



2022

Installation Manual

This Manual belongs to:

Cell

R2Dfuel release

January 2022

Contents

PRODUCT LIABILITY DISCLAIMER –	3
Introduction to R2Dfuel	5
The R2Dfuel Kit	6
Site Visit	7
Tools required	9
Safety	10
Equipment Placement	11
Installing the Sim.....	12
Wiring up the Controller	13
R2Dmax Connection Points (back)	15
R2Dmax Connection Points (front)	16
Installing the Flowmeter and Fuel Solenoid	17
Powering up the unit for the first time.....	18
Communicating with the Controller	19
SMS Communication.....	19
USB Communication	21
Website Server Communication	22
Adding Tags.....	26
Important - Additional Product Considerations and precautions	28
New product releases.....	30

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R2D Fuel (PTY) Ltd. reserves the right to change the terms, conditions, and notices under which its products are offered, under certain circumstances.

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 collector (solenoid max. 2000mA DC limited to 2 seconds max.)
Battery Charging output	1 x 13.8V DC 1A regulated output with protection and cut out
Size	160 x 80 x 55 mm (Approx.)
Weight	420g (Approx.)
Operating temperature	-20 to 60 deg. C

Notes: Current consumption drops by 100mA if the device is used with an OLED display screen, useful in Solar 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 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 of this manual immediately.

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

The R2Dfuel basic Kit

The R2Dfuel kit can be installed as follows:

1. Controller and Flowmeter only
2. Controller and Solenoid only
3. Controller and fuel level sensor only
4. Controller, Flowmeter and Solenoid
5. Controller, Flowmeter, Solenoid and Fuel Sensor (maximum 3 per controller)

The functions of the kit are as follows:

- a. R2D micro controller – A visual representation of fuel remaining in the bowzers and the last volume of fuel dispensed. This also houses the D-Tag receptacle to identify Vehicle and Driver if required.
- b. Flowmeter – A meter that is driven by the flow of fuel past an impeller.
- c. Solenoid – Basically an electronic shut-off valve that is switched by the Controller.
- d. Transformer – a 24Volt DC transformer providing the primary power to the R2Dmax controller.

ADD ON - Fuel Level Sensors - Capacitive fuel sensors used to monitor the level of fuel remaining in the mobile bowser or bulk storage tanks, a maximum of three per controller can be added. Tanks with a capacity exceeding 65535 litres will have to be calibrated as half of their total volume known as “N” value and then have the values doubled on both the web platform and controller.



A



C



B



D

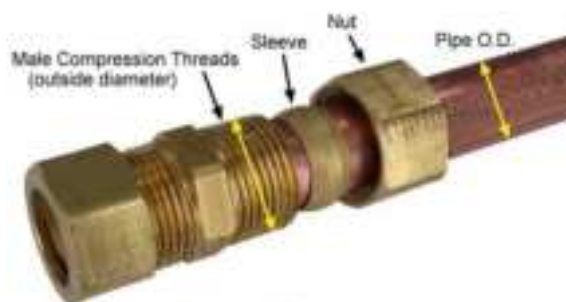
Quick install Guide

- 1) Install a working SIM into the controller, connect the input voltage supply appropriately
- 2) Fit ancillary equipment as required and connect to R2D controller
- 3) Check basic operations of Tagging, flowmeter input and FLS inputs on controller LCD screen
- 4) Calibrate flowmeter by dispensing into a measured container or using existing in-situ meter
- 5) Lastly double check GSM connectivity and settings by sending SMS command “INFO”

Site Visit

Prior to installation of any of the afore mentioned kit, a site visit is imperative. The site visit will determine what will be required to complete the entire installation timeously. At this point it will be important to decide on the correct controller choice with the options of the R2D micro controller, the R2D PSU or the R2D Solar. These options are explained on the next page.

In many cases an existing electronic flowmeter and solenoid or nozzle switch may be available for integration, which means absolutely no plumbing will be necessary. Open the bowser pump, determine where the installation of the intended kit will take place. If necessary, measure the diameter of the pipes and cable runs so that all the required pipe couplings and cable trunking can be purchased prior to the installation. Most installations require standard Galvanised pipe fittings the installation below depicts one where copper pipe has been used. Your site visit will also be valuable in determining the service provide with the strongest GSM/GPRS signal strength, it often pays to inquire with the locals.



The correct fittings required will be available at most plumbing stores. Ensure that the correct pipe diameter, thread pitch and compression sleeves are available for the installation. The general pipe dimensions for R2Dfuel kit is 1 inch BSP (British Standards Pipe) thread. ***Note: galvanised and copper piping are not suitable for petrol.***

Remember – In many cases, once the installation has started, the client will not be able to dispense fuel until the installation is complete. The more you prepare for the installation, the faster it will be completed.

Since all the ancillary kit components are imported both sealed and tested by the respective manufactures, they are not tested by R2Dfuel (PTY) Ltd, only the controller has been submitted to very stringent test cycles, it is advisable that all ancillary components are bench tested by the installer before leaving for site, it is also advised that a complete spare Kit is always carried. This can save one much frustration and travel time while providing replacement spares for any unforeseen events and incidents that may compromise the system.

The R2D micro controller is not housed with a battery, this means that it will not function if the main source of power is removed. Although the micro controller works perfectly well without a 12-volt battery connected, the data being sent to the server may well be compromised in a sudden power outage especially while in the process of pumping or receiving fuel in the bulk tanks. It is therefore advisable to add the battery back-up.

Best suited for:-

Integration with existing commercial dispensers.

Simple management of live fuel values in storage tanks.

Adding a controller to dispensing systems with two dispensing nozzles.

Environments that have a continual uninterrupted power supply either battery or AC mains systems.

Mobile browsers that are permanently connected to a battery supply

Advantages

Lower cost

Easy fitment in smaller spaces

Less conspicuous and can be hidden

Your own battery back-up or PSU can be fitted

Disadvantages

Vulnerable to tampering

Smaller space to work in for cable connections

No “last Gasp” of data without battery or back-up

The R2D PSU or R2D Solar is the same controller housed in a metal cabinet with IP66 rating, the enclosure contains a 24-volt supply transformer including a 12-volt 12 amp/hr battery to provide several days’ worth of back-up depending on the controller settings. The cabinet can also be ordered with the keypad to capture mileage and engine hours.

Advantages

All in one, Tamper resistant enclosure

Larger space for connections of cables

Easy to house an additional Relay for pump control

Supply power to additional R2D micro controllers

Option of Bluetooth antennae to communicate with wireless tags

Option of having the face mounted keypad

Disadvantages

Requires slightly larger fitment area

The weight requires a firm mounting point

Tools required

Generally, a Digit Distributor should have all the tools required to install this system, however a few larger shifting spanners, pipe wrenches, vice grips and hacksaw will be required to remove and refit pipe couplings.

