



2022

Installation Manual

GENERATORS

This Manual belongs to:

Cell

R2Dfuel release

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Introduction to R2Dfuel

R2Dmax is a GPS/GSM driven micro-controller designed to manage, display, record and transmit the live activities associated with the non-commercial dispensing and receiving of liquid kerosene-based fuels like diesel and paraffin in both mobile and fixed installations, the web-based interface is tailored to display the data in a user-friendly manner offering an array of essential and convenient reports both live and historic.

Specifications

Power supply	8 to 36Volt DC (default is 24V DC)
Power supply (Battery back-up)	12V DC (1.2 – 48Ah lead acid or gel cell)
Current consumption (24v)	190 mA typical with 3x FLS, peaks of 700mA on solenoid operation
Current consumption (12v Bat)	280 mA typical with 3x FLS, peaks of 900mA on solenoid operation
Inputs	1 x analogue, 4 x digital, 5 x virtual, 3 x UART
Outputs	2 x open collector (solenoid max. 2000mA DC limited to 2 seconds)
Battery Charging output	1 x 13.8V DC 1A regulated output with protection and cut out
Size of Micro controller	160 x 80 x 55 mm (Approx.)
Weight	420g (Approx.)
Operating temperature	-20 to 60 deg. C

Notes: Current consumption drops by 130mA if the device is set to low power mode, useful in Solar and Mobile Bowser applications. The solenoid valve is not held open with full 2000mA power, after opening the valve the output power drops to below 600mA for holding open only. This allows the maximum pump dispensing time to remain uncompromised. Duty cycles and maximum pump run times should always be considered when setting up the max FDT (fuel dispense time) variable.

The product and offering are subject to a **PRODUCT LIABILITY DISCLAIMER – TERMS OF USE, WARRANTY & LIABILITY WAIVER this must be read and acknowledged prior to proceeding with any installations.**

The author of this manual assumes that the installation of the R2Dfuel system and related products will be carried out by competent, suitably trained, and qualified personnel.

If you are unsure of any information in this manual, contact the author and or the distributor of this manual immediately.

If you have not had suitable training in the installation of fuel products, especially in high voltage applications, contact your employer or franchisor for advice and engage the services of experienced and suitable professionals.

The R2Dfuel MOBILE generator Kit and Quick Install Guide

The R2Dfuel mobile generator kit consists as follows:

1. Micro Controller.
2. Fuel Level sensor with cables and gasket set, 1 for static gensets and 2 for mobile gensets.
3. External GPS/GSM combination antennae.
4. One Bluetooth tag for generator identification.
5. One 25mm male adaptor conduit gland.
6. 2 x 5mm pop rivets.



The functions of the kit are as follows:

- a. R2D micro controller – A visual representation of fuel readings from each FLS including the total sum and percentage of fuel in the tank. The generator battery voltage is also displayed. The device houses a Tag receptacle to switching the backlight on to assist with night readings. The light will turn off automatically after 2 minutes.

Quick install Guide

- 1) Assess the installation, take pictures, measurements and capture the IMEI number of the KIT, the bar code provided on the KIT will give you all the kit information, complete your job card with regards to all the information requirements pertaining to your responsibility.
- 2) Firmly attach the Bluetooth micro Tag in a concealed position onto the generator we suggest using a pop rivet or strong fast curing adhesive e.g. Sikaflex or quick set epoxy, the micro tag should not be fully contained in a steel enclosure, some open access is required to emit signal.
- 3) Mount the controller box using the two 5mm pop rivets, install the Sim card into the PCB holder
- 4) Install the combination GPS/GSM external antennae to the generator and attach to the SMA connectors to the PCB .
- 5) Fit the Fuel Level Sensors as required and connect to R2D controller (view separate installation guide, “R2D Fuel Level Sensor Installation Guide”).
- 6) Connect the input voltage supply appropriately from the 12 volt source recommended by the generator manufacturer, typically labld on the 12v DC terminal Bus or Block.
- 7) Lastly gently push the PCB onto the 3 pin mount supports, fit the thumb nuts provided, and fit the front screen outer housing to seal the box housing.

