

FUEL CONTROLLER

INSTALLATION MANUAL



10 R - 05 0066



FUEL CONTROLLER

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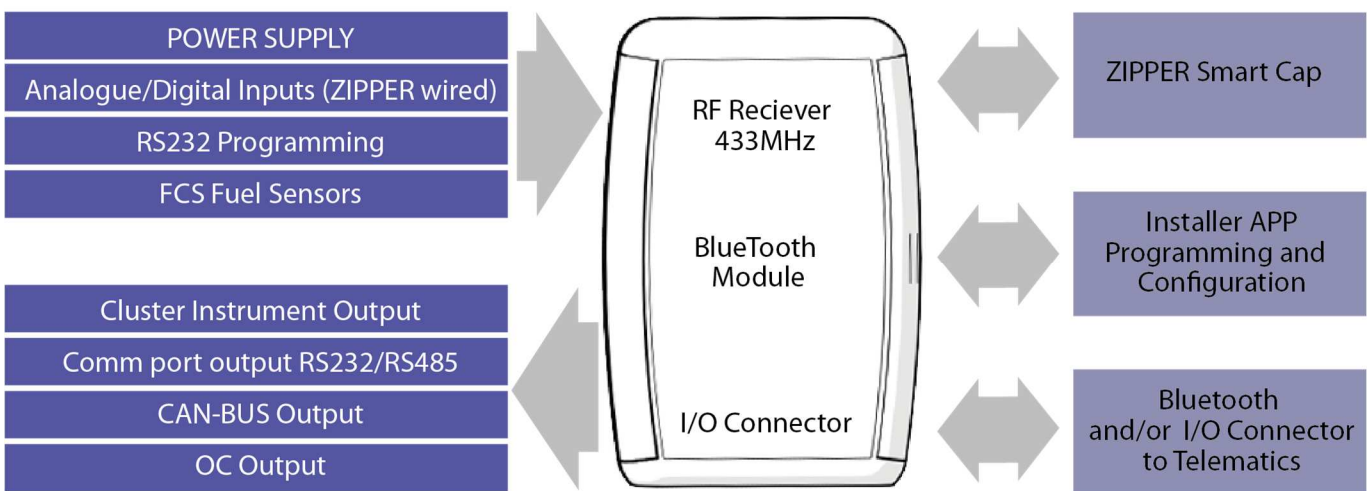
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1 SYSTEM

FuelCONTROLLER is a system made up of an Electronic control unit and one or two FCS fuel sensors. The fuel sensors read the level of fuel which is in the tank(s) and provides this information to the dedicated Electronic control unit, which applies algorithms to the data, generating valuable information which it then sends to the GPS/GSM telematics device on board. All the while, a resistive protocol is generated by the system to provide input to the cluster instrument on board., because FCS sensors replace the original sensors and do not require tank modification.

1.1 THE FUELCONTROLLER ELEMENTS

1.1.1 FuelCONTROLLER Electronic Control Unit – FC DATA HUB



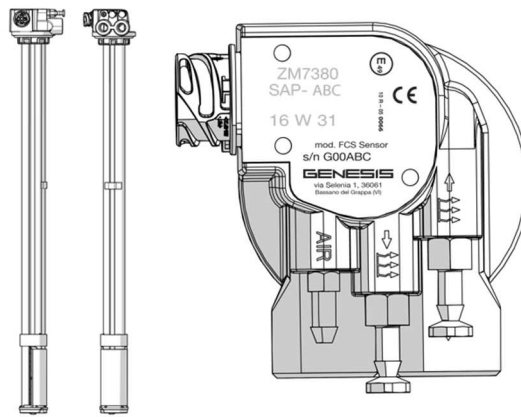
1.1.2 FuelCONTROLLER Specifications

General	Operating temperature -40 to +85°C - Non volatile data memory 16 MB2 digital dedicated input (only for FCS Fuel Sensors)
Regulations	ECE R10-05 - E49 10R-050066 CE
Power	12/24 Volt DC – Consumption 75 mA / 24 V
Output	1 CAN Bus Channel 2.0 - 1 RS232/RS485 Serial port - 1 dedicated resistive output -1 secondary resistive output (optional) - 2 open collector output: I _{max} 1A, R _{on} 0.5 Ω - 1 analog output: 1-12 V or 4-20 mA - 3 analog input: R _{in} 1 MΩ, V _{max} 100 V
TX	Bluetooth® V2.0+EDR class 2. - Radiofrequency Maximum power 3,85dBm (Max) 433MHz
RX	Bluetooth® V2.0+EDR class 2. - Radiofrequency Maximum power 3,85dBm (Max) 433MHz
Processor	CPU 32 bit ARM® Processor - Non volatile data memory 16 MB
Operating Temperature	Operating temperature -40 to +85°C
Sensor Resolution	8 Bit CPU, 10 Bit resolution (1024 points)
Sensor Output	FuelController Dedicated

1.1.3 FuelCONTROLLER Sensor – FCS SENSOR

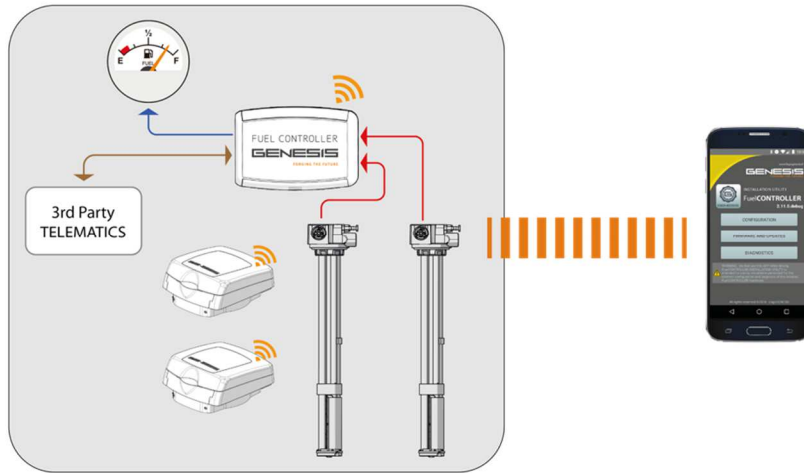
The FuelCONTROLLER Sensor is a capacitance high resolution sensor with 1024 points of resolution, no moving parts and which measures along its entire length with no dead spots. It is equipped with an 8 bit CPU and is dedicated to the FuelCONTROLLER Data Hub, but more importantly, to the standard opening (star hole) found in the great majority of European brand trucks. It can be truly considered a plug and play proposition.

The FCS Sensor is available in different lengths to fit most common tank types and does not require on site calibration after installation, with exception of very few cases involving non-standard tank variables.