The use of a “Vernier” and tape measure during the initial site visit will also be required to determine the required pipe couplings and **steel** conduit requirements needed to complete the installation.



Safety

Ensuring the safety of yourself and those around you cannot be emphasised enough during this installation. Remember, during this installation, there is going to be fuel leaking out of pipes that are being removed, fuel residue where you will be working, electrical connections, heights when installing fuel sensors on the top of bowzers, etc.

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 and requirements pertinent to your installation.

1. Cordon off the area where you will be working.
2. Ensure all electrical supply breakers to the bowser 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 shut off fuel valves from the bowser are off, and again clearly marked as such so that they are not accidentally switched back on again during the installation.
4. Ensure that you either bring the necessary firefighting equipment with you or you are aware of the location of the required safety equipment on the site.
5. Personal Protective Equipment must always be worn.



**FUEL BOWSER WORK IN
PROGRESS**

DO NOT SWITCH BREAKERS

TIPs –

Make use of an oil drain tray or plastic tub to catch any fuel that leaks out when pipes are removed or cut. You will be working on a client's premises. Respect their safety rules and regulations.

In many cases you may be able to TAP into the systems existing electronic flowmeter signal

Equipment Placement

During the site visit, the placement of the equipment should already have been decided. The following must be taken into consideration.

- a. Are you creating a hazard by installing in the location that you have chosen?
- b. Are you creating a weak point in the system by installing in the location that you have chosen?
- c. Is the equipment sufficiently protected from tampering?
- d. Is the equipment sufficiently protected from accidental damaged?
- e. Will your installation be compliant with the local authority guidelines and installation requirements?

Avoid installing the equipment in areas on the fuel pump where it will be damaged by excessive movement of the fuel nozzle hose and accidental damage by vehicles operating in the area. If possible, it is best to install the equipment inside of the fuel pump housing itself, in so doing ensuring that the covers of the pump enclose and protect all installed equipment from movement, accident and tampering.

Remember – out of sight, out of mind.

Acceptable, not Ideal.

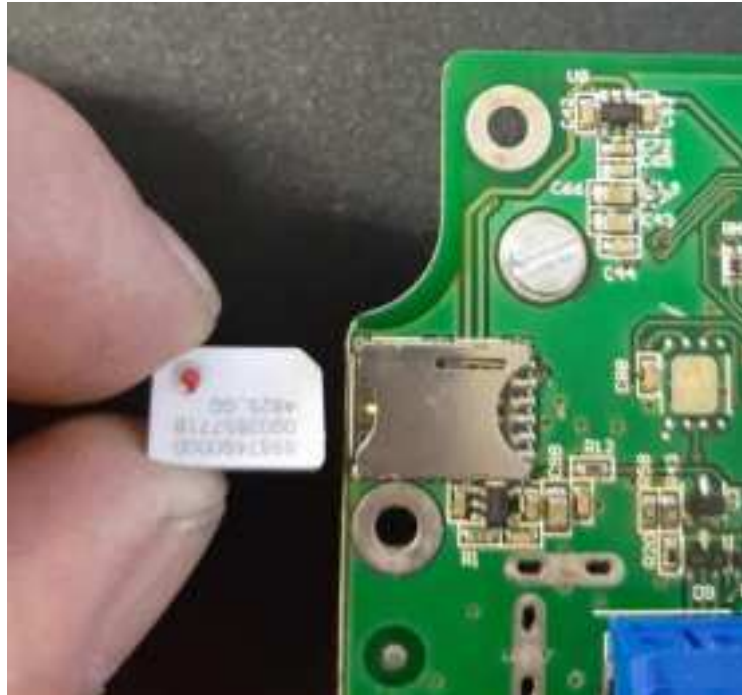


A perfect covert installation.



Installing the Sim

It is suggested before any wiring is done you test (using a phone) and insert the SIM card; the controller will require a 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 a suitable SMS bundle loaded. The APN may be changed to suit countries outside of South Africa, please contact your Product supplier directly to arrange this. Remember to choose the GSM network with the strongest signal in the area, a simple "INFO" message sent to the device can help, the CSQ (signal strength) will be reported 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 reply from the server and GPRS=1 communication established between the device and the server.

It is strongly recommended that all the equipment you plan to install is tested prior to the installation a simple mock-up on your own test bench will confirm all components are functional, this may save you time and a long expensive trip home.

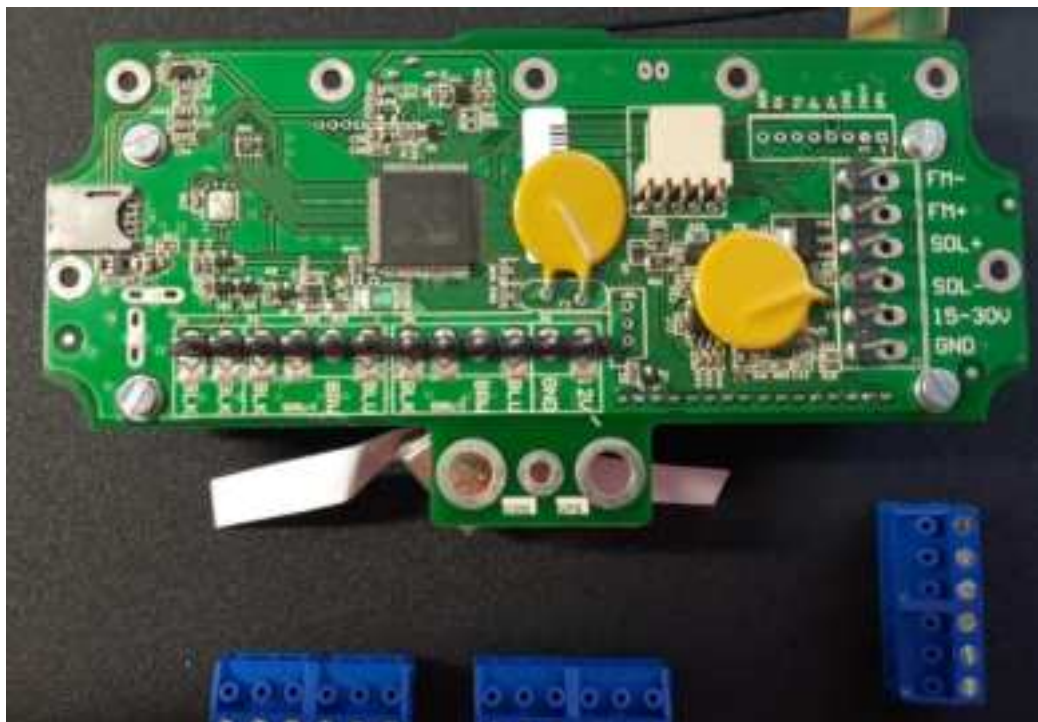
Wiring up the Controller

The wiring of the R2Dfuel system must be done as follows. Ensure that all cables used are sufficiently sized to avoid voltage drop 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 blue screw connector casings up to reveal the designation of each screw connector. This is printed on both sides of the PCB for installer convenience.

