T23 Fleet Accessory Installation Manual
v0.45

Contents

1. General

Instructions how to use and install Tramigo Rev B T23 Fleet professional accessories.

Note: Use Firmware version 1.0.96 or newer.

1.1 Prior Installation testing and steps

It is good practice to test new accessory at the office or other suitable place before heading to the installation location.

- Check that you have all parts and tools needed
- Verify that the accessory is working correctly
- You know how to use and operate the accessory
- Go through the installation steps and process in your mind
- Double check above before heading to the location

This saves tons of valuable time and money, and increases end user/customer satisfaction.

2. Driver ID

With Tramigo Driver ID solution fleet owners can monitor current driver ID and collect data to server. Driver ID SMS message reporting is supported as well.

Driver ID utilizes Maxim Integrated™ 1-Wire technology. With 1-Wire it is possible to connect several 1-wire accessories to one Tramigo T23 Fleet 1-Wire interface.

For more information about 1-Wire please see www.maximintegrated.com

2.1 Parts and tools needed

You need following Tramigo Driver ID system parts. They come with Tramigo Driver ID accessory package. One Driver ID reader is needed per vehicle and maximum number of Driver IDs configured in T23 Fleet device is 10.

Parts needed:

- Driver ID reader, the driver ID fob button reader
- Driver ID buttons (fob), the ID key

See image of parts below.

Driver ID Magnetic Reader and Driver ID fob

Tools needed:

- Wire cutters
- Pliers and wrench
- Automotive tape
- Cable connectors and spare wire
- Drill and 8 mm drill head, 7mm if plastic surface and able to twist the reader into hole

2.2 Initial testing

How to verify that Driver ID Accessory and T23 Fleet are in working order.

2.2.1 Parts and tools needed

You need:

- Tramigo T23 Fleet device with Firmware supporting 1-Wire bus
- 12 wires T23 Fleet IO cable
- Driver ID magnetic reader
- Driver ID fob
- Tramigo Manager (TM) version 3.0 installed into PC or laptop

Tramigo manager can be downloaded from www.tramigo.net/tramigomanager/tmanager.asp with the link to TM 3 User Manual.

If you are missing some parts, please contact to your nearest Tramigo reseller or email to support@Tramigo.com

2.2.2 Assembly and testing

Easy steps:

1. Connect the Driver ID reader BLACK wire to IO cable BLACK ground wire #3 or #4
2. Connect the Driver ID reader RED wire to IO cable WHITE wire pin #12
3. Insert the fob in reader and give a command *ListOneWire* via TM3 or SMS
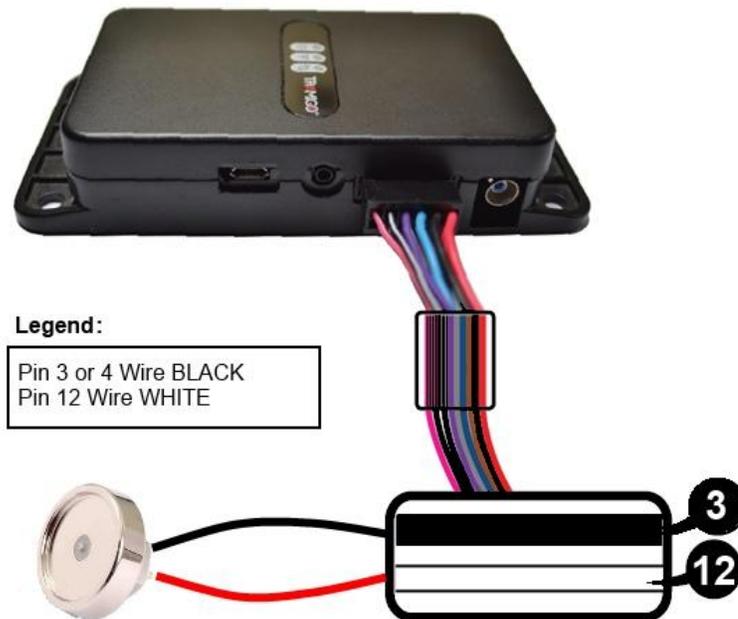
Driver ID reader connected to T23 Fleet

Response example, TM 3 screen:

Tramigo: ListOneWire, Driver (ID: 12981719201ABC), 18:57 Jul 19

The number shown is the unique for each Driver ID fob used, later are instructions how it can be paired with the driver's real name.

If there is an error on reading, response is:

Tramigo: ListOneWire, error, devices not found, 18:57 Jul 19

In this case, try at least 3 times and verify that fob is firmly in place and wiring is correct. If problem persist, please refer to troubleshooting section later on this document.

