicator

Display Code	Description
	Probe is initializing. It shows number 8 only for a few seconds.
	The fuel level height is 18.9cm, it is real time fuel level height
	The left digit "3" is echo numbers code
	Iron tank — The echo code should be great than or equal to "1", "2" is better.
	Aluminum or stainless-steel tank — Fuel level height <60cm — The echo code should be great than or equal to "2"
	Fuel level height >60cm — The echo code should be great than or equal to "1", "2" is better.
	The right digit "2" is installation status code.
	Iron tank — The installation status code should be "1" or "2", "2" is better
	Aluminum or stainless-steel tank — Fuel level height <60cm — The installation status code should be only "2"
	Fuel level height >60cm — The installation status code should be "1" or "2", "2" is better.
	F4 is the inclination angle code. This code must be less than or equal to "4" degree. If this code is great than "4", means this vehicle or fuel sensor probe is not horizontal, please adjust vehicle parking position or fuel sensor probe position until you got code less than or equal to "4".
	Double 9 indicates the digital indicator is not connected with the sensor
	FFFF Please turn off the power and restart the fuel sensor

5.4 Install the Sensor

Step 1: Clean up the testing couplant on the fuel tank and probe surface.

Step 2: Install the protective holder

Please make sure the center of the holder matches the marked round installation position, also the holder should be parallel to the vehicle frame (chassis).

Step 3: Install the fuel sensor probe

1) Put the ring gasket on the surface of the sensor, then fill the measuring area with grease, make it a bit higher than the ring gasket. There must be no air bubbles or dust or sand inside the grease.

2) Insert the sensor into the holder and install the cover plate
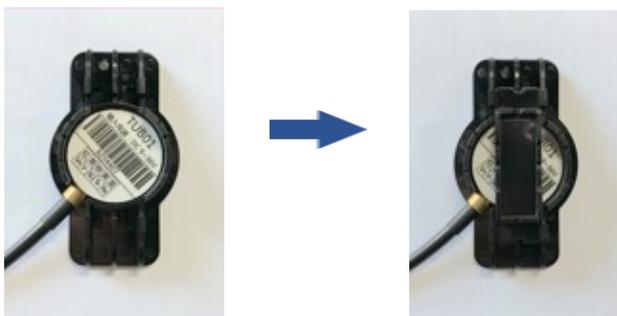
3) Connect to the digital indicator and check if the results are ok, refer to **5.3 Code Instruction of Digital Indicator**

Step 4: Fasten the holder with stainless-steel clamp

1) Stick the rubber pad on the four corners of tank

2) Fasten the steel clamp

3) Fasten the joint of the clamp with a cable tie

4) Check the installation status on digital indicator

Double check the display data from digital indicator
Then remove the digital indicator, connect the sensor to GPS tracker.

5.5 Wiring on Vehicle

Follow the frame of vehicle to arrange extension cable in the cab. Wiring should be at least 20cm far away from the motor and high temperature parts of the vehicle to avoid electromagnetic interference. Usually wiring should not affect vehicle's dumper or maintenance.
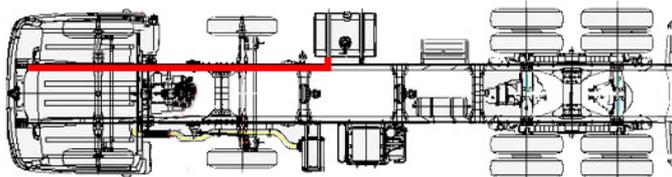

NOTE:

● Wrap over the naked joints with electrical tape

● Tie the extension cable every 50cm with cable tie

5.6 Connect to GPS Tracker (A300 model as example)

Connect the extension cable to probe with aviation connector; Plug the other connector of extension cable into "RS232|MIC|SPK" socket of A300.