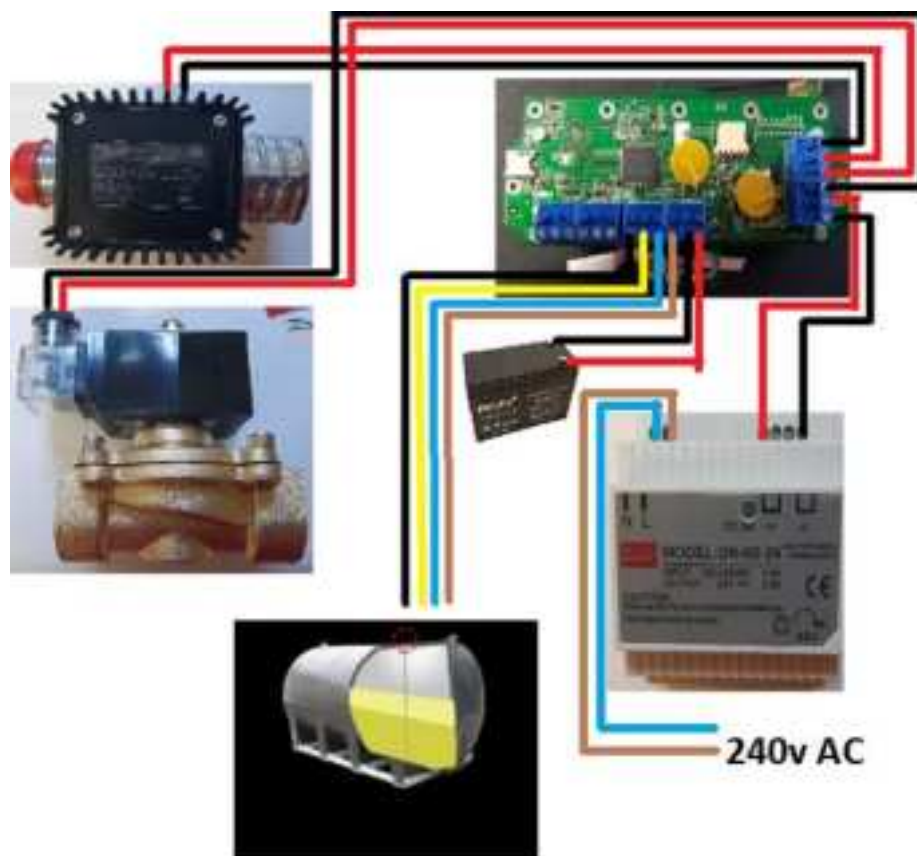


Starting from top right on the board, the pins marked as follows are:

- FM- Flowmeter negative (*Polarity insensitive at the flowmeter*)
- FM+ Flowmeter 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 and 3)
- BRW Brown wire of 4 core cable from Fuel Sensor (2 and 3)
- GRN/Y Green/Yellow wire of 4 core cable from Fuel Sensor (2 and 3)
- BLK Black wire of 4 core cable from Fuel Sensor (2)
- BLK Black wire of 4 core cable from Fuel Sensor (3)



R2Dmax Connection Points (back)

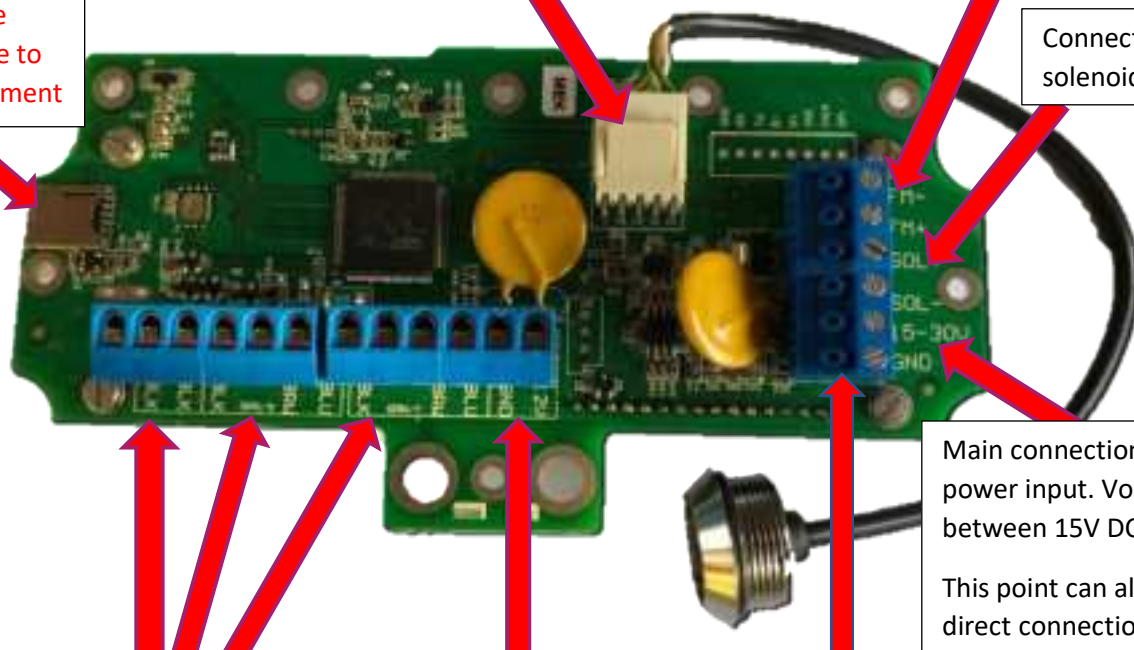
Nano-Sim card slot, chip must face the PC board, with flat edge in line with board edge. **If the controller is mounted to a moving bowser please secure the Sim with some insulation tape to prevent movement**

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 bowzers between 50 and 80 seconds.