2.3   Configuration and commands

You can add maximum of 10 Driver ID and driver name pairs into T23 Fleet device.

2.3.1   Enabling Driver ID

Enabling periodic detection and reading of Driver ID.

Set command parameters:

Set,DriverEnable,0/1

- 0 - Disable periodic detection and reading
- 1 - Enable periodic detection and reading

Example:

Set,DriverEnable,1

2.3.2   Showing Driver ID data on reports

Showing Driver ID data on Status report messages.

Set command parameters:

Set,ShowDriver,0/1/2/3

- 0 – Driver ID data not shown
- 1 – Driver name only, if name is not stored, Driver ID number is shown
- 2 – Driver ID number only
- 3 – Driver name and Driver ID number

Example:

Set,ShowDriver,2

Response:

Tramigo: Set, parameter ShowDriver, value 2, 08:57 May 9

Notes:

1. SET affects to Status, Ignition and Speed report and to all registered users.
2. Not affecting Driver ID data when querying it from the T23 Fleet device memory.

Get current parameter value:

Example:

Get,ShowDriver

Response:

Tramigo: Get, parameter ShowDriver, value 2, 08:57 May 9

2.3.3 Adding a Driver ID user

Example command:

Driver,Add,123456ABD231278,Jane Doe

Response:

Tramigo: Driver, Jane Doe (123456ABD231278) has been added, 08:57 May 9

Notes and tips:

1. Good practice is to create Configuration File (CF) with commands for all drivers to be added into particular vehicle's T23 Fleet device

2.3.4 Listing added drivers

Example command:

Driver,List

Response:

Tramigo: Driver, Jane Doe (123456ABD231278), Mark Hamilton (123345356ABD231278), Hans Wik (123236SCA231278), 08:57 May 9

Notes and tips:

1. Listing comes from the T23 Fleet device memory, not from the reader
2. The fob's Driver ID number can be get with *ListOneWire* command when on reader
3. If problems please refer to troubleshooting section

2.3.5 Reading connected Driver ID data

When Driver ID fob is placed in reader, you can read the ID number and name pair.

Example command:

Driver

Response:

Tramigo: Driver, Jane Doe (123456ABD231278), 08:57 May 12

Notes and tips:

1. If fob is not in reader correctly, it returns "**error, driver not found**"
2. Can be also used to get fob Driver ID number

2.3.6   Deleting a driver

Example commands:

Driver,Del,Jane Doe

Driver,Del,123456ABD231278

Response:

Tramigo: Driver, Jane Doe (123456ABD231278), 08:57 May 9

Notes:

1. Driver deleted from T23 fleet memory

2.3.7   Deleting all drivers

Example:

Driver,Del,All

Response:

Tramigo: Driver, All drivers deleted, 08:57 May 9

Notes:

1. Drivers deleted from unit memory

Response:

Tramigo: Set, parameter DriverEnable, value 1, 08:57 May 9

2.4   Installation

2.4.1   Driver ID reader location

Locate suitable place from the vehicle's dash board. It should be a place where driver's hands or legs are not likely to touch when operating the vehicle.

2.4.2   Driver ID Reader installation steps

Easy steps:

1. Use drill a 8 mm hole on selected location
2. Loose the nut and insert the Driver ID reader to the hole
3. Screw the nut back on the reader and tighten the nut firmly

After Driver ID reader is installed it should look for example like in picture below:
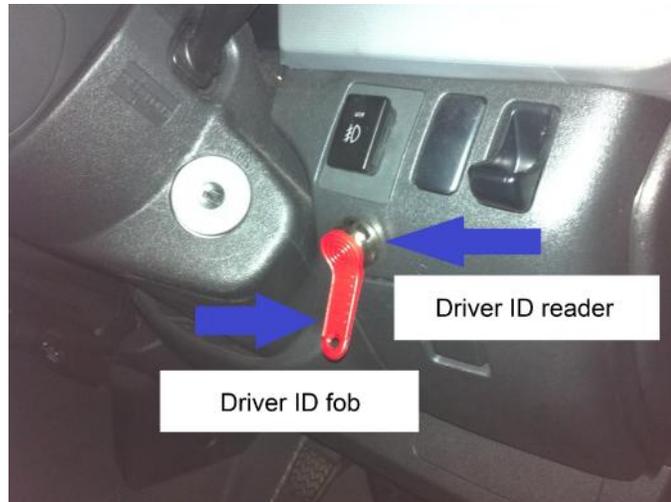
Driver ID reader installed

2.4.3   Driver ID Reader wiring

Refer to section earlier where Driver ID Reader wiring to T23 Fleet device and wire colors is explained. The same applies when Driver ID accessory is installed into vehicle.