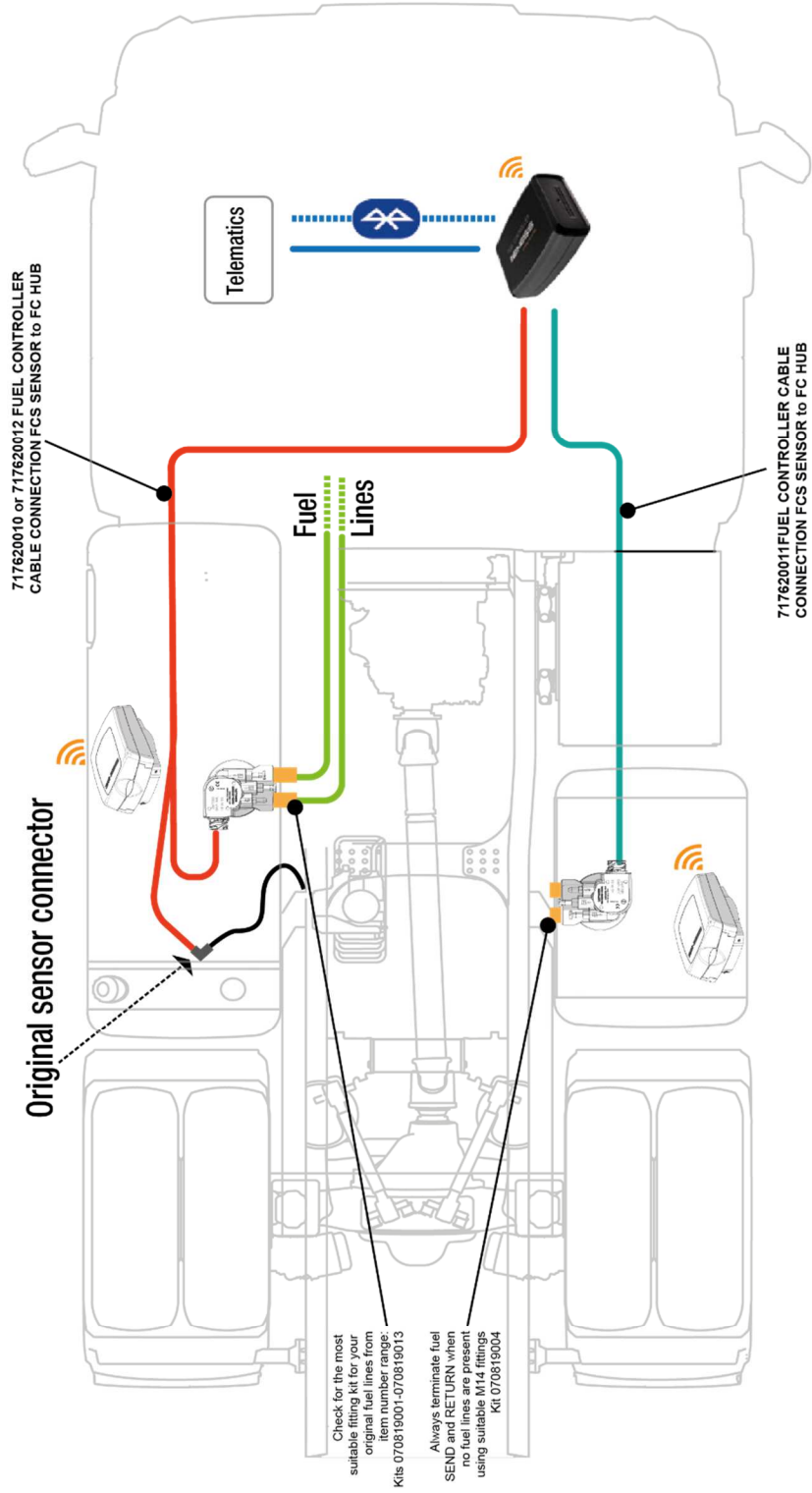


1.2 FuelCONTROLLER – The Overall Concept

FuelCONTROLLER is one element in a complete system which is dedicated to controlling and managing fuel on heavy industrial vehicles. It is made to interface with third party telematics systems and is designed from the onset as a part of the existing Genesis system of products, such as smart fuel caps, anti-siphon devices and more. FuelCONTROLLER, once installed, is configured using a dedicated App on an android device. The same App can be used to update the system with firmware revisions and additional function which derives by the combination of the sensors present on the FCS sensor (level, temperature and inclination), and the resources in the Genesis database, concerning tank shapes, vehicle specifications and more.



FuelCONTROLLER – What a setup looks like



1.2.1 Using FuelCONTROLLER optional dedicated cable harness (717620010-717620012)

1.2.1.1 Main/Primary tank

	71095500X FUEL CONTROLLER HUB	717620010 CABLE CONNECTION	FC PIN
WIRE COLOUR	BROWN (-)	FCS SENSOR 1 BROWN (-)	1
	BLUE (+)	BLUE (+)	13
	WHITE (+)	FUEL GAUGE WHITE (+)	11
	BROWN (-)	BLACK (-)	23

There are rare cases in which these connections are inverted. It is advisable and good practice to test the original sensor output with a tester to check polarity before connection.

Before connecting the cable to Fuel Controller Hub:

1. Complete ALL external connections at the tank
2. Key on at ignition
3. Use a tester to check if the BLACK wire carries a negative (-) and the WHITE wire carries power (generally 5 Volt)
4. If these polarities are respected, complete other connections as per instructions
5. If the polarities are inverted, also invert the connections respecting the actual polarities (ie. Pin 11 positive (+) and Pin 23 negative (-)).

Original Sensor circuit

Dashboard fuel gauge through original sensor connection

FCS Sensor (not included)

Fuel Controller hub and cable (not included)

1.2.1.2 Secondary tank

	71095500X FUEL CONTROLLER HUB	717620011 CABLE CONNECTION	
WIRE COLOUR	BROWN (-)	FCS SENSOR 2 BROWN (-)	2
	BLUE (+)	BLUE (+)	14

