



HOW-TO

How-to Use Virtual Fuel Tank in ADU

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Firmware: 104.0

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1. Description

The Virtual Fuel Tank feature helps you know how much fuel is left in your tank. By analyzing fuel usage data from the ECU (*ecu.usedFuel* channel), it not only tells you the remaining fuel but also estimates how many laps you can do with that fuel. This helps you plan your race strategy based on your fuel levels.

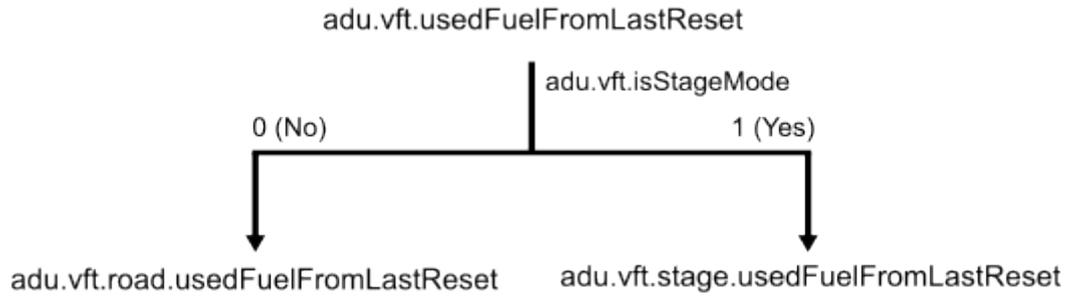
Parameter	Description
Fuel tank size definition	<ul style="list-style-type: none"> - Fixed volume – tank is always filled to its maximum volume (defined by <i>Fuel tank size (fixed)</i>) - Defined by channel – volume of fuel in the tank after the refill is defined with a channel (<i>Fuel tank size channel [L]</i>)
Fuel tank size (fixed)	Capacity of fuel tank in litres. This parameter is active when the <i>Fuel tank size definition</i> is set to "Fixed Volume"
Fuel tank size channel [L]	Channel defines total volume of fuel in the tank after refill (what was left + what was filled). This parameter is active when the <i>Fuel tank size definition</i> is set to "Defined by channel"
Used fuel channel	The channel contains used fuel information sent by the ECU. By default, this is the <i>ecu.usedFuel</i> channel
Max used fuel change	Maximum acceptable difference between two consecutive readings of fuel consumption information. If the change is greater than this parameter, it will be ignored. The parameter also enables the function to work correctly if the fuel consumption channel in the ECU is reset
Fuel usage correction	Correction factor when there is a difference between the fuel consumption information provided by the ECU and the actual fuel consumption. This parameter is adjusted empirically based on the measured actual fuel consumption
Stage mode channel	<p>The Virtual Fuel Tank can monitor fuel consumption and distance traveled simultaneously in two modes: stage and road. Each mode has two channels for distance and used fuel.</p> <p>The Stage mode channel determines which mode is active.</p> <p>If the value of the channel assigned in this field is 0 - used fuel and covered distance is assigned to the road channel.</p> <p>If the value of the channel assigned in this field is 1 - used fuel and covered distance is assigned to the stage channel.</p>

Channel	Description
<i>adu.vft.fuelTankSize</i>	Currently used fuel tank size
<i>adu.vft.remainingFuel</i>	Amount of fuel remaining in the tank
<i>adu.vft.numLapsOnRemainingFuelAvg</i>	Number of laps that can be completed using the fuel remaining in the tank, based on the average fuel consumption (Fuel used per lap avg)
<i>adu.vft.numLapsOnRemainingFuelLast</i>	Number of laps that can be completed using the fuel remaining in the tank, based on the fuel consumption of the last lap (Fuel used per last lap)
<i>adu.vft.usedFuelPerLap</i>	Average fuel consumption per lap (since resetting the fuel tank)
<i>adu.vft.usedFuelPerLastLap</i>	Fuel consumption on the last lap
<i>adu.vft.usedFuelFromLastReset</i>	Fuel used since last virtual fuel tank reset
<i>adu.vft.isStageMode</i>	Shows whether fuel is assigned to stage or road
<i>adu.vft.stage.distanceFromLastReset</i> <i>adu.vft.road.distanceFromLastReset</i>	Distance traveled in stage/road mode since the last refueling
<i>adu.vft.stage.usedFuelFromLastReset</i> <i>adu.vft.road.usedFuelFromLastReset</i>	Fuel used in stage/road mode since the last refueling