Note: Good common ground with T23 Fleet device is essential. Ground the Driver ID reader with T23 Fleet device grounding point.

2.4.4   Testing

After Driver ID accessory is installed into vehicle you can test it functionality with the Driver ID commands described earlier in this document.

Supply the *Status* command when fob in reader and verify that driver ID is part of the response.

Example response:

Tramigo: Status: GPS: 83%, GSM: 0%, Temperature: 41.59 C, battery: 99% (4.20 V), ID: Jane Doe (123456ABD231278), Power, Trip, Find (1,0.5,360,40), Status (5,-,30,-), 14.55934, 121.01943, 15:16 May 14

Note:

1. Check and verify that vehicle's signal lights and meters are working before the accessory is installed
2. Check and verify that vehicle's signal lights and meters are working after the accessory is installed and tested

2.5   Usage

> Important note: Driver ID fob has to be placed in reader when driver is driving the vehicle. Tramigo Driver ID is magnetic reader and fob will stick to it.

Most common way of reporting Driver ID data:

1. Enabling Driver ID data on Status, Ignition and Speed reports
2. Collecting Driver ID data via GPRS M2M message (Refer to Tramigo GPRS guide.)
3. One time query with *Driver* command

Option 1 is suitable for fleet owners using M1 Fleet Enterprise GPRS- or M1 Move with SMS reporting.
Option 2 for fleet owners using M1 Fleet Enterprise with GPRS data reporting.
Option 3 mainly for asking current drivers with single SMS message or testing purposes.

2.6   Trouble shooting

Cannot read the driver ID number from the fob.

1. Check that wirings are correct
2. Check with another fob, is the fob possible damaged
3. Use common commands like *ListOneWire* or *Driver*
4. If not reporting even "no driver", check the T23 Fleet FW version, it should be 1.0.96 or above.

Driver ID number or data not seen on report message.

1. If reporting "No Driver" check the wiring
2. If still no success, try another fob
3. Check that you have supplied correct SET commands to enable reporting

No Driver ID shown (neither Temperature Sensor data if installed)

1. Check that there is a gap on fob as shown in picture below
2. Check that there are no metallic parts stuck neither on the magnetic reader nor the fob

Above might cause a short circuit and T23 Fleet is unable to read any 1-Wire bus data.

How to detect defective fob

3. Temperature Sensor

With Tramigo Temperature Sensor solution fleet owners can monitor vehicle and cargo temperatures and collect data to server. Temperature SMS message reporting is supported as well.

Temperature sensors utilize Maxim Integrated™ 1-Wire technology.

For more information about 1-Wire please see www.maximintegrated.com

3.1   Parts and tools needed

You only need Tramigo 1-Wire Temperature Sensor.

Temperature Sensor

Tools needed:

- Wire cutters
- Pliers and wrench
- Automotive tape
- Cable connectors and spare cable

3.2   Initial testing

How to verify that Temperature Sensor Accessory and T23 Fleet are in working order.

3.2.1   Parts and tools needed

You need:

- Tramigo T23 Fleet device with Firmware supporting 1-Wire bus
- 12 wires T23 Fleet IO cable
- Temperature Sensor
- Tramigo Manager (TM) version 3.0 installed into PC or laptop

Tramigo manager can be downloaded from www.tramigo.net/tramigomanager/tmanager.asp with the link to TM 3 User Manual.

If questions, please contact to your nearest Tramigo reseller or email to support@Tramigo.com

3.2.2 Assembly and testing

Temperature sensor comes with three wires. Usually YELLOW or WHITE wire is the 1-Wire bus cable. RED cable is the auxiliary power line.

Extra power <u>may be needed</u> if attaching 3 sensors, cable length is over 10 meters per senor and measuring   100 °C temperatures. Auxiliary power range is 3.0 – 5.25 VDC. BLACK wire is connected to vehicle Ground.

Note: When auxiliary power is not needed both RED and BLACK wire is connected to the vehicle Ground.

Easy steps:

1. Connect the sensor's BLACK and RED wire to IO cable BLACK ground wire #3 or #4
2. Connect the sensor's WHITE or YELLOW wire to IO cable WHITE wire pin #12
3. Give a command *Set,TempSensorEnable,1* and *TempSensor* via TM3 or SMS

Temperature Sensor connected to T23 Fleet

Response example, TM 3 screen:

Tramigo: TempSensor, TempSensor1: 31.43 C (2832E497050000), 02:12 Nov 11

Later are instructions how sensors can be named and configured.