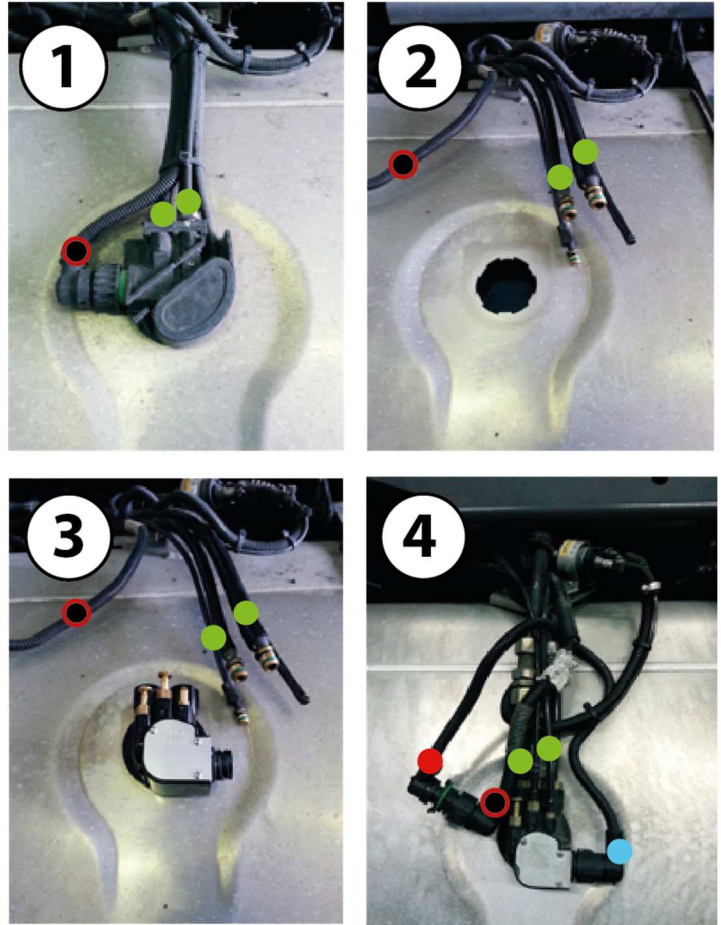
Fuel Controller hub and cable (not included)

FCS Sensor (not included)

The above figures are extracts from each extension cable instructions. Please refer to the original instructions included with each product.

1.3 FuelCONTROLLER – Installing the FCS Sensors – The practical approach

- 1 Disconnect the original connector (●) and disconnect the fuel lines (●) from the original fuel sensor.
- 2 Remove the original fuel sensor by rotating, after having disconnected the fuel lines (●).
- 3 Insert the FCS Fuel Sensor in the hole.
- 4 Connect the FCS Fuel Sensor using the supplied connector (●) and the wire lines to the relevant pins on the Fuel Controller Hub located in the cab.
Connect Fuel Controller level gauge output (●) to the original fuel sensor connector (●).



1.3.1 Fuel Line Fittings



FuelCONTROLLER Sensors can be fitted with any number of specific fittings which allow you to connect the original fuel lines of the vehicle directly to the fuel sensor/sender without making any modification to the fuel lines themselves (ref. 3 to 7 of the above diagram and table).

Be it fuel feed to the motor or to the diesel heater on board, there is most probably a suitable fitting available from the range of dedicated FuelCONTROLLER accessories.

Before installation make sure the fittings you have ordered are the correct ones for your vehicle type and that suitable O-rings and/or seals are used where necessary (refer to the specific fitting documentation).

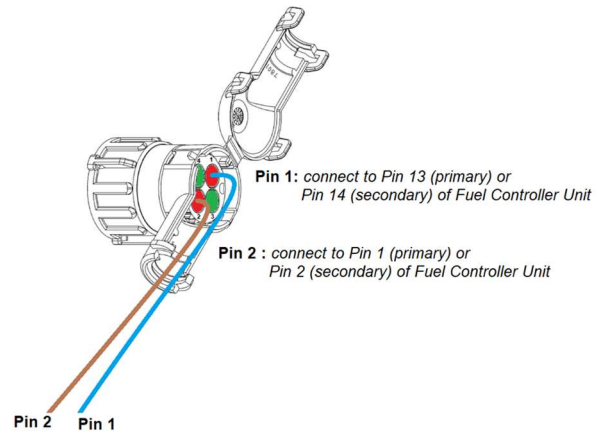
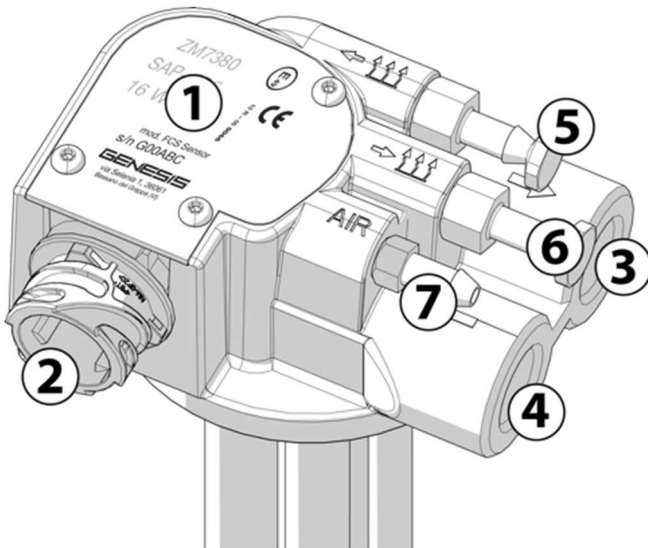
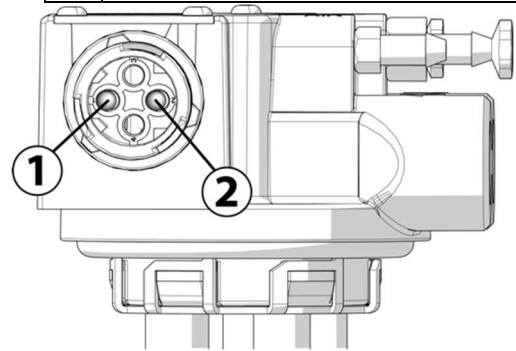
It is advisable to use a suitable lubricant when inserting fuel line fittings to safeguard seal and/or O-ring integrity.

1.4 Connecting the FCS fuel Sensors

1. After having connected the FuelCONTROLLER electronic control unit in the vehicle cabin, you will proceed to change the original tank mounted sensor with the FCS fuel sensors.
2. Make sure the length of the FCS sensor is the same as the length of the original sensor being removed from the tank(s).
3. Insert the FCS sensor, making sure there is an O-Ring under the sensor head which seals the sensor opening when the sensor is installed.
4. To fix the sensor, make sure the “star hole” bayonet is correctly inserted and rotate clock-wise until the sensor rotates no further and is fixed in its’ installed position. In doing so, make sure you do not apply excessive force to the plastic electrical connector. If necessary, use a tool to be able to gain leverage to overcome the initial resistance to rotation.
5. Screw in the fuel line fittings, ensuring you always include the supplied copper washers and O-rings. Respect the fuel send and return indications.
6. To conclude, connect the electrical signal respecting the polarity of the FCS sensor. Pin no. 1 of the sensor is the positive (+) signal and connects to Pin 13 or 14 (main and secondary tanks respectively) of the FuelController electronic control unit. Pin 2 on the FCS sensor is the negative (-) and connects to Pin 1 or 2 (main and secondary tanks respectively) of the FuelController electronic control unit.