Quick check List

- 8) Check basic operations of Tagging input and FLS inputs on controller LCD screen.
- 9) Check the connectivity and reporting of all connected Fuel level sensors..
- 10) Check GSM connectivity and settings by sending SMS command “INFO” provided the Sim card has SMS functions, alternatively send the command from the server platform or micro USB port.
- 11) Take pictures and record details of the completed installation.
- 12) Leave machinery, equipment and site clean, tidy and safe.

Tools and sundries required

Cleaning rags, cleaning solvent, Tape measure, Permanent Marker, Notebook & Pen, Hacksaw, Multi meter, Side cutter, screwdriver set, drill machine, vacuum cleaner, flexible magnet stick, 5mm drill bit, 25mm hole saw, 35mm hole saw, cutting paste, cable ties, insulation tape, 1-2mm 2 core connecting cable for power input, 12mm Sprag outer sleeving, pipe cutter, pop rivet gun, 8mm Socket for drill, 8mm Socket and ratchet, Laptop with micro USB and USB-C type cables.



Safety

Ensuring the safety of yourself and those around you cannot be emphasised enough during any installation. Remember, during an installation there may be fuel leaking out of tanks including fuel residue where you will be working, electrical connections must be done with battery disconnected and engine/exhaust temperatures considered safe below 50 degrees.

Ensure that every safety measure is put in place before starting the installation of any system and especially where high volumes of fuel are involved. Ensure you are familiar with local legislation, company health and safety procedures and any other requirements pertinent to your installation.

1. Cordon off the area where you will be working to prevent 3rd party interference.
2. Ensure all electrical supply breakers and battery connections to the generator are off, and, if possible, are clearly marked as such so they are not accidentally switched back on again during the installation.
3. Ensure all fuel shut off valves from the tanks are closed, and again clearly marked as such so that they are not accidentally switched back on again during the installation.
4. Ensure you have the necessary fuel recovery equipment to contend with any spills.
5. Ensure that you bring the necessary firefighting equipment with you and you are aware of the site safety requirements and location of safety equipment on the site.
6. Personal Protective Equipment must always be worn.
7. Do not proceed to install on Equipment that you consider in any likelihood as “unsafe”



**FUEL BOWSER WORK IN
PROGRESS**

DO NOT SWITCH BREAKERS

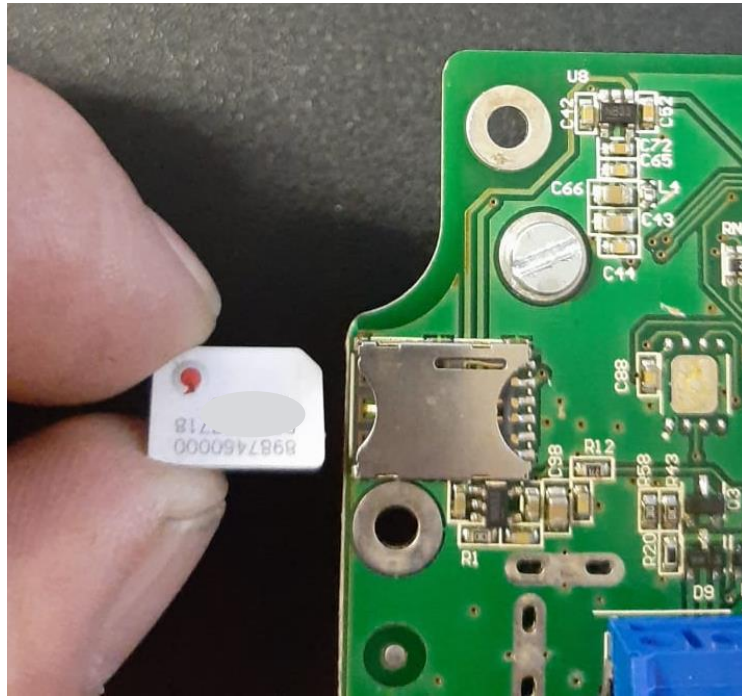
Equipment Placement

- 1) The R2Dfuel micro controller is typically placed level and below the previously installed equipment, so as not to interfere with the existing components and wiring, both sides of the door must be checked before fitting the controller with two dome head 4.8mm blind aluminium rivets.
- 2) Once fitted a 25mm hole can be made through the rear plastic housing and steel door to fit the 25mm conduit male adapter provided in the kit which serves to protect the cabling.
- 3) The cables from one or more FLS including the antennae and battery input power can all be fed through this gland to facilitate the PCB connections.
- 4) A protected or fused 12-volt power and battery earth can be taken from the generator “DC terminal block” to supply the controller PCB at the 12v BATTERY Input/output terminal.