If there is an error on reading, response is:

Tramigo: TempSensor, error, not found, 18:57 Jul 19

In this case, try at least 3 times and verify that wiring is correct. If problem persist, please refer to troubleshooting section later on this document.

3.3 Configuration and commands

You can add maximum of 3 Temperature Sensor and sensor name pairs into T23 Fleet device.

3.3.1   Enabling Temperature Sensor

Enabling periodic detection and reading of Temperature Sensors.

Set command parameters:

Set, TempSensorEnable,0/1

- 0 - Disable periodic detection and reading
- 1 - Enable periodic detection and reading

Example:

Set, TempSensorEnable,1

Response:

Tramigo: Set, parameter TempSensorEnable, value 1, 08:57 May 9

3.3.2   Showing Temperature Sensor data on reports

Showing Temperature Sensor data on Status report messages.

Set command parameters:

Set,ShowTempSensor,0/1/2

- 0 Sensor(s) Not shown
- 1 Sensor(s) Name and Value shown
- 2 Sensor(s) Name, Value and ID shown

Example:

Set,ShowTempSensor,2

Response:

Tramigo: Set, parameter ShowTempSensor, value 2, 08:57 May 9

Notes:

1. SET affects only to Status message data.

Get current parameter value:

Example:

Get,ShowTempSensor

Response:

Tramigo: Get, parameter ShowTempSensor, value 2, 08:57 May 9

3.3.3   Adding and naming Temperature Sensors

1. First find the Temperature Senor's unique ID number.

Example Command:

ListOneWire

Response

Tramigo: ListOneWire, TempSensor (ID: 12652398171920), 08:57 May 9

2. Then pair the sensor's ID number with desired name.

Example command:

TempSensor,Add,12652398171920,Chiller

Response:

Tramigo: TempSensor, Chiller has been added, 08:57 May 9

Notes and tips:

> 1. Good practice is to create Configuration File (CF) with commands for all temperature sensor to be added into particular vehicle's T23 Fleet device

3.3.4   Reading connected Temperature Sensors

Example:

TempSensor

Response:

Tramigo: TempSensor, Chiller -2.06 C (12652398171920), Cargo 9.09 C (42652598171923), 08:57 May 9

3.3.5   Reading single Temperature Sensor data

Example:

TempSensor,Chiller

Response:

Tramigo: TempSensor, Chiller: -2.45 C (12652398171920), 08:57 May 9

3.3.6   Temperature alarm

Setting the limits.

Example:

TempSensor,Chiller,Max,40

TempSensor,Chiller,Min,20

Response:

Tramigo: TempSensor, Chiller: maximum limit 40 C, alarm when above, 08:57 May 9

Tramigo: TempSensor, Chiller: minimum limit 20 C, alarm when below, 08:57 May 9

Turning the alarm on or off.

Example:

```
TempSensor,Chiller,On
TempSensor,Chiller,Off
```

Response:

Tramigo: TempSensor, Chiller alarm, reporting is turned on, 08:57 May 9

Tramigo: TempSensor, Chiller alarm, reporting is turned off, 08:57 May 9

Report:

Tramigo: Alarm detected, TempSensor, Chiller: 19 C, temperature below 20 C, parked, at Valero Street-Rufino Street, Makati, NCR, PH, 14.55954, 121.01953, 11:55:39 May 14

To see the values set use command

TempSensor,Chiller,Min or *Max*

Notes:

1. If alarm is activated and there are no sensor detected or connected to the unit it will display "not found".
2. One limit, above or below alarm, simply set both Minimum and Maximum to same value.

3.3.7   Deleting a sensor

Example:

```
TempSensor,Del,12652398171920
```

Response:

Tramigo: TempSensor, Chiller (12652398171920) deleted, 08:57 May 9

Notes:

1. Deleted from unit's memory, sensor may be still there, if not removed.

3.3.8   Deleting all sensors

Example:

```
TempSensor,Del,All
```

Response:

Tramigo: TempSensor, All Temperature Sensors deleted, 08:57 May 9

Notes:

1. Deleted from unit's memory, sensor(s) may be still there, if not removed.

3.4   Installation

Maximum number of Temperature Sensors configured in T23 Fleet device is 3.

Temperature Sensors measurement range is from -55 °C to +125 °C. However, recommended range is from -25 °C to +100 °C.