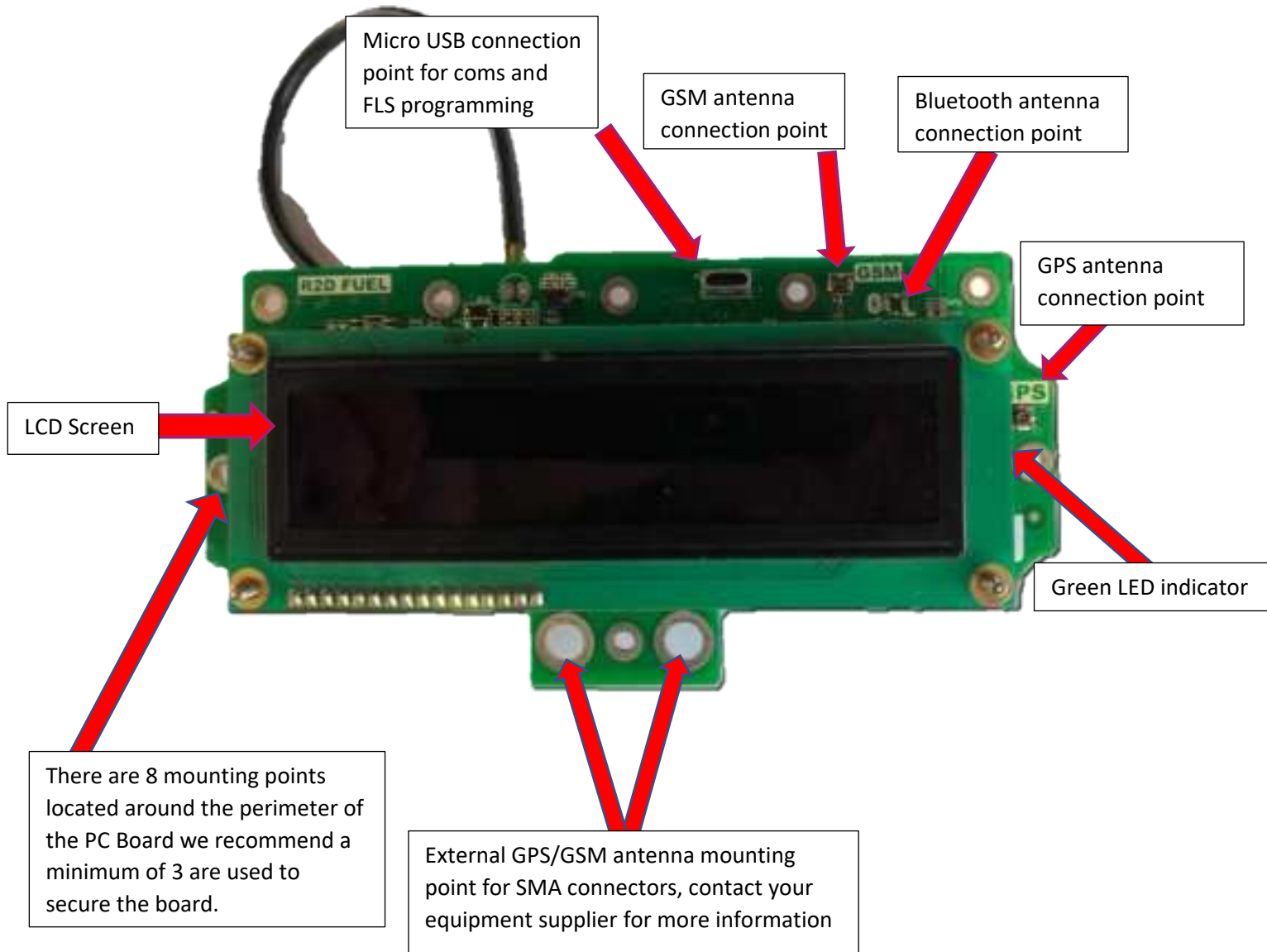
Connection point for a 12 Volt backup battery, this is a regulated output or can be used as the primary input if you only have a 9 -14 Volt supply (e.g., mobile bowser). **It is recommended that a 12V back-up battery is installed.**

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

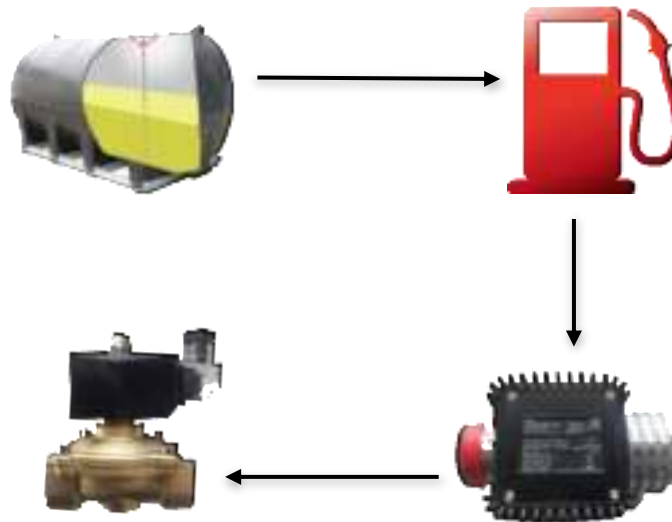
R2Dmax Connection Points (front)



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

Installing the Flowmeter and Fuel Solenoid

When installing the Flowmeter and Solenoid, the best order of the parts is as shown below. By installing the solenoid last in line, it will ensure that the Flowmeter always remains full of fuel preventing small losses in accuracy and prevents easy access to tampering.



High quality, high temperature Polytetrafluoroethylene thread Tape (PTFE), generally referred to as “plumbing tape”, can be used on all fittings other than compression type fittings, this will generally ensure that there are no fuel leaks after installation. However, new technology liquid or paste type thread sealants are kinder to sensitive components downstream. Sometimes a combination of both thread tape and paste is required for stubborn leaks, it is not uncommon to trace fault in fuel components to clogging from a piece of Teflon tape that washed off the ends of the threads and gets clogged in the flowmeter turbine.

Calibration of the flowmeter is an essential post-installation procedure, this can be done remotely or on site from values obtained, either from dispensing into a measured volume container or using the comparison values obtained from the existing in-situ meter. Check the current PPL (Pulse Per Litre) count by sending “INFO” via SMS, this is the value of electronic pulses counted to display a result of One Litre on the LCD screen and R2Dfuel server. Only whole numbers (integers) are acceptable (i.e., 88.5 is unacceptable), by increasing this value you will **decrease** the value of litres shown on the display and R2Dfuel platform and by decreasing it you will **increase** the litres displayed on the LCD screen and R2Dfuel platform. Once the big adjustment is made, fine calibration is done by using the PPLF (Pulse Per Litre Factor) setting, the final litres counted are multiplied by this value settable between 0.800000 and 1.200000 for increased accuracy.