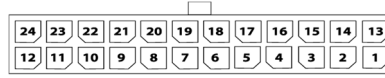
1	FCS Code and Serial No.
2	Electrical Connector
3	Fuel SEND - Sends fuel to Engine
4	Fuel RETURN- Returns fuel to tank
5	Fuel Return – Auxiliary Heater unit
6	Fuel Send – Auxiliary Heater Unit
7	Venting Valve

1	PIN 1 – Positive (+) Signal
2	PIN 2 – Negative (-) Signal



1.5 ELECTRICAL CONNECTIONS

1.5.1 ELECTRICAL CONNECTOR PIN OUT RS232 OUTPUT VERSION

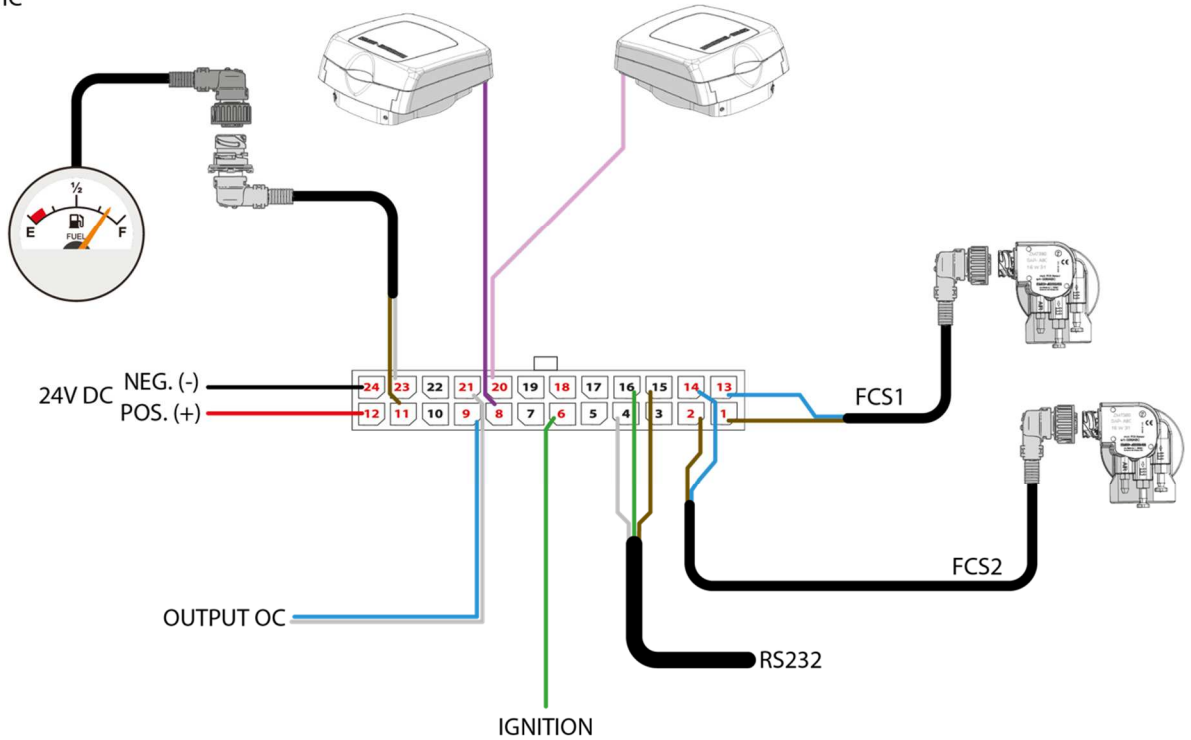


Fuel Controller Connector as seen on the unit itself
Consult PIN OUT table for more information

Pin	Description	Cable	Wire Colour	Function
1	INTSENS1-	Black cable Fuel Sensor FCS 1	Brown	Negative signal FCS 1 (to be connected to the Pin 2 of the main tank's fuel sensor)
2	INTSENS2-	Black cable Fuel Sensor FCS 2	Brown	Negative signal FCS 2 (to be connected to the Pin 2 of the secondary tank's fuel sensor)
3	OUT 0-5 V/4-20mA	Single Wired	WHITE/YELLOW	Output programmable / Analog
4	RX2 232	GRAY cable output RS232 (x 3 wired)	White	RS232 Cable RX Uart2 Connection for third parties
5	RX0 232			Not connected / RX debug MF
6	ANALOG 4	Single Wired	GREEN	Ignition (+15) / 485 A (OPZ)
7	VEIC K+ (CANH)	Twisted Pair	YELLOW	CAN H
8	ANALOG 1	Single Wired	PURPLE	Programmable Input (example: ZIPPER Wired 1)
9	OUT_1	Single Wired	BLUE	Programmable Output Open Collector type (example: positive alarm Buzzer)
10	IND2+	GRAY cable output fuel gauge 2	White	Secondary Fuel Gauge + (Positive pin)
11	IND1+	GRAY cable output fuel gauge 1	White	Primary Fuel Gauge + (Positive pin)
12	VCAR+ (30)	Single Wired	RED	POSITIVE. Power Supply 24 Volt
13	INTSENS1+	Black cable Fuel Sensor FCS 1	Blue	Positive signal FCS 1 (to be connected to the Pin 1 of the main tank's fuel sensor)
14	INTSENS2+	Black cable Fuel Sensor FCS 2	Blue	Positive signal FCS 2 (to be connected to the Pin 1 of the secondary tank's fuel sensor)
15	GND	GRAY cable output RS232 (x 3 wired)	Brown	RS 232 Cable GND Uart2 Connection for third parties
16	TX2 232	GRAY cable output RS232 (x 3 wired)	Green	RS 232 Cable TX Uart2 Connection for third parties
17	TX0 232			Not connected / TX debug MF
18	ANALOG 3			Not connected / 485 B (OPZ)
19	VEIC K- (CANL)	Twisted Pair	WHITE	CAN L
20	ANALOG 2	Single Wired	PINK	Programmable Input (example: ZIPPER Wired 2)
21	OUT_2	Single Wired	GRAY	Programmable Output (example: NEG Buzzer)
22	IND2-	GRAY cable output fuel gauge 2	Brown	Secondary Fuel Gauge - (Negative pin)
23	IND1-	GRAY cable output fuel gauge 1	Brown	Primary Fuel Gauge -- (Negative pin)
24	GND (31)	Single Wired	BLACK	NEGATIVE (-) power supply GND

1.5.2 SCHEMATICS RS232

RS232 SCHEMATIC



1.5.3 The phases of installation

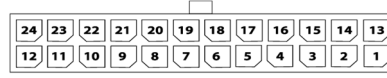
Before powering up the Electronic Control Unit, make sure you have made the following connections:

1. Connect the BLACK wire (Pin 24) to the vehicle GND
2. Connect the RED wire (Pin 12) to the positive +30 power of the vehicle. It is advisable to protect this circuit introducing a 5 Amp fuse. Power +24Volt.
3. Connect the GREEN wire (Pin 6) to the dash signal or positive after ignition +15 of the vehicle.
4. Connect the sensors FCS 1 and FCS 2, respecting the polarity: BROWN wire (Pin 1 and Pin 2) negative (-) signal; LIGHT BLUE (Pin 13 and Pin 14) positive (+) signal. On the cables you will find FCS1 indicating main sensor and FCS2 indicating secondary sensor.
5. Connect the signal for the cluster instrument, GREY twin polarity wire labelled OUTPUT FUEL GAUGE , respecting the polarity: BROWN wire (Pin 23) negative (-) signal, WHITE wire (Pin 11) positive (+) signal. Use a tester on the original sensor connector to check the correct polarity before making said connections.
6. Connect the RS 232 communication line to the Telematics device: GREEN wire (Pin 16) is TX signal, WHITE wire (Pin 4) is RX signal and BROWN wire (Pin 15) is GND).