3.4.1   Temperature sensor installation steps

Easy steps:

1. Select the location(s) where temperature is measured.
2. Secure sensor in place for example with cable tie.

After Temperature Sensor is installed it should look for example like in picture below. Use proper installation materials depending on the location of the Temperature Sensor.

Temperature Sensor installed under dashboard

3.4.2   Temperature sensor wiring

Refer to section earlier where Temperature Sensor wiring to T23 Fleet device and wire colors is explained. The same applies when Temperature Sensor is installed into vehicle.

Note: Good common ground with T23 Fleet device is essential. Ground the sensor with T23 Fleet device grounding point.

3.4.3   Testing

After Temperature Sensor is installed into vehicle you can test it functionality with commands described earlier in this document.

Supply the $Status$ command and verify that Temperature Sensor data is part of the response.

Example response:

Tramigo: Status: GPS: 83%, GSM: 0%, battery: 99% (4.20 V), Chiller: -6.78 C, Cargo: 5.34 C
Power, Trip, Find (1,0.5,360,40), Status (5,-,30,-), 14.55934, 121.01943, 15:16 May 14

Note:

1. Check and verify that vehicle's signal lights and meters are working before the accessory is installed.

2. Check and verify that vehicle's signal lights and meters are working after the accessory is installed and tested.

3.5   Usage

Most common way of reporting Temperature Sensor data:

1. Enabling sensor data on Status reports.

2. Collecting Sensor data via GPRS M2M message (Refer to Tramigo GPRS guide.).

3. One time query with *TempSensor* command.

Option 1 is suitable for fleet owners using M1 Fleet Enterprise GPRS- or M1 Move with SMS reporting.
Option 2 for fleet owners using M1 Fleet Enterprise with GPRS data reporting.
Option 3 mainly for asking current temperatures with single SMS message or testing purposes.

3.6   Trouble shooting

Cannot read the temperature data.

1. Check that wirings are correct.

2. Check with another sensor, is the sensor possible damaged.

3. Use common commands like *ListOneWire* or *TempSensor.*

4. If T23 is refusing the commands, check the T23 Fleet FW version, it should be 1.0.96 or above.

Temperature data not seen on report message.

1. Check the wirings.

2. If still no success, try another sensor.

3. Check that you have supplied correct SET commands to enable reporting.

Temperature Sensors show disconnected state

1. Check the wirings and connections.

2. Test with spare sensor is it working.

3. If Driver ID is used, check is it working:

    a. If not: Confirm that Driver ID is not short circuit.
        (Refer to Driver ID troubleshooting section.)

    b. If yes: Double check wirings, settings and sensors.

False temperature readings

1. Check wirings and connections.

2. Test with spare sensor is it working.

4. Analog Input

Tramigo T23 Fleet Analog Input can be used with various analog accessories and for analog measurements. In practice all accessories and devices which output data is in voltage range 0 - 30 VDC can be considered and utilized.

Hints and Tips:

Tramigo T23 Fleet has one (1) analog input; one device can be attached at one time. However, if just measuring plain voltage, you can use T23 Fleet output and relay to switch input coming from the device or accessory. For example if you are measuring two vehicle batteries voltage level, this can be done with above arrangement.

4.1 Initial Testing

Familiarize with analog input and how to use it.

4.1.1 Parts and tools needed

You need:

- Tramigo T23 Fleet device with Firmware supporting Analog input
- 12 wires T23 Fleet IO cable
- Voltage source, adjustable power source preferred but 1.5-12 V battery can be used
- Tramigo Manager version 3.0 (TM3) installed into PC or laptop

Tramigo manager can be downloaded from www.tramigo.net/tramigomanager/tmanager.asp with the link to TM3 User Manual.

If you are missing some parts, please contact to your nearest Tramigo reseller or email to support@Tramigo.com

4.1.2 Wiring and testing

Easy steps:

1. Connect the voltage source ground to IO cable BLACK ground wire #3 or #4
2. Connect the voltage source positive to IO cable PINK wire pin #11
3. Give a command *ReadAnalog* via TM3 or SMS

Voltage source connected to T23 Fleet

Response example, TM3 screen:

Tramigo: ReadAnalog, 12.723 V, 15:16 May 14

If there is an error on reading, response is:

Tramigo: ReadAnalog, error, no analog voltage, 18:57 Jul 19

In this case, try at least 3 times and verify wiring is correct. If problem persist, please refer to troubleshooting section later on this document.

4.2   Configuration and commands

Depending on the application, sensors and voltage source what is targeted to measure or observe, and what is the desired configuration and reports.

4.3   Installation

When using 3rd party analog sensors and devices refer to supplier's manuals and guides.