Ultrasonic fuel sensor	Wire Connection	GPS tracker (A300)
Power wire (Red)	⬅➡	VCC wire (Red)
Ground wire (Black)	⬅➡	Ground wire (Black)
8 Pin connector	⬅➡	RS232 port (8 Pin)
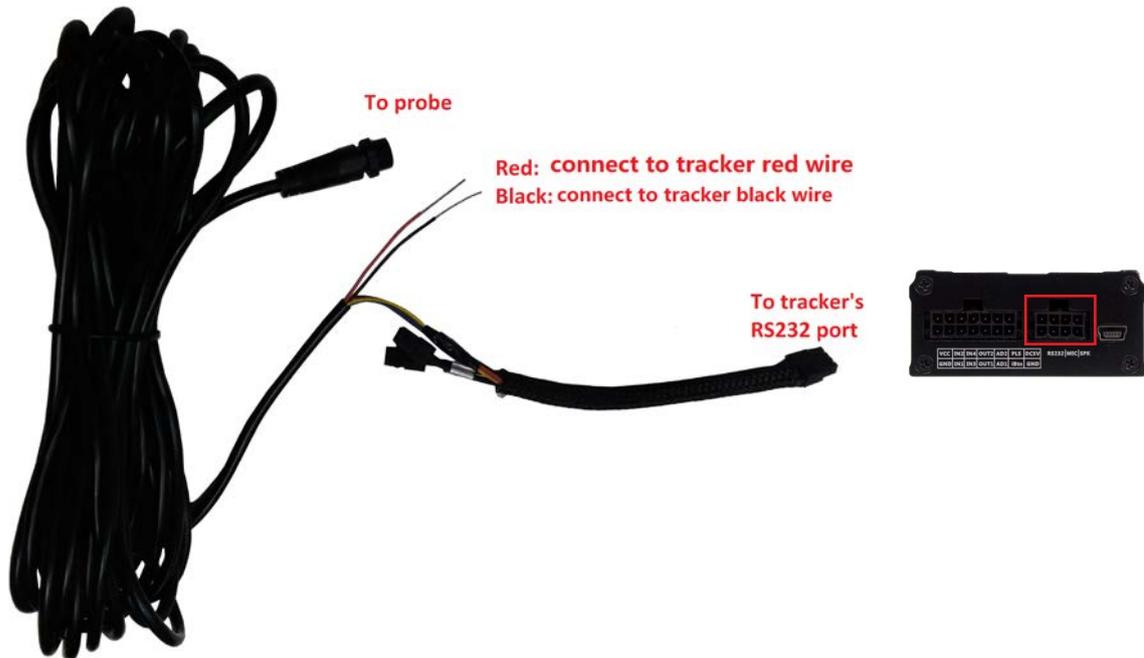
Connect extension cable and tracker to vehicle's battery, and then, both fuel sensor and tracker start to work.

Note:

● Connect sensor's extension cable and tracker's cable together, and then connect to vehicle's battery. Wrap over the naked joints with electrical tape. At last, connect extension cable to fuel sensor, and power on sensor. It can avoid damage to fuel sensor.

● During installation, reading digital indicator is necessary, which is useful to determine whether operation is correct or not.

5.7 Check Connection Between Sensor and Tracker

After sensor and tracker power on, sensor initializes and starts detecting fuel level after 1 minute,. User can use below SMS command to check the connection, and check whether sensor works normally:

SMS command: 000000,C05

Reply: C05,<rt_level>,<install-status>

While,

rt_level: real-time fuel level of sensor, unit mm

install-status: The detected installation status, which can be

"OK"

"Probe Disconnect"

"Low Power"

"Unexpected Restart"

6 Operation

6.1 Setting on FIMS

User needs to set "Fuel level" sensor on FIMS, and then, all function about fuel will be working. Follow below steps:

Login FIMS, select target tracker->Edit->Sensors->Add,
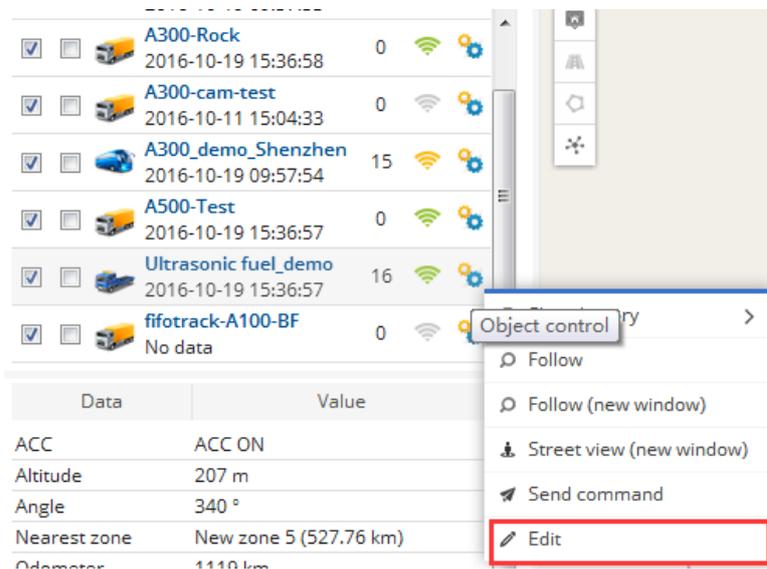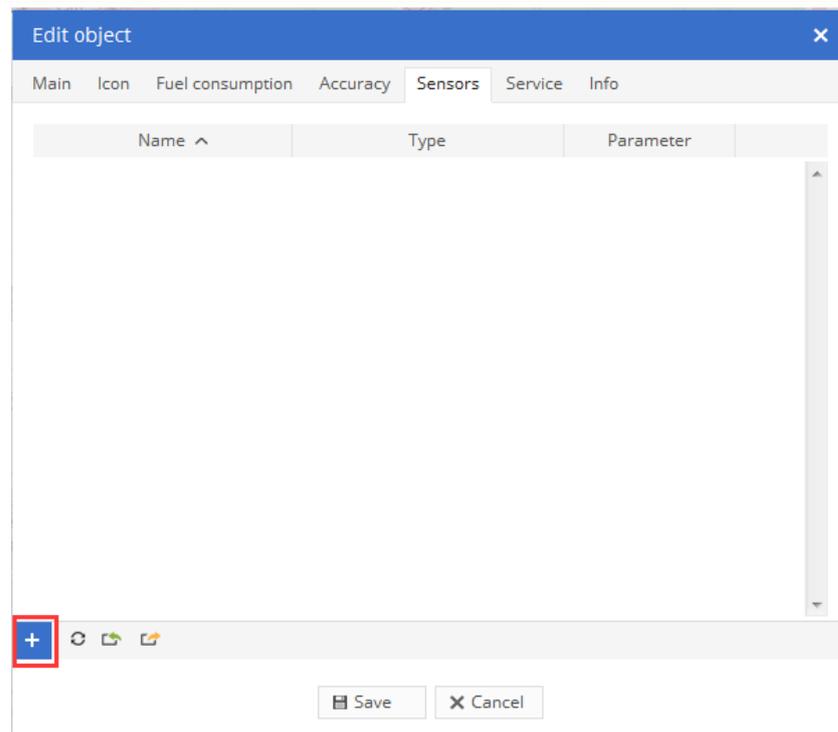
At "Sensor Properties" dialog, set parameters as below:

Sensor

- ⊙ Name: Input self-define string

- ⊙ Type: Select "Fuel level"

- ⊙ Parameters: Select "ai2"

- ⊙ Show in popup: selected

Result

- ⊙ Type: Select "Value"

- ⊙ Units of measurement: self-define

- ⊙ Formula: (X*max_c)/max_h, while

  max_c: maximum capacity of tank, using the unit specified in "Units of measurement"

  max_h: maximum height of tank, unit mm

For example, when tank has capacity of 155Liters, and maximum height 40cm, the formula is (X*155)/400

Click "Save", fuel level will be display at "Object page", as below:

6.2 Fuel Reports

FIMS supports three types of fuel reports:

◉   Fuel fillings

◉   Fuel thefts

◉   Fuel level graph
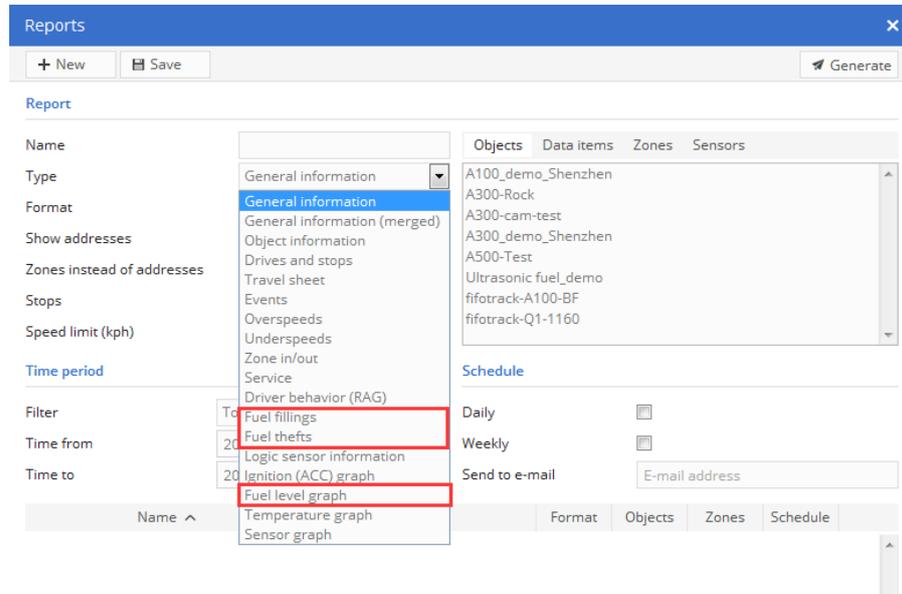
The below figures are exported reports:

Fuel level graph

Fuel fillings

7 Threshold Value of Fuel Change

If fuel changes, the result will not respond in real time. The sensor has working mechanism based on threshold values to filter fuel level fluctuations under different application environment such as uphill, downhill or external power lost, etc.