Tip – Determine the current PPL by sending the “info” message, then pump out a measured volume of fuel, for example 100L, the controller display may show a live dispensing of 106L, now do some math $(106/100)=1.06$ now multiply the default or current PPL in this case 88 by 1.06 $(88 \times 1.06) = 93.28$, result 93 is closer than 94 so program the controller PPL for 93 and do further dispensing, the PPLF values can now be used to fine tune the overall values displayed with precision, all these adjustments can be done while monitoring the controller LCD screen where the new result will be instantly displayed.

PPL formula $(\text{R2Dmax displayed volume} / \text{Actual volume dispensed}) \times \text{Current PPL} = \text{NEW PPL}$ *whole numbers only*

PPLF formula $(\text{Actual volume dispensed} / \text{R2Dmax displayed volume}) \times \text{Current PPLF} = \text{NEW PPLF}$

Powering up the unit for the first time

To ensure that both the backup battery and 240v AC power supply are working properly, first connect the back-up battery to power up the unit before switching on the 220-24v DC mains supply to the bowser. If no back-up battery is used simply connect the 220-24v DC power supply provided in the kit.

The controller will power up and display a value of fuel remaining in the bowser if a fuel level sensor 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 will be lit up RED.

Once “tagged”, the LED will turn GREEN and an audible “Click” of the solenoid switching will be heard.

Fuel can now be dispensed.

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)

A fast 0.5 second RED flash for five seconds – indicates an unauthorised tag has been presented.

A fast 0.5 second GREEN flash for five seconds – indicates an authorised tag has been presented outside of a predetermined pump dispensing time.

Both LED on (almost an orange appearance) indicates the Device has been LOCKED

The R2Dmax controller uses internal non-fixed GSM and GPS antennas. Should the controller be installed in a compromised area or enclosure that requires the use of external antennas then the two internal antennas can be replaced with standard SMA connector type antennas. The I-PEX to SMA adapters must be fitted on the existing connectors allowing standard antennas to be used. Please use extreme caution when removing and replacing the connector, do not use a screwdriver, your thumb and index finger should be more than adequate, gently roll the connection over to remove and the new connection is pressed on with gentle pressure.



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.

As can be seen on the left picture, send "info" in the form of an SMS to the GSM number of the R2Dmax controller. The unit will reply with the following:



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) (0 means no 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. **On start-up** the controller only accepts the two messages highlighted in Green below.

Further SMS commands as seen below can be sent only from a management number, allowing further setup of the controller. **(R2Dfuel recommends most commands are done via the server to record the date and settings)**

INFO	Controller replies with details and variable settings saved on the device
MANAGEMENT NO1=	One-time Public command, this is the first and most important admin number, DO NOT enter this number incorrectly , only a server or USB input instruction can edit or delete this number. The controller will only accept SMS commands from an admin number. (max. 3 admin numbers)
REG=	Name the controller (maximum 20 characters)
RESTART	Restart controller, can be used to reinitiate the GSM connection
POS RESET	Reset the default GPS position, the first satellite lock achieved by the device defines this location
SCREEN ON	This is the Default / Normal mode, the LCD screen backlight is on permanently
SCREEN OFF	This power saving mode turns the screen off after 2 minutes of no activity, tagging the controller will turn the screen on and normal functionality will resume, a second tagging will activate the solenoid
SCREEN OFF2	This power saving mode turns the screen backlight off after 2 minutes of no activity, the text is still be visible, tagging the controller turns the screen on and a second tagging will activate the solenoid
SCREEN	Question mode selection, Screensaver=0 (normal), 1 (full power saving mode), 2 (no backlight)
BACKLIGHT=10	LCD backlight brightness settable between 1 (dim) and 10 (full bright)
LOCK and UNLOCK	
LOCK	lock all tag functionality in the event tags are lost or stolen, the controller will not accept a Tag
UNLOCK	Un-lock Tag functionality and allow normal use of the controller
FUEL DISPENSING time	
DISPENSE TIME=600	Fuel dispense time limit per Tag action, settable between 10 and 4800 seconds
DISPENSE TIME=0	Fuel Dispense time unlimited - WARNING unlimited dispensing time can cause solenoid overheating
DISPENSE TIME	Controller replies with current dispense time setting in seconds
Vehicle TAG settings	
TAG DELAY=60	Solenoid OFF time settable between 10 and 4800 seconds, count starts when flowmeter is stationary
TAGS ADD	Puts controller in program mode to receive authorised tags at the controller (maximum total of 750)
TAGS ERASE ALL	Deletes all Tags previously loaded (only a web login can delete individual Tags)
TAGS	Controller replies with a summary of the total number of Tags added and erased
Driver TAG settings	
DTAGS ADD	Puts controller in program mode to receive authorised Driver tags at the controller (max 750)
DTAGS ERASE ALL	Deletes all Driver Tags previously loaded (only a web login can delete individual Tags)
DTAGS	Controller replies with a summary of the total number of Driver Tags added and erased
PULSE PER LITRE settings on the Flowmeter	
PPL=91	Settable between 10 and 400 the default is 88 and once calibrated should rarely be adjusted
PPLF=1.000	Settable between 0.8000 and 1.2000, this factor is multiplied to the litre count and then displayed
DOUBLE DISPLAY VALUES	
TANKD=1	Double the value shown for FLS 1 on the controller display (used for tanks larger than 65500 L)
TANKD=2	Double the value shown for FLS 2 on the controller display (used for tanks larger than 65500 L)
TANKD=3	Double the value shown for FLS 3 on the controller display (used for tanks larger than 65500 L)
TANKD=N	This will return all "double value" tank readings back to normal
ADMIN and REPORTING numbers	
SMS1=	Add reporting No.1 to receive alarm SMS only, user may not communicate with the device
SMS2=	Add reporting No.2 to receive alarm SMS only, user may not communicate with the device
SMS3=	Add reporting No.3 to receive alarm SMS only, user may not communicate with the device
SMS1delete	Delete reporting number one
SMS2delete	Delete reporting number two
SMS3delete	Delete reporting number three
DELETE ALL MN	Delete ALL 3-management no's, can only be executed by a management no. or Web server command

USB Communication

An alternative method of communication with the controller is via the micro-USB port located on the top of the controller above the screen. This method allows the installer to send the same SMS commands above including the additional commands below.