Specifications

General	Operating temperature -40 to +85°C - Non volatile data memory 16 MB2 digital dedicated input (only for FCS Fuel Sensors)	Output	1 CAN Bus Channel 2.0 - 1 RS232/RS485 Serial port - 1 dedicated resistive output -1 secondary resistive output (optional) - 2 open collector output: I _{max} 1A, R _{on} 0.5 Ω - 1 analog output: 1-12 V or 4-20 mA - 3 analog input: R _{in} 1 MΩ, V _{max} 100 V
Regulations	ECE R10-05 - E49 10R-050066 CE	TX	Bluetooth® V2.0+EDR class 2. - Radiofrequency Maximum power 3,85dBm (Max) 433MHz
Power	12/24 Volt DC – Consumption 75 mA / 24 V	RX	Bluetooth® V2.0+EDR class 2. - Radiofrequency Maximum power 3,85dBm (Max) 433MHz

1.5.4 ELECTRICAL CONNECTOR PIN OUT RS485 OUTPUT VERSION

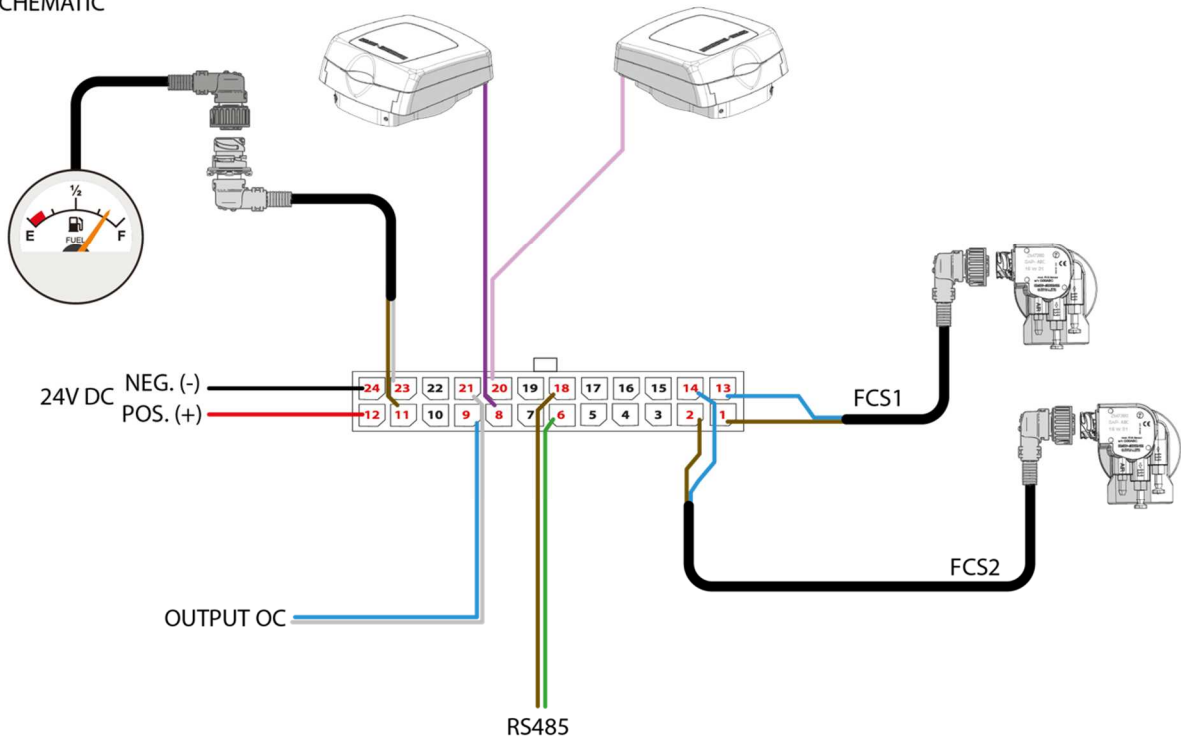


Fuel Controller Connector as seen on the unit itself
Consult PIN OUT table for more information

Pin	Description	Cable	Wire Colour	Function
1	INTSENS1-	Black cable Fuel Sensor FCS 1	Brown	Negative signal FCS 1 (to be connected to the Pin 2 of the main tank's fuel sensor)
2	INTSENS2-	Black cable Fuel Sensor FCS 2	Brown	Negative signal FCS 2 (to be connected to the Pin 2 of the secondary tank's fuel sensor)
3	OUT 0-5 V/4-20mA	Single Wired	WHITE/YELLOW	Output programmable / Analog
4	RX2 232	GRAY cable output RS232 (x 3 wired)	White	RS232 Cable RX Uart2 Connection for third parties
5	RX0 232			Not connected / RX debug MF
6	ANALOG 4	TWISTER PAIR	GREEN	485 A (OPZ)
7	VEIC K+ (CANH)	Twisted Pair	YELLOW	CAN H
8	ANALOG 1	Single Wired	PURPLE	Input programmable (example: ZIPPER Wired 1)
9	OUT_1	Single Wired	BLUE	Output programmable Open Collector type (example: positive alarm Buzzer)
10	IND2+	GRAY cable output fuel gauge 2	White	Secondary Fuel Gauge + (Positive pin)
11	IND1+	GRAY cable output fuel gauge 1	White	Primary Fuel Gauge + (Positive pin)
12	VCAR+ (30)	Single Wired	RED	POSITIVE. Power Supply 24 Volt
13	INTSENS1+	Black cable Fuel Sensor FCS 1	Blue	Positive signal FCS 1 (to be connected to the Pin 1 of the main tank's fuel sensor)
14	INTSENS2+	Black cable Fuel Sensor FCS 2	Blue	Positive signal FCS 2 (to be connected to the Pin 1 of the secondary tank's fuel sensor)
15	GND	GRAY cable output RS232 (x 3 wired)	Brown	RS 232 Cable GND Uart2 Connection for third parties
16	TX2 232	GRAY cable output RS232 (x 3 wired)	Green	RS 232 Cable TX Uart2 Connection for third parties
17	TX0 232			Not connected / TX debug MF
18	ANALOG 3	TWISTER PAIR	BROWN	485 B (OPZ)
19	VEIC K- (CANL)	Twisted Pair	WHITE	CAN L
20	ANALOG 2	Single Wired	PINK	Input programmable (example: ZIPPER Wired 2)
21	OUT_2	Single Wired	GRAY	Output programmable (example: NEG Buzzer)
22	IND2-	GRAY cable output fuel gauge 2	Brown	Secondary Fuel Gauge - (Negative pin)
23	IND1-	GRAY cable output fuel gauge 1	Brown	Primary Fuel Gauge -- (Negative pin)
24	GND (31)	Single Wired	BLACK	NEGATIVE (-) power supply GND

1.5.5 SCHEMATICS RS485

RS485 SCHEMATIC



1.5.6 The phases of installation

Before powering the hub, please ensure all connections are completed.