Items	Threshold value	
Fuel filling	Fuel filling should be greater than 3cm fuel level change, otherwise the sensor will ignore it.	
	Sensor will not update fuel level change during filling process.	
	Until filling process finished, and wait for 1 minute more, sensor starts to update real time fuel data.	
Fuel theft	Fuel theft is equal to or great than 3cm fuel level change.	Sensor will not update theft fuel level change during fuel theft process.
		Until the fuel theft process finished, and wait for 8 minutes more, sensor starts to update real time fuel data
	Fuel theft is smaller than 3cm fuel level change.	The fuel level will decrease 1mm at every second
Sensor lost external power	Sensor will keep the current fuel data until the external power is reconnected and the sensor starts to update real time fuel data after 1 minute.	

8 FAQ

1. The ultrasonic fuel sensor solution is reliable or not?
Yes, It is reliable solution. At the early stage, the main installation way is by A/B glue for the probe fixation. This installation process is related to technician's skills and experiences. On the other hand, the A/B glue may be affected by environment factors such as temperature, humidity as time goes by. The new installation way uses sensor probe holder to replace the A/B glue for fixation, this is big improvement. Compare to the old way, the installation process is much easier, the sensor stability is very satisfied during the lifetime.

2. What's the ultrasonic fuel sensor accuracy?
It is 98-99% under correct installation

3. What's the ultrasonic fuel sensor measurement range?
Default is 0-100cm. Optional range is 0-400cm, the price is different.

4. Your ultrasonic fuel sensor can work with other GPS tracker brand?
No. Only work with fifotrack GPS tracker We have developed debugging way in firmware to make sure this sensor is installed properly. Working with third-party GPS tracker may hurt our brand because of the out of control performance.

5. The ultrasonic fuel sensor is suitable for small car fuel monitoring?
Not suggest
The fuel tank of small car is part of car body with irregular shape. There are three challenges below:
1. Not easy to find a suitable position on fuel tank to install the sensor
2. Need do calibrations to get good results
3. Fuel tank height is too short, return time of sound burst refection is too fast, the accuracy is not guaranteed.

6. Why the ultrasonic fuel sensor has blind zone in the bottom of fuel tank?
When the fuel level is shorter than 3cm (0-400cm type sensor fuel level is shorter than 6cm), the sensor can't identify the signals of return sound burst reflections accurately, so the bottom of fuel tank is blind zone. On the other hand, in practical applications, fuel level is almost always higher than 3cm in the fuel tank.

Sensor type	Common blind zone	Special blind zone
0-100cm type sensor	0-3cm	Iron tank: 0-5cm
		Engineering machinery vehicle tank: 0-5cm
0-400cm type sensor	0-6cm	\

7. How can you make sure the ultrasonic fuel sensor work well in local?
We have developed debugging way to identify each key stage's state.
1. During installation, we provide digital indicator to help identify proper installation operation
2. We have command 000000,C05 to check the connection between the GPS tracker and sensor.
3. We have command 000000,B95,1,1 to check raw data of sensor, which help us judge the state of sensor.
4. Since May of 2016, we have over 4 years rich support experience in this field.

8. fifotrack provides AS10 capacitive Fuel sensor, ultrasonic fuel sensor, original fuel sensor, liquid sensor, what's the difference, how I choose?
AS10 fuel sensor is the priority among above options. It is an economic, mature, adaptable and safe solution. However, the AS10 fuel sensor can't cover all applications. If the customers have below problems:
- Customers refuse to drill a hole on the fuel tank, at the same time need high accuracy fuel monitoring, ultrasonic fuel sensor is recommended. However, the ultrasonic need higher installation skills and the price is around usd30 higher than the AS10 fuel sensor.
- Customers want to monitor the small car fuel. Both the AS10 fuel sensor and ultrasonic fuel sensor are not suitable for most small cars, so the original fuel sensor solution (using vehicle existing built-in fuel sensor) becomes a solution accepted by part of customers. However, this solution accuracy is

around 90%, but cost is 0, only need buy GPS tracker itself.

- Customers have stationary big container like 5 meters height need to monitor level. The liquid sensor is the most suitable solution both on cost and installation convenience considerations. However the liquid sensor is not suitable for moving objects.

9. Do you provide video installation guide?
Yes, the video link is: https://youtu.be/d5lBwaEp-kw

Please e-mail us at info@fifotrack.com if any question or feedback.