TAGS=	Add specific tag numbers, coma separated if more than one is added
TAG LIST	A full list of all the tags loaded on the controller will be downloaded to your serial program
FLS FREQUENCY VALUES	
FLS1E=	Sets FLS 1 empty frequency value
FLS2E=	Sets FLS 2 empty frequency value
FLS3E=	Sets FLS 3 empty frequency value
FLS1F=	Sets FLS 1 full frequency value
FLS2F=	Sets FLS 2 full frequency value
FLS3F=	Sets FLS 3 full frequency value
FLS VALUES	Controller replies with the high and low values of all FLS
PUMP settings that also trigger SMS alarm	
PUMP OUT=1000	Alarm - Maximum single dispensing volume, default is 1000 L, settable between 50 and 20000 litres
PUMP OUT=0	Disable alarming function, i.e. no maximum volume is defined
PUMP OUT	Controller replies with current pump out volume variable in litres
PUMP TIME=4,16	Authorised pump run time in GMT and currently as shown represents 6am to 6pm in SA time settable between 1 and 24, default is 24,24 (subtract 2 hours to account for SA time)
PUMP TIME=0	Disable alarming function, turns off timer so authorized pump time is undefined
PUMP TIME	Controller relies with current pump time alarm variables
MANAGEMENT NUMBERS	
MANAGEMENT NO1=	Load ADMIN number 1 for SMS programming of variables via SMS
MANAGEMENT NO2=	Load ADMIN number 2 for SMS programming of variables via SMS
MANAGEMENT NO3=	Load ADMIN number 3 for SMS programming of variables via SMS
NUMBER QUERY	Controller replies with all Management (ADMIN) and reporting numbers loaded

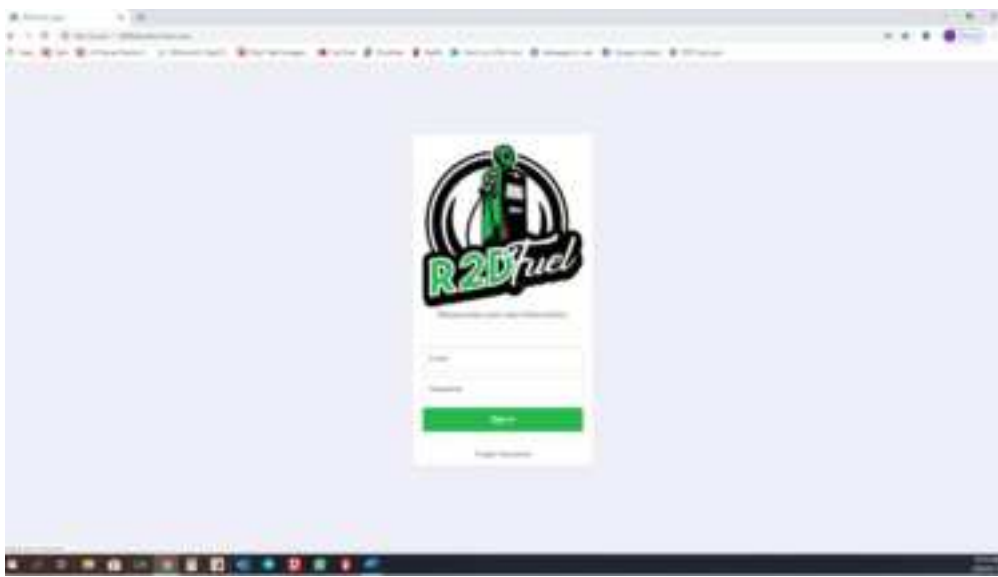
Website Server Communication

To achieve Server communication, the user must be logged into the R2Dfuel website.

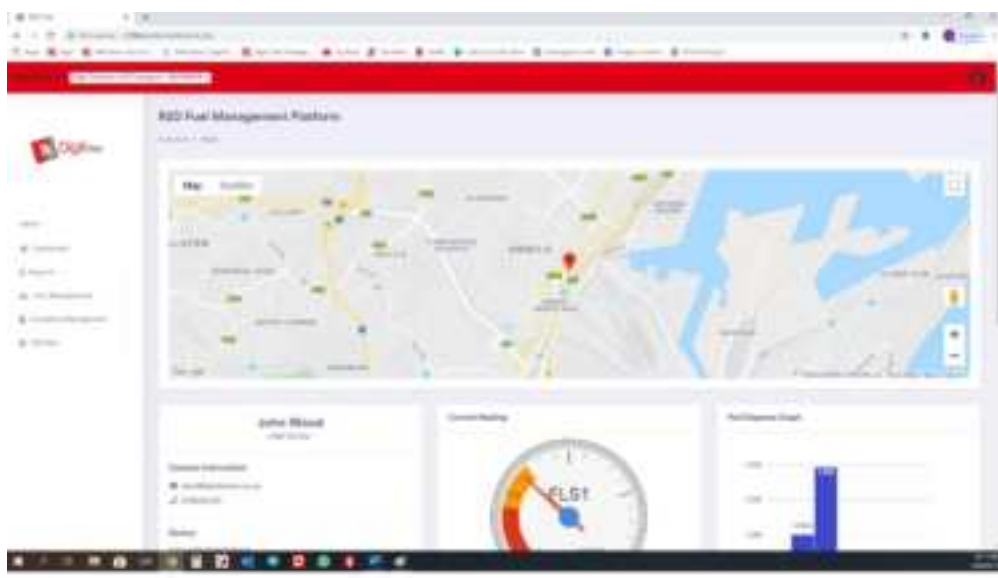
www.r2dfuel.com

Before communication can commence with the controller, the device must be added to the server. To do this, the following must be completed.

1. Log into the R2Dfuel website. (Your login details will be provided by Digicell)



2. Once logged in, the main dashboard will be shown.



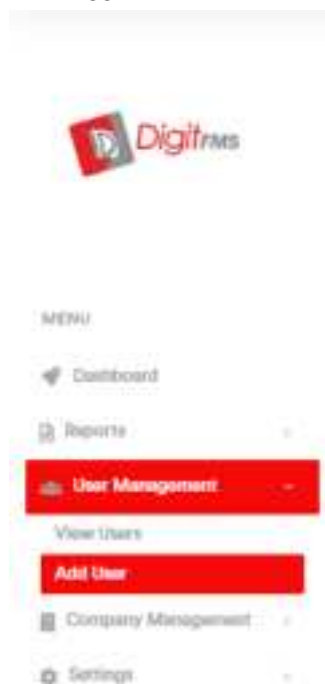
3. Under “Company Management, click on “ADD COMPANY”



4. Fill in all the New company details and then click on “SAVE DETAILS”.

A screenshot of the 'ADD NEW COMPANY' form within the Digitrms application. The form is titled 'ADD NEW COMPANY' and includes a sidebar with a list of fields: Company Name, Address, Phone, Email, State (Country), Website, PIN Code, GST Number, Vendor Code, Bank Management Code, Bank Code, Bank Name, Bank Code (Branch Code), and Company Logo. The main area contains input fields for each of these fields. The 'State (Country)' field has a dropdown menu showing 'India'. The 'PIN Code' field has a dropdown menu showing '000000'. The 'Bank Management Code', 'Bank Code', and 'Bank Name' fields have dropdown menus showing '000000', '000000', and '000000' respectively. The 'Bank Code (Branch Code)' field has a dropdown menu showing '000000'. The 'Company Logo' field has a text input field with the placeholder 'Company Logo, PNG, JPG, GIF, etc.'. At the bottom right of the form is a red button labeled 'SAVE DETAILS'.