1. Connect the black wire (pin 24) to the vehicle GND.
2. Connect the red wire (pin 12) to the positive (+) +30 of the vehicle, possibly protecting the circuit with a 5Amp fuse. Power 24V.
3. Connect the sensors FCS 1 and 2, respecting the polarity, brown wire (Pin1 and Pin 2) negative (-) and light blue wire (pin 13 and pin 14) positive (+). The wires are marked FCS1 for the main tank sensor and FCS2 for the secondary tank sensor respectively.
4. Connect the control for the fuel gauge through the grey twin wire which are marked OUTPUT FUEL GAUGE 1, respecting the polarity, brown wire (Pin 23) negative (-), white wire (Pin 11) positive (+). Use a tester on the original sensor connector while disconnected from the sensor to confirm these polarities before making these connections.
5. Connect the RS485 communication wire to the GPS/GPRS tracking unit: green wire (Pin 6) is the 485A signal, brown wire (Pin 18) is the 485B signal.

2 PROGRAMMING USING THE FUEL CONTROLLER APP

2.1 Getting Started

The FuelController APP allows communication between an Android device and Fuel Controller, via the Bluetooth channel.

The APP diverse functions each address specific functions:

- FuelController firmware updates
- Vehicle setup once FuelController is installed
- Copy a saved setup to other similar vehicles
- Select the output channel for specific telematics devices
- Generate specific calibration curves for specific tank shapes
- Generate specific resistive protocols for cluster instruments
- Pairing of Zipper smart-caps with FuelController Electronic control unit
- Checking zipper functionality
- Checking FCS Sensor functionality
- Verificare il corretto funzionamento dei sensori installati

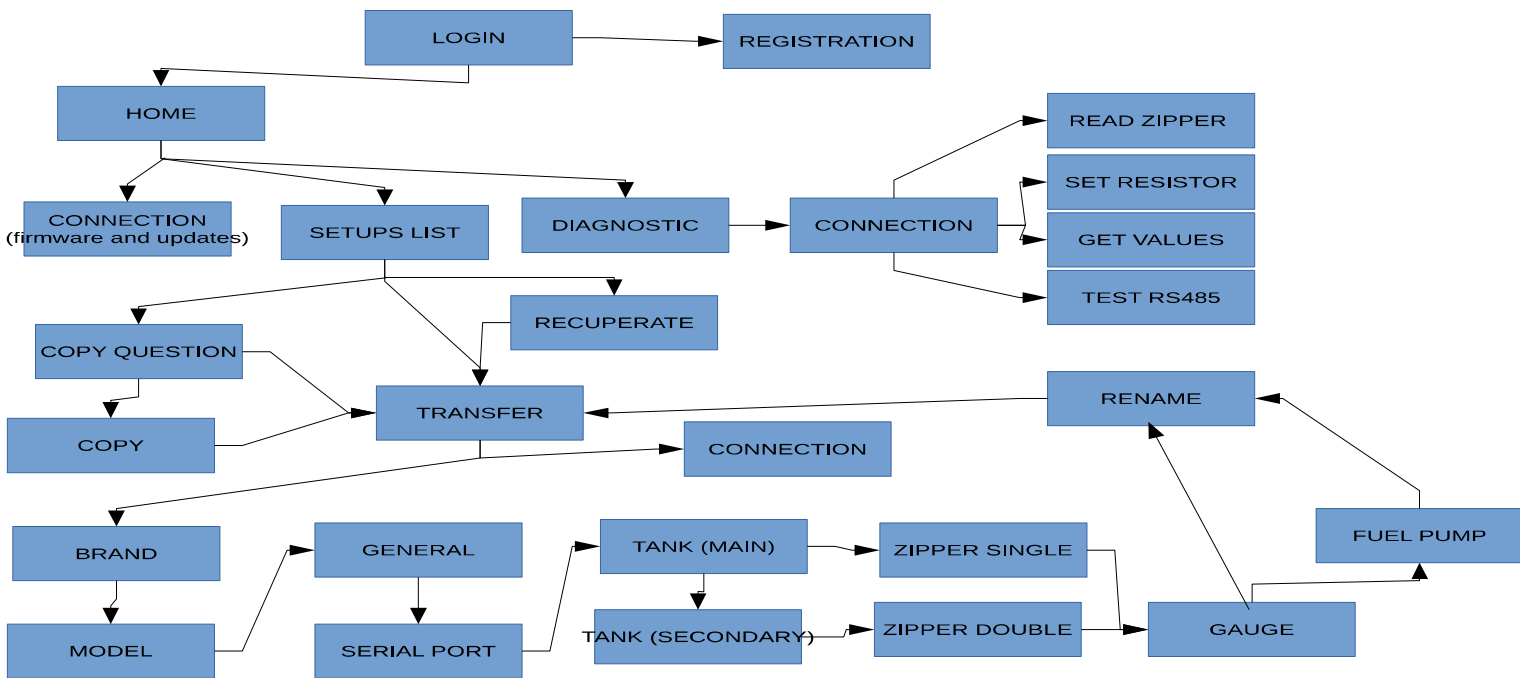
2.1.1 INSTALLING THE APP

To install the FUELCONTROLLER App on an android phone check Google Playstore and search LagoGENESIS FuelCONTROLLER.

It is necessary to register to receive credentials once installed, this ICON will appear on your device.



2.1.2 NAVIGATION MAP of the FuelCONTROLLER APPLICATION



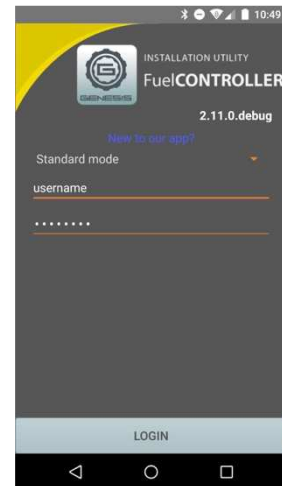
2.1.3 Getting Started

Once started, the APP will ask USERNAME and PASSWORD, which you should have been provided after your registration.