If measuring for example vehicle's battery voltage simply connect the wire from the battery to the T23 Fleet's analog input. Remind the applicable measurement range of 0 – 30 VDC.

4.4   Trouble shooting

Cannot get analog reading

1. Check that wirings are correct and intact.
2. If T23 is refusing the commands, check the T23 Fleet FW version, it should be 1.0.96 or above

5. 3rd Party Fuel Level Sensor

Possible to connect any analog fuel level sensor with 0 - 30 VDC output voltage.

5.1   Initial testing

> **Note:** Refer to sensor supplier's set-up, calibration, testing and installation manuals and guides.

Fuel level sensor voltage output can be tested when tank has different fuel levels. Most convenient would be fill up the empty fuel tank and check the readings.

5.2   Configuration and commands

In most of the cases sensors output curve is linear (straight line), hence the minimum set of voltage-percentage pairs is 2; tank empty 0% and tank full 100%, if the shape of the tank is uniform.

Perform possible testing and measurement when vehicle is in level and fuel is not moving inside the tank. Wait until output voltage is not changing after adding fuel in the tank.

Refer the sensor supplier's guide regarding the voltage ranges and calibration.

5.2.1   Configuring the T23 Fleet

Refer to configuration steps explained in section **6.3.2 Configuring the T23 Fleet**. As explained above, fuel sensor curve is most likely linear, hence fewer voltage – percentage pairs needed.

Note: With external fuel level sensor it is most likely empty tank voltage is smaller than when tank is full, for example: Empty tank 0.00 VDC and full tank 5.00 VDC.

5.3   Installation

Refer to supplier's manuals and guides.

5.4   Usage

Most common way of reporting fuel level sensor data:

1. Enabling fuel level data on Status and Ignition reports.
2. Collecting data via GPRS M2M message (Refer to Tramigo GPRS guide.).
3. One time query with *ReadAnalog* command.

Option 1 is suitable for fleet owners using M1 Fleet Enterprise GPRS- or M1 Move with SMS reporting.
Option 2 for fleet owners using M1 Fleet Enterprise with GPRS data reporting.
Option 3 mainly for asking current fuel level with single SMS message or testing purposes.

Fuel theft (shiphoning) alarm can be enabled for any registered user, including GPRS.

5.5 Trouble shooting

Note: Refer to supplier's documentation and guidance.

Cannot read the analog fuel level data.

1. Check that wirings are correct and intact.
2. Good grounding is essential, sensor ground and T23 Fleet ground preferably from the same point.
3. Check with multimeter that sensor is outputting voltage when vehicle ignition is on.
4. Use common commands like *ReadAnalog.*
5. Check that you have supplied correct SET commands to enable reporting.
6. If T23 Fleet is refusing the commands, check the T23 Fleet FW version, it should be 1.0.96 or above.

5.6 3rd Party fuel sensor suppliers

There are several suppliers on market. Here is one supplier's data.

Mr. Maxim Gutsalo, Sales Manager

RCS-NAVIGATION LTD

2/6 E Novozabarska Str.

04074 Kiev, Ukraine

Tel: 044 206 69 79

Fax: 044 206 42 34

Mobile: +38 093 887 46 26

Skype: maximus2867

Email: rcssale2@gmail.com

6. Tramigo Fuel Level Measurement

6.1 Parts and tools needed

Parts needed:

No parts needed. Vehicle's fuel gauge analog voltage signal is wired to T23 Fleet analog input pin #11.

Tools needed:

1. Wire cutters

2. Pliers and wrench

3. Automotive tape

4. Cable connectors, posi-taps and spare wire

6.2 Initial testing

> **Note:** Familiarize yourself with analog input functionality and commands before actual vehicle installations. Saves time and resources.

6.3 Configuration and commands

6.3.1 Measuring the fuel gauge voltage

Fuel gauge voltage output levels can be tested when tank has different fuel levels. Most convenient would be fill up the empty fuel tank and record the readings. Read and follow instructions listed on below carefully.

- Disconnect the vehicle's battery during the wiring the T23 Fleet to vehicle's fuel gauge to avoid short circuits.

- **Note:** Double check your wirings and connections before connecting vehicle battery or turning the ignition on.

- Use posi-tap or similar wire connection methods, do not cut the vehicle's analog voltage wire.

- Vehicle shall be in level, not tilted.

- When taking the measurements, vehicle ignition should be on, it powers the fuel gauge.

- It is most likely that resulting line is not linear, hence multiple readings are needed.

- Note that most of the fuel gauges outputs minimum voltage when tank is full and maximum voltage when tank is empty.