5. Under User Management, click on “ADD USER”.



6. Fill in all the user details taking note that the email and telephone details must be filled in correctly. The password can be changed by the client, forgotten passwords require the server to send an SMS directly to the user cell phone.

The screenshot shows the 'RED Fuel Management Platform' user registration form. It includes fields for 'First Name', 'Last Name', 'Email', 'Phone', 'Company Name', 'Company Address', 'Company City', 'Company State', 'Company Zip', 'Company Country', 'Company Website', 'Company Email', 'Company Phone', 'Company Fax', 'Company Mobile', 'Company Email', 'Company Phone', 'Company Fax', 'Company Mobile', 'Company Email', 'Company Phone', 'Company Fax', 'Company Mobile'. There are also checkboxes for 'I am a client' and 'I am a distributor'. A 'Save Details' button is at the bottom.

7. Under “Settings”, click on “Device Management”. Once the page refreshes, click on “Manually Assign Device”.

The screenshot shows the 'RED Fuel Management Platform' 'Assign Device' page. It has a sidebar with 'Settings' and 'Device Management' highlighted. The main content area has a table with columns for 'Device ID', 'Device Name', 'Device Type', 'Device Status', 'Device Location', 'Device Company', 'Device Client', 'Device Distributor', 'Device Owner', 'Device Manager', 'Device Assigned To', 'Device Assigned Date', 'Device Assigned By', 'Device Assigned To', 'Device Assigned Date', 'Device Assigned By'. A black arrow points to the 'Manually Assign Device' button.

8. Fill in all the required details of the device including the tank full values. NOTE: select the appropriate company from the drop-down menu and click on “Assign Device”. Do not unnecessarily assign the device to the distributor as well as the client.

The screenshot shows the 'RED Fuel Management Platform' 'Assign Device' form. It includes fields for 'Device ID', 'Device Name', 'Device Type', 'Device Status', 'Device Location', 'Device Company', 'Device Client', 'Device Distributor', 'Device Owner', 'Device Manager', 'Device Assigned To', 'Device Assigned Date', 'Device Assigned By', 'Device Assigned To', 'Device Assigned Date', 'Device Assigned By'. There are also checkboxes for 'I am a client' and 'I am a distributor'. A 'Save Details' button is at the bottom.

9. Under “Settings”, click on “Send Device Commands”. You are able to fine tune certain parameters and variables on the controller to suit your particular client requirements.



The list of commands available to send to the device are available from the dropdown tag under “Command”. The table of server commands is quite extensive and includes all SMS and USB communication commands. Once the appropriate command is selected you may have to populate the necessary new variable appropriate to the command, this is inserted in the “setting value” field.

10. To view the reply from the device according to the appropriate message sent, either click the quick link displayed on the same page *OR* under “Reports”, click on “Device responses” here a history of all replies is tabled for reference.



Adding Tags

The R2Dmax controller requires the use of a Dallas or iButton Tag to activate the system so that fuel dispensing can take place. After initial installation, any Button Tag will activate the system. However, once the first Asset Tag ID is programmed to the R2Dmax controller the system will seek to identify authorised Tag ID numbers on all further Tags before the solenoid or pump is activated to dispense fuel. **Adding Tags to the software does not automatically add them to the controller, they are two independent processes.** Adding tags to the R2Dfuel platform is purely to name and identify the Tag ID, adding Tags to the controller (either at the controller manually or using the software to send the Tag ID to the controller) will embed the unique Tag ID into the processor memory. A maximum of 750 Vehicle/asset Tag entries and a further maximum of 750 Driver/Attendant Tag entries may be added. Note adding 50 Tag and deleting 10 will use up 60 of the available 750 entries

NOTE: Once a Driver/Attendant tag (DTAG) has been added to the controller, the system switches on the DUAL TAG MODE, the controller will first have to be tagged with the driver/Attendant tag before it can accept the vehicle/asset tag, after dispensing the same vehicle/asset tag will be required to close the solenoid or pump relay. Always add the Vehicle/asset tag prior to adding the Driver/Attendant Tags on the controller.



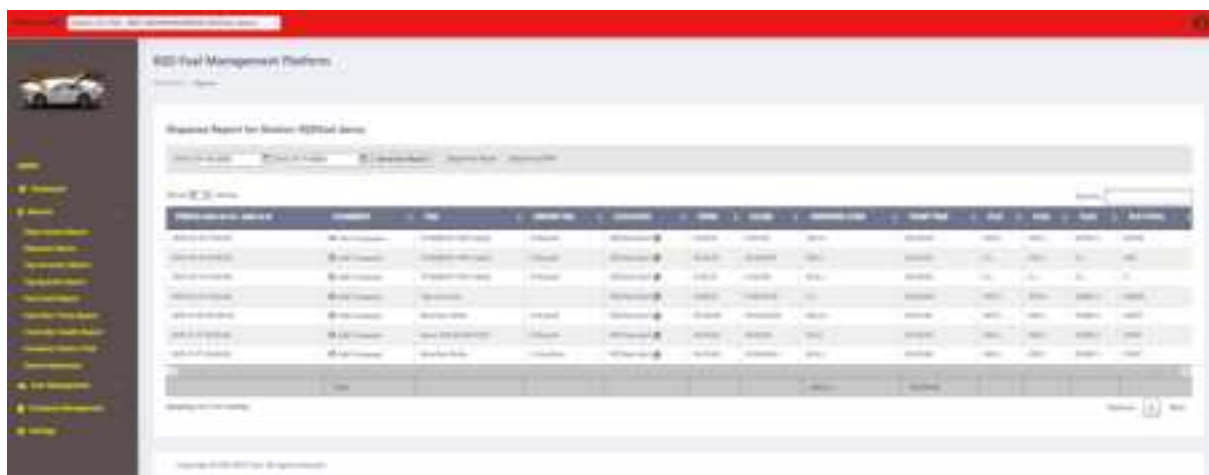
ID

For added security measures, the complete button tag number (ID or address) is used when adding to the system. Therefore, as in the picture below, this Tag ID will be **2600001C3A189D01** making use of the Tag 2 Text reader will greatly reduce the time and effort required to capture Tag numbers.