N.B - A reliable network connection is necessary when starting the App. Each time the App is restarted, the necessary updates will take place automatically.

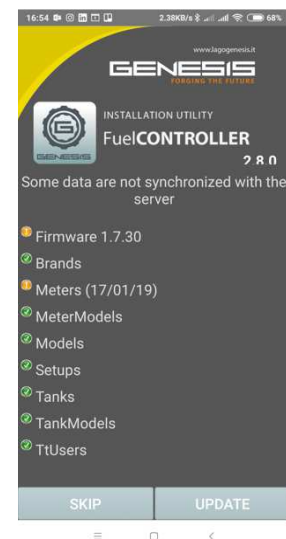
LOG IN

1. Select STANDARD MODE
2. Insert your Username and Password
3. Press LOGIN



2.1.4 AUTO UPDATE

If configuration files on the app are older than those available at time of login, the red markers will indicate what requires updating, and by pressing UPDATE, all files will be updated automatically.



2.2 Firmware Update

2.2.1 UPDATING FIRMWARE

From the main menu select FIRMWARE



2.2.2 PAIRING WITH FUEL CONTROLLER

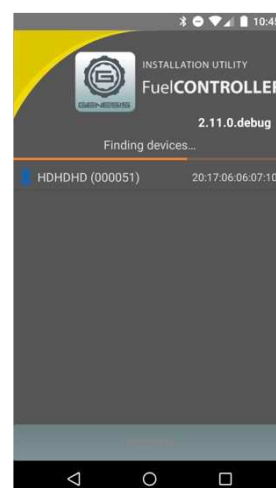
Select the device from the list of visible ones

The compatible device names always start with FuelCONTROLLER...

NOTE

The first time you are searching the device, should be that the name isn't in the list. In this case, after scanning ends select RESCAN and wait.

If is the first time that you connect the device, you need to enter del PIN provided with device.



2.2.3 TRANSFERRING FIRMWARE TO FUEL CONTROLLER

During transfer, details of the firmware version will appear the screen showing operation progress.



2.2.4 FINISHING UP

At the end of the update if everything is OK, you will see the message UPDATE COMPLETED SUCCESSFULLY.

After update FuelCONTROLLER hardware will restart automatically.



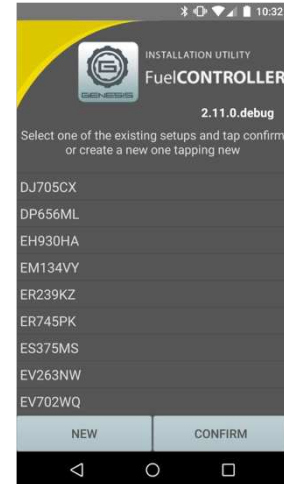
2.3 Custom Setup

From the main menu select CONFIGURATION

2.3.1 SELECTING AN EXISTING SETUP

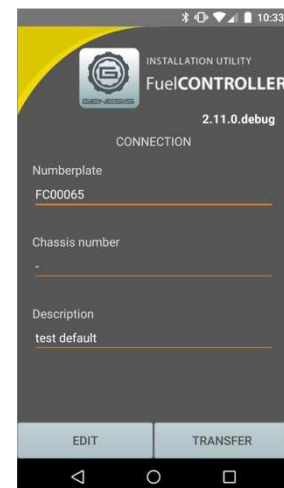
In the Configuration Menu you will find all of the specific setups saved under your username.

Each setup is identified by the registration of the vehicle which it belongs to.



2.3.2 TRANSFERRING SETUP TO FUEL CONTROLLER

Once an existing setup is highlighted it is possible to use it to program FuelCONTROLLER by pressing TRANSFER. On the other hand, it can be modified by pressing EDIT, before transferring it to the FuelCONTROLLER.

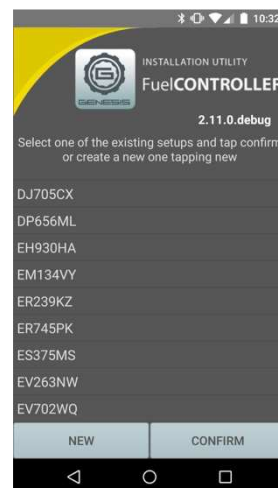


2.3.3 CREATING A NEW SETUP

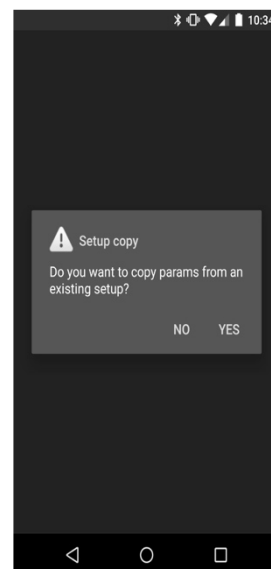
In the Configuration Menu you will find all of the specific setups saved under your username.

Each setup is identified by the registration of the vehicle which it belongs to.

You can create a new setup by pressing NEW, or you can select an existing one by highlighting it and pressing CONFIRM.



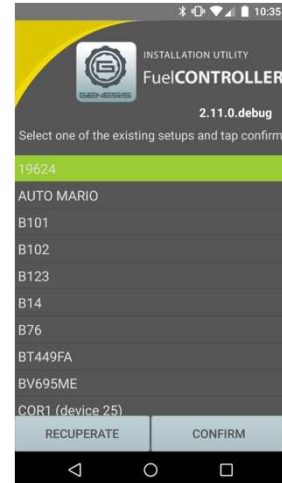
If you have chosen to create a new setup, you will be asked whether you want to copy an existing one or start from scratch.



2.3.4 NEW SETUP – COPY EXISTING

If you have chosen to create a new setup by copying the parameters of an existing one, you will be asked to choose the name of the setup you want to copy.

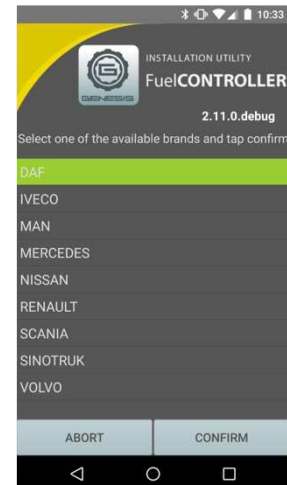
Once chosen, press CONFIRM to continue.