- Recommended to take voltage reading minimum per every 10 liters added. Use multimeter or T23 Fleet unit and command *ReadAnalog.*

- Between the fillings and taking the reading, wait until fuel is not moving inside the tank.

- Depending on gauge model there may be filtering in place. After adding fuel, wait until measured voltage is not changing (up till 1 - 4 minutes).

Below is example of Honda CRV 1998 measurements, multiple measurement points.

Liters	Voltage
0	3.16
1	3.04
2	2.98
3	2.86
4	2.73
5	2.58
6	2.5
7	2.43
8	2.36
9	2.29
10	2.22
17	1.85
27	1.64
37	1.2
47	0.4
52.28	0.37

Liters – Voltage pairs

Measurement pairs print the curve shown below.
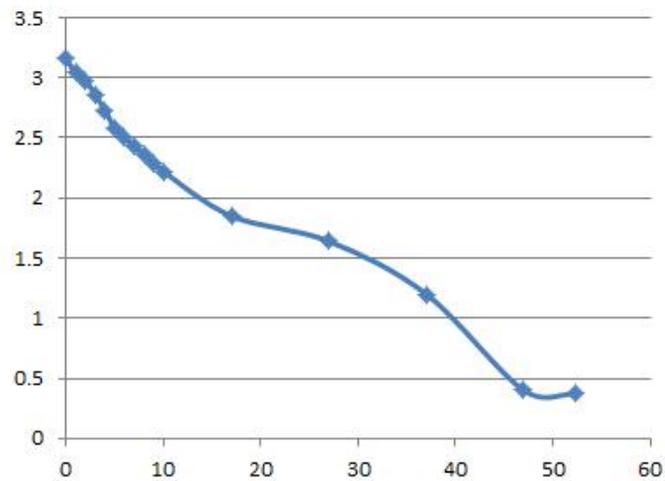
Measurements curve Liters – Voltage

As can be seen on above picture, the curve is not linear. T23 Fleet has in-build smart functionality which calculates the fuel volume between the measurement points.

6.3.2   Configuring the T23 Fleet

Below is shown <u>example</u> configuration commands and procedure for vehicle which fuel tank capacity is 85 liters, outputting 0.5 VDC when tank is full and 3.8 VDC when tank is empty.

Naturally, use capacity and measurements of the vehicle under installation.

For complete set of commands, how to list, delete and edit, refer to
"*T23F_AIS_Analog_Input_Specification_ENG_v0.3_FUEL*" document

Example Comfiguration:

// Set the minimum and maximum voltage, tank full (100%) and tank empty (0%)

ANALOG,MINVOLTAGE,3.8

ANALOG,MAXVOLTAGE,0.5

// Add voltage - percentage pairs. Especially if voltage curve is not linear

// Important: Percentage % values use integer (whole numbers) values only

ANALOG,ADD,80,0.7

ANALOG,ADD,60,1.05

// ...more points here

ANALOG,ADD,10,3.65

// Check that voltage - percentage pairs are correct

ANALOG,LIST

// Set the moving average window. This will smooth the analog voltage reading measured.

// 5 = reading interval in seconds, 20 = number of readings from moving average is calculated

// Minimum interval value is 5 sec. Maximum interval value is 600 sec.

// Minimum number of readings is 1 (no averaging). Maximum is 30 readings.

ANALOG,INTERVAL,5,20

// NOTE: with above setting it takes approx. 5 x 20s = 100 seconds to have correct averaged

// voltage when Ignition is turned on.

// READANALOG -command can be used to read current voltage without averaging.

// Set the unit literal. Not needed, if only voltage value needed on reports

ANALOG,UNIT,Liters

// Range in order to show remaining fuel capacity, refers to SET function option 3.

ANALOG,MAXRANGE,85

ANALOG,MINRANGE,0

// SET,SHOWANALOG,0/1/2/3

// Set how fuel level is shown in reports

// 0 - not shown, affects only Status and Ignition report

// 1 - Analog voltage only (Default)

// 2 - Analog voltage and percent value

// 3 - Value in volume unit given and percent

SET,SHOWANALOG,3

// SET,ANALOGENABLE,0/1

// Enable analog data periodic reading

// 0 - Disable periodic reading of analog input

// 1 - Enable periodic reading of analog input

SET,ANALOGENABLE,1

// Setting the fuel theft (siphoning) alarm

// 10 = percentage % change in fuel level, 300 = % change happened in 300 seconds period

// BELOW = volume was decreased

ANALOG,FuelTheft,10,300,BELOW

FuelTheft,ON

// Reporting: Used as normal, for example REPORT,2,FuelTheft,ON

// Disable reporting "FuelTheft,OFF

// Setting the alarm rearm delay time
// Set this value higher than the analog alarm time divided by analog reading value.