Installing the Sim

It is suggested before any wiring is done you first test the SIM card using a phone and then insert the SIM card; the controller will require a working NANO SIM card to communicate with the R2Dfuel server. It is advisable to secure the SIM card with some tape should the controller be installed on a moving vehicle.



Install the SIM card as shown above. The SIM must be active, have a valid data balance and preferably a suitable SMS bundle loaded. The APN may be changed to suit applications or countries outside of South Africa, please contact your Product supplier directly to arrange this. A simple “INFO” message sent to the device will reveal the CSQ (signal strength) as well as the GPRS connectivity status (GPRS=0, no communication from or to the controller, GPRS=2, communication sent from the controller with no handshake reply from the server and GPRS=1 communication established between the device and the server).

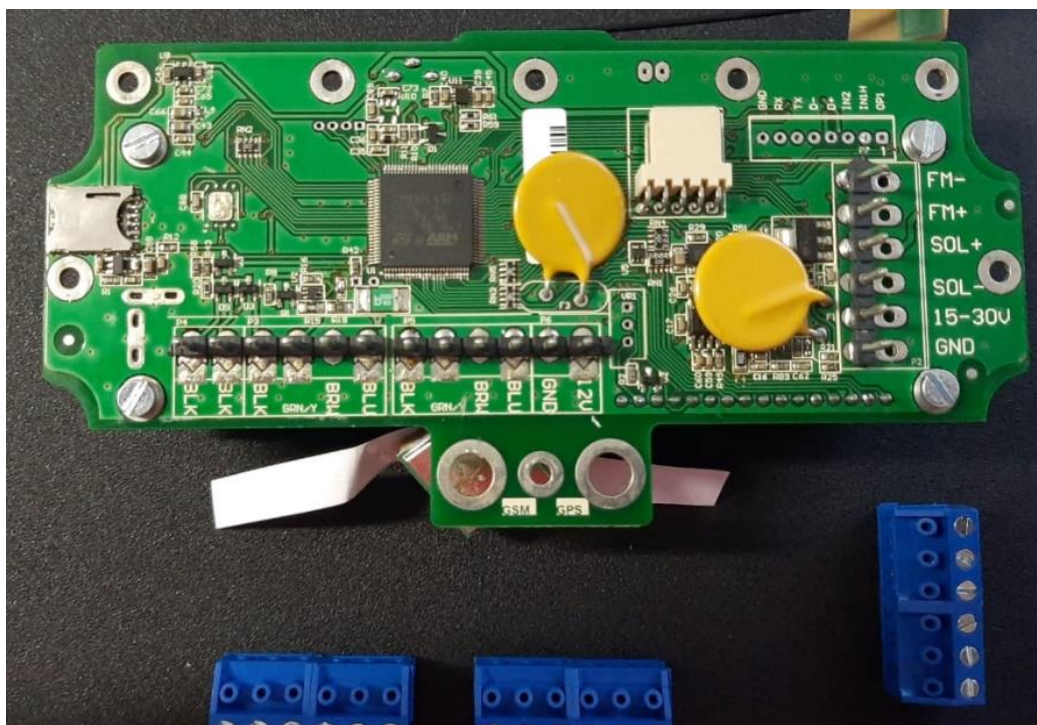
Wiring up the Controller

The wiring of the R2Dfuel system must be done as follows. Ensure that all cables used are sufficiently sized to avoid voltage drops over longer lengths.

a. R2Dmax Controller



By gently lifting the board out of the enclosure, turn the board so that it lies face down and gently lift the screw terminal connector blocks up to reveal the designation of each screw connector. This is printed on both sides of the PCB for installer convenience.