2.3.5 SETUP PARAMETERS

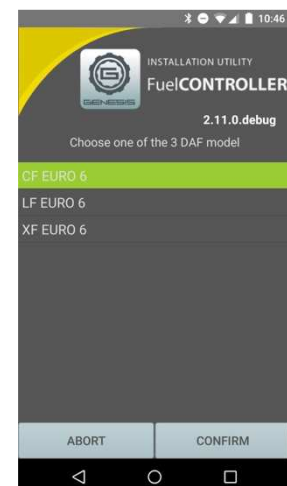
2.3.5.1 BRAND

The first parameter to be set is the brand of the vehicle. Select the brand and confirm.



2.3.5.2 MODEL

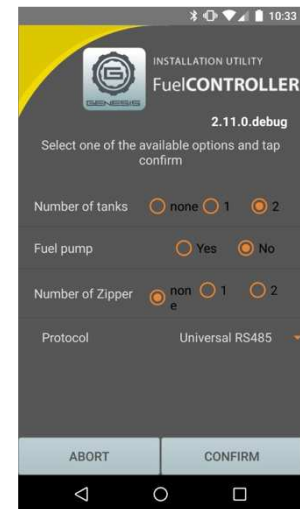
Select the model and confirm.



2.3.5.3 GENERAL PARAMETERS

From this screen you can set:

- the number of tanks
- if the tanks are connected by a fuel pump (generally only relevant for DAF twin tank vehicles). N.B. This option requires a specific ECU.
- the number of Zipper smart caps installed
- the communication protocol required by the specific telematics hardware



2.3.5.4 TANKS

From this screen you can chose the types of tanks which are present on the vehicle.

By Checking “show only” you will only be shown the known relevant tanks. By unchecking it you will be shown all tanks on the database.

PLEASE NOTE - In the case of twin tanks, this procedure is repeated twice.



2.3.5.5 CLUSTER INSTRUMENT

From this screen you can chose the type of instrument which is present on the vehicle.

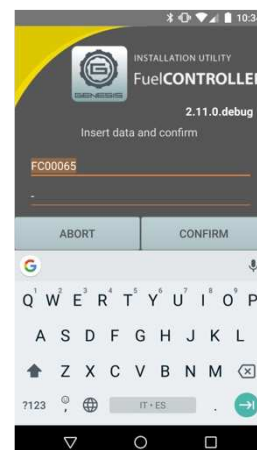
By Checking “show only” you will only be shown the known relevant instrument protocols. By unchecking it you will be shown all instrument protocols on the database.

PLEASE NOTE – In the case of the existence of a fuel pump between the two tanks (eg. DAF twin tank), this procedure is repeated twice.



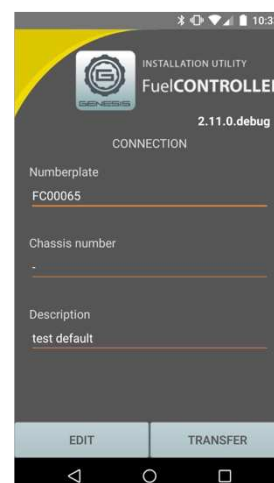
2.3.6 SAVING SETUP

Input the registration number and chassis number of the vehicle and press CONFIRM.



2.3.7 TRANSFERRING THE SETUP TO FUELCONTROLLER

At this point the SETUP can be used to program the FuelController Electronic Control Unit by pressing TRANSFER or EDIT to further modify it before transferring.

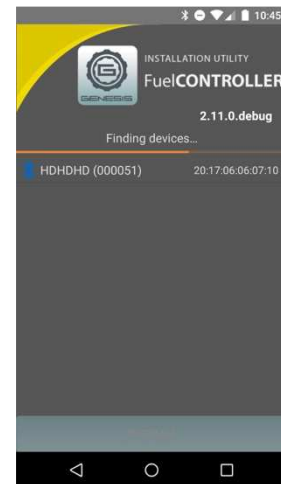


2.3.8 AVAILABLE DEVICES

Select the relevant FuelCONTROLLER from those present in the list. All relevant devices have the FuelCONTROLLER prefix in their name, followed by a number.

PLEASE NOTE – The first time you are pairing with a new device, it is possible that the name does not appear in the list of available devices. If you cannot find your device in the list, press RESCAN and wait for it to appear.

At first connection with each FuelCONTROLLER, you will be asked to insert the PIN number provided with the FuelCONTROLLER itself.



2.3.9 TRANSFERRING

During the transferring process, you will be shown the progress of the transfer operation on screen.



2.3.10 SET UP CONFIRMATION

During the transferring process, you will be shown the progress of the transfer operation on screen.



2.4 Diagnostics

From the main menu select DIAGNOSTICS

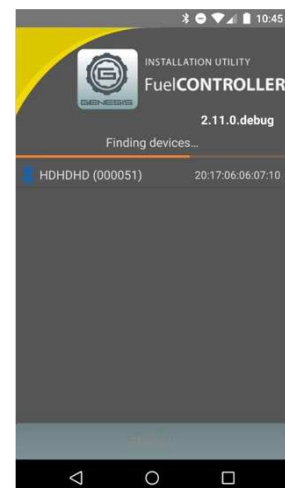


2.4.1 AVAILABLE DEVICES

Select the relevant FuelCONTROLLER from those present in the list. All relevant devices have the FuelCONTROLLER prefix in their name, followed by a number.

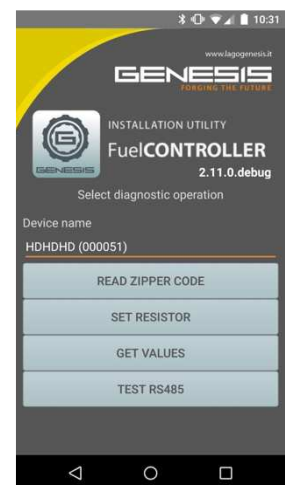
PLEASE NOTE – The first time you are pairing with a new device, it is possible that the name does not appear in the list of available devices. If you cannot find your device in the list, press RESCAN and wait for it to appear.

At first connection with each FuelCONTROLLER, you will be asked to insert the PIN number provided with the FuelCONTROLLER itself.



2.4.2 TYPE OF DIAGNOSTIC

Select the type of diagnostics you would like to execute and press CONFIRM.



2.4.3 GET VALUES

If you have chosen GET VALUES you will see a screen where there are:

- Fuel Level 1 e 2.
- Temperature 1 e 2 in °C
- Zipper: shows the state of Zipper fuel caps.
- Resistor: shows the resistance value outputted to the cluster instrument (or fuel pump) at that moment.
- Control: shows the time from the last update of all values
- Accelerometer: shows the inclination read by the sensors.
- Analog (1,2,3): shows the values at the analogue inputs.



2.4.4 SET RESISTOR

From this screen it is possible to modify the resistive pattern output to the cluster instrument.

Select MAIN or SECONDARY.

Select the OHM value and press CONFIRM



2.4.5 READ ZIPPER CODE

From this screen it is possible to read the RF code outputted by the ZIPPER fuel cap when present.

Press CONFIRM and immediately open the Zipper cap.