// In this case 300s / 20 = 15 seconds.

SET,ANALOGALARMREARMDELAY,20

Hint: You can integrate your settings to your Configuration (CF) file.

6.4   Installation

The location, shape and size of the vehicle's fuel gauge depends on the make and model.If possible, study and inspect the vehicle make and model before the installation so it is easier to locate the fuel gauge and the wire that bears the fuel level analog voltage.

6.4.1   Steps

1. Disconnect the vehicle's battery during the installation and wiring to avoid short circuits. Connect battery only when performing measurements or testing the functionality.
2. Locate the fuel gauge. It is usually on the top of the tank.See picture below.
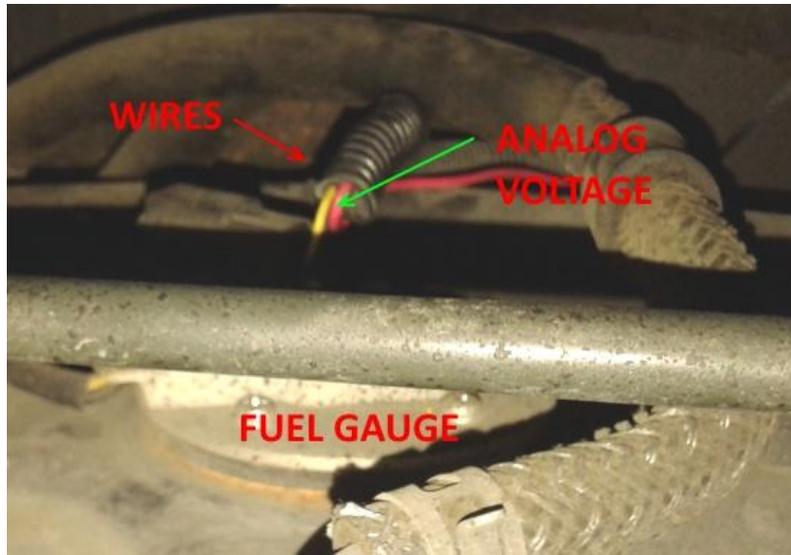
3. **Note:** Many cases you can locate the same wire running under panel next to drivers seat. Locate the same color wire and check that the voltage is the same as in a wire on fuel gauge. This way no need to run the cable from fuel tank.

4. Connect T23 Fleet IO cable PINK wire #11 to Analog Voltage wire coming from the fuel gauge.

> **Note:** If you are using previous T23 IO cable type, you should have full 11 wires model. The color of the wire #11 can be PINK w/ BLACK stripe or GREEN.

Use posi-tap or similar methods, do not cut the vehicle's fuel gauge wires.

5. **Note:** Double check your wirings and connections before connecting vehicle battery or turning the ignition on.

6. Measure the voltage with command *ReadAnalog* when vehicle ignition is OFF. It should be 0.0 V.

7. Measure the voltage with command *ReadAnalog* when vehicle ignition is ON. It should be within the minimum and maximum voltage limits.

8. T23 Fleet should be already configured in as instructed earlier in section *6.3.2 Configuring the T23 Fleet.* Use the *Status* command to see is reporting correct.

9. Secure wiring and connections using automotive grade tape, adhesives, cable tie, posi-taps and crimps (buts).

6.5   Usage

Most common way of reporting fuel level data:

1. Enabling fuel level data on Status and Ignition reports.
2. Collecting data via GPRS M2M message (Refer to Tramigo GPRS guide.).
3. One time query with *ReadAnalog* command.

Option 1 is suitable for fleet owners using M1 Fleet Enterprise GPRS- or M1 Move with SMS reporting.
Option 2 for fleet owners using M1 Fleet Enterprise with GPRS data reporting.
Option 3 mainly for asking current fuel level with single SMS message or testing purposes.

Fuel theft (shiphoning) alarm can be enabled for any registered user, incluging GPRS.

6.6 Trouble shooting

Cannot read the analog fuel level data.

1. Check that wirings are correct and intact.
2. Good grounding is essential, check T23 Fleet grounding.
3. Check with multimeter that sensor is outputting voltage when vehicle ignition is on.
4. Use common commands like *ReadAnalog.*
5. Check that you have supplied correct SET commands to enable reporting.
6. If T23 Fleet is refusing the commands, check the T23 Fleet FW version, it should be 1.0.96 or above.