Starting from top right on the board, the pins marked as follows are:

Below is informative only and greyed out indicates not used in Generator applications

FM- Flow Meter negative (*Polarity insensitive at the flowmeter*)

FM+ Flow Meter positive (*Polarity insensitive at the flowmeter*)

SOL+ Solenoid positive (*Polarity insensitive at the solenoid*)

SOL- Solenoid negative (*Polarity insensitive at the solenoid*)

15-30V Positive 24v DC from transformer power supply in Kit or 24volt vehicle

GND Negative 24v from power supply and common earth

The terminal connectors at the bottom of the board are as follows (right to Left):

12V 12v positive backup battery connection or primary 12V source if 24V is not available

GND 12v negative backup battery connection or primary 12V source if 24V is not available

BLU Blue wire of 4 core cable from Fuel Sensor (1)

BRW Brown wire of 4 core cable from Fuel Sensor (1)

GRN/Y Green/Yellow wire of 4 core cable from Fuel Sensor (1)

BLK Black wire of 4 core cable from Fuel Sensor (1)

BLU Blue wire of 4 core cable from Fuel Sensor (2)

BRW Brown wire of 4 core cable from Fuel Sensor (2)

GRN/Y Green/Yellow wire of 4 core cable from Fuel Sensor (2)

BLK Black wire of 4 core cable from Fuel Sensor (2)

R2Dmax Connection Points (back)

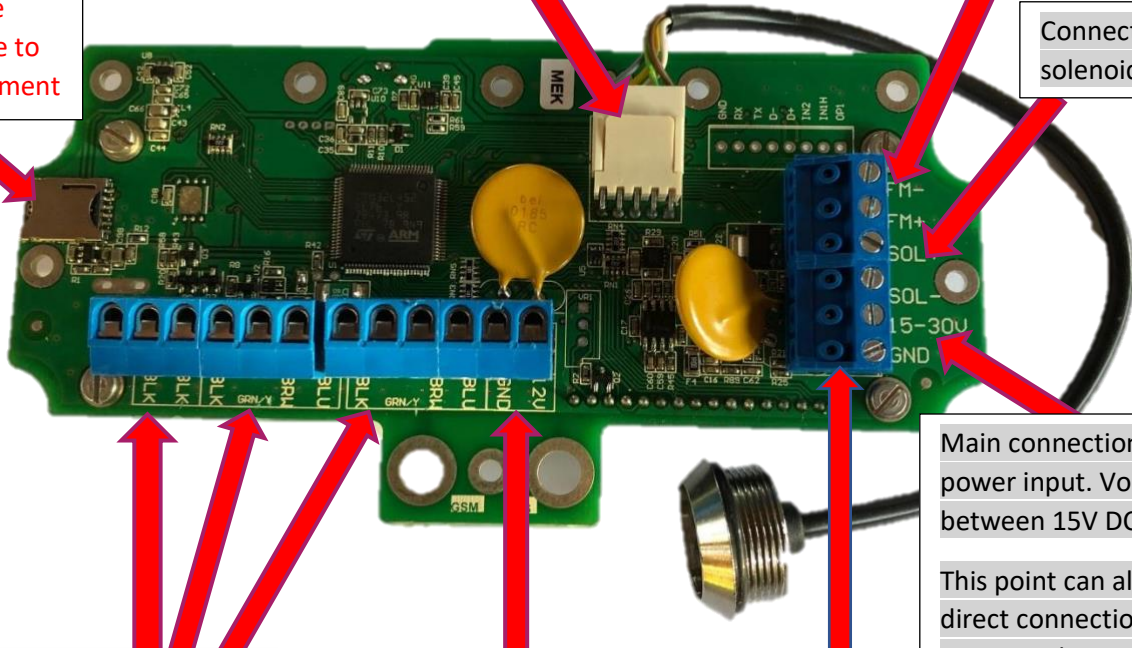
Nano-Sim card slot, chip must face the PC board, with flat edge in line with board edge. **If the controller is mounted to a moving bowser, please secure the Sim with some insulation tape to prevent movement**

Connection point for the TAG receptacle cable plug, standard extension cables up to 10m can be purchased from your product supplier

Connection point for the Flowmeter (FM + & FM -), most digital dispensers can be integrated directly



Connection point for the solenoid (SOL + & SOL -)



Connection points for FLS (Fuel level sensor). Please note connection points are marked by colour. Up to 3 FLS's can be connected and monitored.