NOTE When using the software to add tags to the controller, enter all 16 digits of the number, using higher case lettering where necessary.

Once a Tag has been added to the controller, it can then also be assigned to the R2Dfuel platform using the menu “Settings” and sub menu “Tag Management”. Complete the necessary details per tag so that the Dispense reports shows which person or vehicle activated the pump instead of the Tag ID number. Tags can also be further identified by selecting Primary or Driver in the naming convention. The Tag IMPORTER/EXPORTER makes light work of adding and editing multiple entries.



Important - Additional Product Considerations and precautions

The general flow of a fuel dispensing system

From the bulk supply tank/s through a simple in-line strainer to trap large debris, then the fuel pump, next a fuel filter with water trap, then your flowmeter (preferably only one to avoid conflicting readings) then the electric solenoid and lastly the manual valve on the end of the hose which we call the dispensing nozzle. Note: many mechanical flowmeters can be adapted to produce electronic signals for R2Dfuel monitoring.

NB! Fuel filters should be in-line AFTER the main fuel pump, a filter before the pump will reduce the pressure in the suction line and a dirty filter significantly more so. Lower pressure with high temperatures makes it easier to reach the vapor pressure of the fuel and create a vapor lock condition that can also cause the pump to overheat and fail. In layman's terms often referred to as cavitation. So simply this means do not suck from a filter, rather push fuel through the filter.

Transformers and power supplies

The 220 V AC transformer supplied in the kit is a DIN rail mount type with output 24V DC and current rating of 2.5A/hr this is the minimum output power requirement to manage a complete system, the transformer should be mounted in a well-protected, dry and ventilated position being a considerable and safe distance from fuel pumps, dispensing activities and potential spillage areas. Cables and steel conduit should be adequately protected and routed to avoid unnecessary exposure to movement of vehicles, dispensing activities and fuel spillage including the tank bunded area.

Flowmeters

It is very important not to exceed the capabilities of the flowmeter and in certain applications a larger and more appropriate flowmeter may be required. The Piusi K24 ATEX/IECEX Pulser supplied in the kit is typically rated at best accuracy performance with flows between 7 and 120 litres per minute, with the maximum operating pressure being 20 BAR (300 PSI) and overall accuracy plus/minus 0.6% (when calibrated and coupled with R2Dmax). The aluminium housing inlet and outlet thread are 1" BSP (male to female) with Bi-Directional flow capability. The only fluids permissible are DIESEL, KEROSENE, PETROL, PETROL ALCOHOL MIXED MAX 20%, AVGAS 100/100LL (PUMP ONLY), JET A/A1 (PUMP ONLY). This turbine flowmeter is also well suited to gravity fed dispensing applications typically found in agriculture. With any flowmeter a calibration after fitment will be required to produce accurate results, generally one can pump a volume of fuel into a measured vessel (*Recommended 200L with minimum acceptable quick reference 20L*) and adjust the pulse per litre count to reflect the correct reported value on the R2Dmax controller, alternatively the comparison can be done using an existing in-situ meter if its accuracy can be relied upon. Adjustments are best made using the R2Dfuel web platform, the USB and or SMS communication options can also be used. Always ensure the cable gland and outer covers are securely sealed to prevent moisture or fuel residues entering the electronic components contained within the flowmeter outer casting. Ideally ensure the cable gland is facing downwards. **In many cases where there is an existing digital flowmeter provided by the manufacturer, we can integrate into the pulse output signal and calibrate the PPL to produce exactly the same volume readings dispensed.**

Solenoid valves

Make sure the solenoid valve is connected in the correct flow direction and that the valve type and seals are suitable for the liquid product or media passing through it. Do not exceed the operating voltage or open time limits specified by the manufacturer. Many fuel pumps have a limited duty cycle, in some cases as little as 20 -30 minutes continuous running in one hour, the R2Dfuel controller can help manage this maximum pump time and prevent misuse.

Do not exceed the pressure rating of the valve, high-pressure systems require pilot operated valves, while low pressure systems like gravity fed dispensing types are best fitted with direct acting solenoid valves. Be sure the solenoid valve is always downstream of any high-pressure bypass valves.

Where possible install the valve with the armature tube vertical, this reduces the risk of piston jamming cause by sediment, a particle filter must be fitted upstream of the solenoid valve to prevent sediment contamination of the valve's components.

In any non-commercial fuel dispensing system, the last valve in the circuit should be a manually operated valve being either spring or liquid force return shut actuated down stream of any electronic operated valve. Under no circumstances should any of the springs contained in the solenoid valve be stretched or altered in any way, this may severely affect the opening and closing ability of the device.

R2Dmax Controller

Make sure the low voltage supply cable specification and surge protection to the controller is appropriate to the device specifications. The input power requirement is a minimum of 15 V DC, should your ONLY supply voltage be from a standard 12V battery (as in some mobile bowser applications) then you must use the battery connection point shown in the manual. In the event that the vehicle is 24V then connect your input power on the 15-36V input terminals. When the primary power source is 220v the transformer is used to step this down to 24 Vdc, if the power source is unreliable with frequent interruptions (i.e., South Africa) it is advisable to connect a 12v battery back-up as shown in this manual. Power interruptions could cause data losses during dispensing actions.

The controller is equipped with onboard pigtail GPS and GSM antennae to allow the user the convenience of adding external GPS, GSM and Bluetooth antennae should the installation so require, example the controller PCB is mounted in a steel housing or the entire system is enclosed under a steel roof, the latter here may only require the GPS antenna to be extended externally, a simple test would be to see if your own phone has an internet connection. When using the on-board GSM, do not stick this on any steel surface as it will dramatically reduce the signal strength, the GPS antenna should be stuck on the bottom of the enclosure as far from the electronics and LCD screen as possible so as to maximise signal strength. It is also important to ensure the fine coaxial cable of these GPS patch antenna are not in contact with the spacer pins connecting the board layers as this may also diminish GPS signal. The GSM adhesive antenna is also best left floating in free space, GSM signal is significantly **reduced** when the antenna is stuck to a steel surface.

Below diagram represents some recommended maximum installation distances to consider.



For more information on the R2Dfuel software platform
please refer to the software manual.

NEW R2Dfuel PSU mini

Includes power supply, 12V 12 Ahr battery and din rail to add pump control contactor

The current housing is 2mm Aluminium, both anodised and powder coated for long-term use.

Dimensions approx. 135mm deep, 230mm wide and 270mm high