Additionally, it's important to set up a button to reset the Virtual Fuel Tank. In the *Buttons* panel, there's a button defined as "Reset virtual fuel tank." This button is crucial because the driver needs to press it when refueling. When pressed, it resets the fuel level to full and begins a fresh count of all the data.

The Virtual Fuel Tank data is saved in the device's memory, so even when you turn off the ignition, it's retained. Properly connecting the device to power is crucial for this function to work correctly, requiring separate connections for the battery and ignition switch. This ensures that even when the ignition is off, the settings remain saved.

Using Stage mode channel If there's a significant difference in fuel use, like when driving to a special stage compared to driving the stage itself, you can measure fuel use for two separate situations: on the road and during the stage. With this setup, the overall fuel use channel, *adu.vft.usedFuelFromLastReset*, gets additionally divided into two separate channels: *adu.vft.stage.usedFuelFromLastReset* and *adu.vft.road.usedFuelFromLastReset*. This lets you analyze and predict fuel use in more detail. The channel determining which of the two channels to assign the data is the one defined in the setting: *Stage mode channel*.



Similarly, with the distance channels: *adu.vft.stage.usedFuelFromLastReset* and *adu.vft.road.usedFuelFromLastReset*.

Using Fuel tank size channel [L] You can adjust what is the value of the Virtual Fuel Tank when you reset it. This is possible when the *Fuel tank size definition* is set to "Defined by channel". Set the *Fuel tank size channel [L]* to the channel indicating the amount of fuel in the tank after refill, which includes the remaining amount plus what was added. For example, this can be adjusted using a knob during refill. Then, pressing the "Reset virtual fuel tank" button will set the remaining fuel value to the current channel's value.

2. Example

In this example we will cover a step-by-step basic configuration and use the Virtual Fuel Tank (VFT) for a real-time analysis of the consumption data.

To properly configure the VFT, it's very important to set up the button *Reset virtual fuel tank* in the *Buttons* panel:



Buttons	
Next page - channel	
Next page - trigger	Press
Previous page - channel	
Previous page - trigger	Press
Acknowledge alarm #1 - channel	
Acknowledge alarm #1 - trigger	Press
Acknowledge alarm #2 - channel	
Acknowledge alarm #2 - trigger	Press
Reset session - channel	
Reset session - trigger	Press
Reset distance meter - channel	
Reset distance meter - trigger	Press
Reset distance meter 2 - channel	
Reset distance meter 2 - trigger	Press
Freeze/unfreeze distance meter - channel	
Freeze/unfreeze distance meter - trigger	Press
Freeze/unfreeze distance meter 2 - channel	
Freeze/unfreeze distance meter 2 - trigger	Press
Reset track data - channel	
Reset track data - trigger	Press
Reset min/max data - channel	
Reset min/max data - trigger	Press
IMU pitch zeroing - channel	
IMU pitch zeroing - trigger	Press
Reset virtual fuel tank - channel	k_button_fuel ...
Reset virtual fuel tank - trigger	Press
Button defined track start/finish line set - channel	
Button defined track start/finish line set - trigger	Press
Beacon input - channel	

Each time the car is refueled, the driver has to press the button to let know the system, the tank is full once again. This action will reset the remaining fuel.

In this example, we will cover the basic mode of operation, with the fuel tank being filled to full every time. Hence, we will leave the *Fuel tank size definition* as "Fixed volume". Next, we have to input the *Fuel tank size*.