The minimum value of any FLS is 1L and maximum is 65500L. With fixed non-moving tanks it is advisable to set the averaging time between 10 and 20 seconds, ideally 20 seconds on 2KL tanks and 10 seconds on 23KL tanks, for moving bowsters between 50 and 80 seconds.

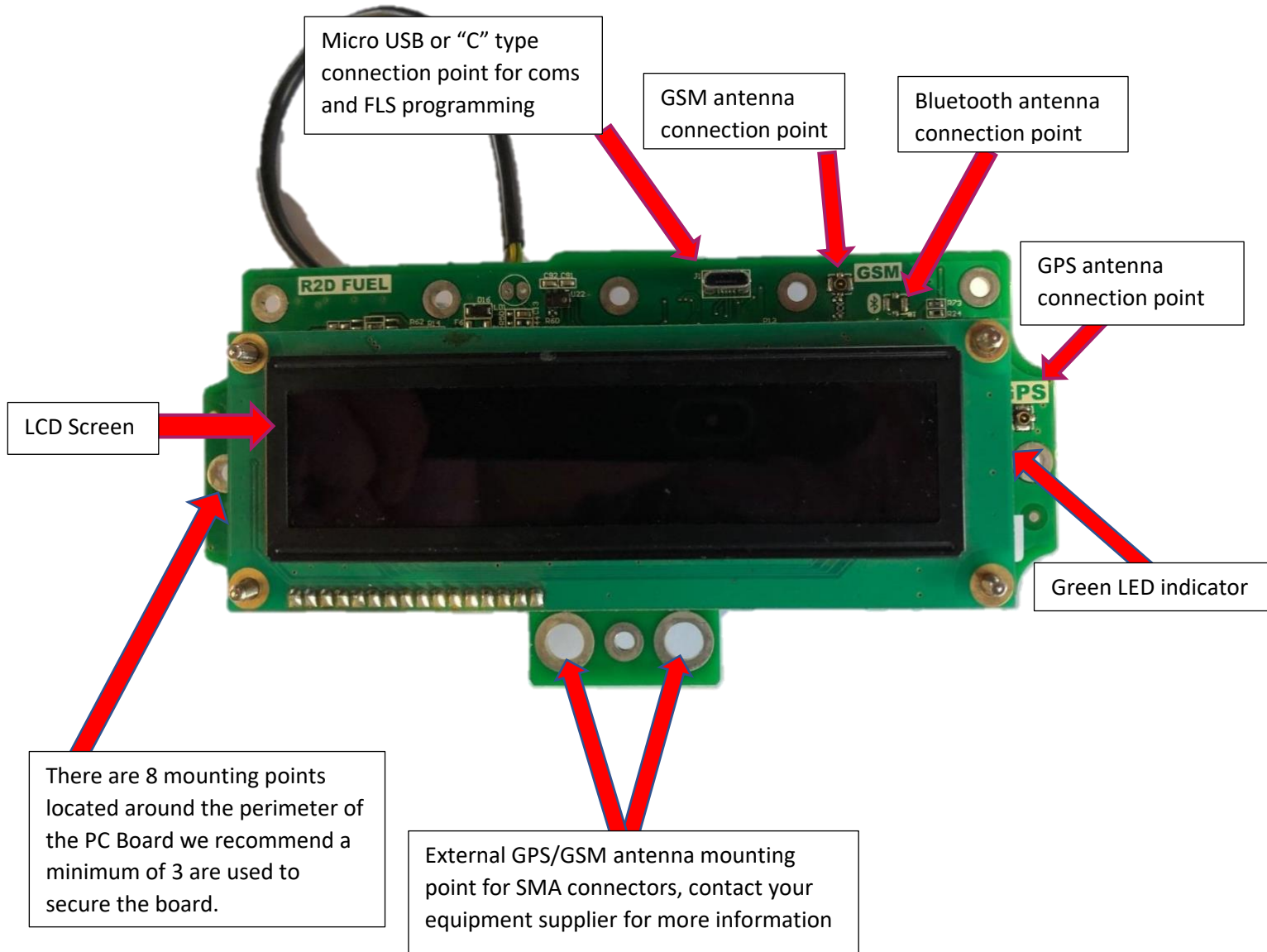
Connection point for a 12 Volt backup battery, this is a regulated output or can be used as the primary input if you only have a 9 -14 Volt supply (e.g., mobile bowser). **It is recommended that a 12V back-up battery is installed.**

Main connection point for power input. Voltage range between 15V DC to 36V DC max.

This point can also be used for a direct connection to a suitable 18-24V solar panel (min 80Watt)

PLEASE NOTE: The plastic terminal connectors slide off the pin seats for easy removal and fitment, do not connect wires when the supply voltages are present and rather use flexible, braided copper cable to prevent damage to the PCB

R2Dmax Connection Points (front)



WARNING BE GENTLE WITH THE CIRCUIT BOARD, FORCING THE BOARD INTO AN ENCLOSURE CAN CAUSE THE BOARD TO BEND AND FLEX WHICH IN-TURN CAN CAUSE COMPONENTS TO CRACK AND SOLDERED JOINTS TO BREAK

Powering up the unit for the first time

The controller will power up and display a value of fuel remaining in the tanks provided the fuel level sensors has been connected.



On start-up, the green LED situated on the right-hand side of the PC Board will indicate the following:

Solid light with a brief “off” every second = NO GSM or NO SIM card present

Slow flash = busy registering on a GSM network

Brief 0.1 second flash every second = good GSM connection established

With power connected, the Tag receptacle LED on the side of the micro controller will be lit up RED.

The light on the tag receptacle has a secondary function to display certain conditions, namely.

A slow RED flash – indicates no GPS lock (solid indicates good GPS lock)

Communicating with the Controller

Communication with the controller can be achieved in 3 different ways.

a. SMS

Sending an SMS to the unit will allow the installer to receive basic information that will determine the functionality of the unit.

b. Direct USB connection

Using a USB to micro-USB cable, the installer can communicate via a laptop using the Serial communication software provided by the product supplier.

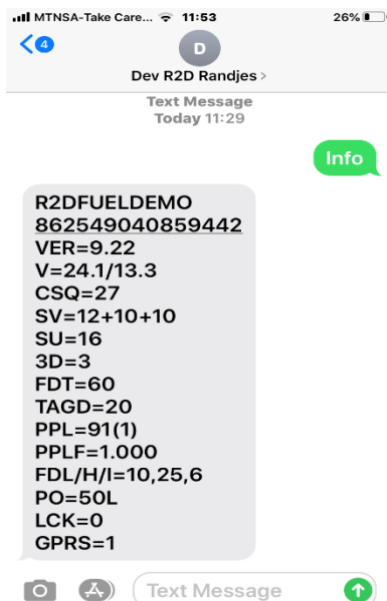
c. Server

Once logged into the R2Dfuel website, all commands can be sent to the unit directly via internet connection.

SMS Communication

Once the initial installation is complete, the installer can confirm that the controller is working by sending an (info) SMS to it. The message reply contains all the immediate and important data which is essential in evaluating the installation BEFORE the installer leaves site.

A General health and information query “INFO” can be done on the controller via SMS, USB or server. The unit will reply with the following: Each display line is explained below.



1. The name assigned to the controller
2. The unit IMEI number 862549040859442
3. The unit firmware version (9.22)
4. Input voltage 24.1 and battery voltage 13.3
5. CSQ or Cellular Signal Quality (27) out of 31
6. Satellites in view (12+10+10) from the different constellations
7. Satellites currently in use (16) (0 means no GPS lock)
8. 3-dimensional satellite lock (3) perfectly healthy GPS lock
9. Fuel Dispense Time in seconds (600)
10. Tag Delay or off time with no dispense activity in seconds (60)
11. Pulse count per litre (91) the (1) indicates Flowmeter is present
12. Pulse count per litre correction factor (1.000000)
13. FDL litres threshold drained to trigger SMS (10 x2)
14. FDH litres threshold added to trigger SMS (25 x2)
15. FDI is the interval checks for fuel theft or adds every minute (6)
16. PO= Max amt. of fuel that can be dispensed at once (default 1000)
17. LCK - solenoid locked (0 = RUN, 1 = LOCKED)
18. GPRS=1/2/0 (1=good, 2= no server coms, 0= no communication)

Important other than the **INFO** message, if you need to communicate with the controller via SMS you will have to be assigned as a management number.