To enable the calculation of the fuel, it's necessary to configure the *ecu.usedFuel* channel. Most ECUs are able to export this data based on injectors flow and injection times.

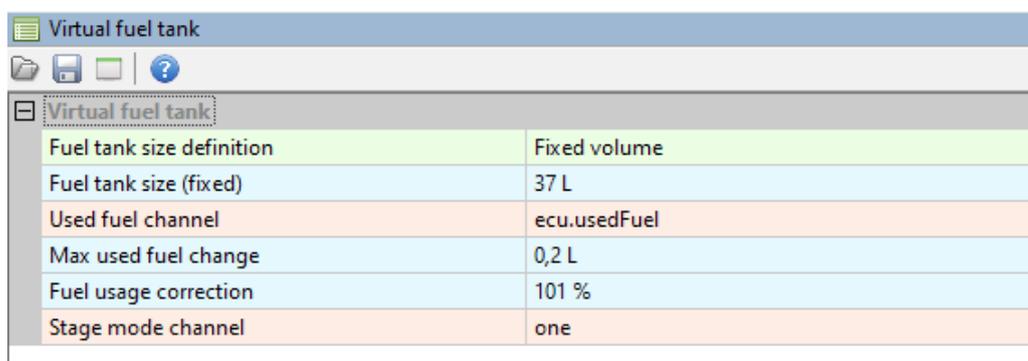
Max used fuel, as defined before, is maximum acceptable difference between two consecutive readings of fuel consumption information. If the change is greater than this parameter, it will be ignored. For most cases, the default parameter 0,2 l should be correct. A typical race car uses about 0,5 l of fuel per minute of race drive.

The last parameter, *Fuel usage correction*, can be used for precise adjustment of the calculations. We recommend testing it before the event. To determine the value of this parameter, measure the actual volume of fuel used during a session and the last value of the *adu.vft.fuelUsedFromLastReset*.

$$\text{Fuel usage correction} = (\text{Actual volume of fuel} / \text{adu.vft.fuelUsedFromLastReset}) * 100\%$$

If the real value was greater than the VFT value, the *Fuel usage correction* value will be greater than 100%, and vice versa.

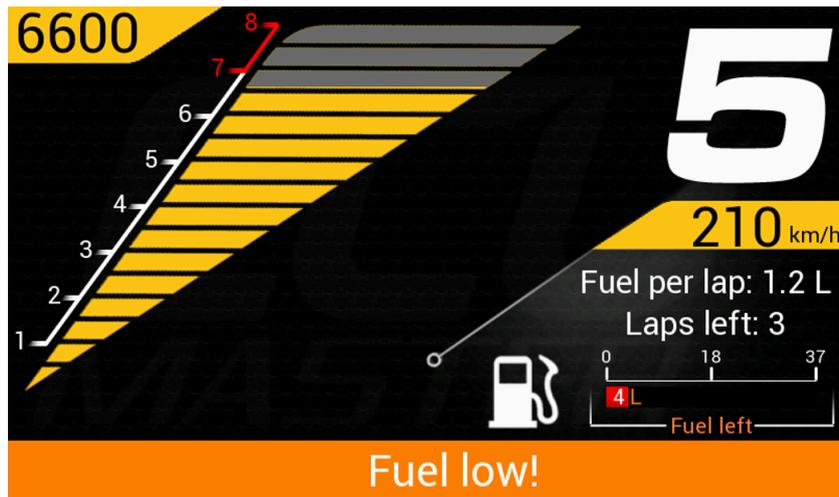
In this case, we will utilize only one used fuel meter, hence the *Stage Mode Channel* will be left to default channel one. For more details on the *Stage Mode Channel*, see: [Description \(on page 2\)](#).



Virtual fuel tank	
Fuel tank size definition	Fixed volume
Fuel tank size (fixed)	37 L
Used fuel channel	ecu.usedFuel
Max used fuel change	0,2 L
Fuel usage correction	101 %
Stage mode channel	one

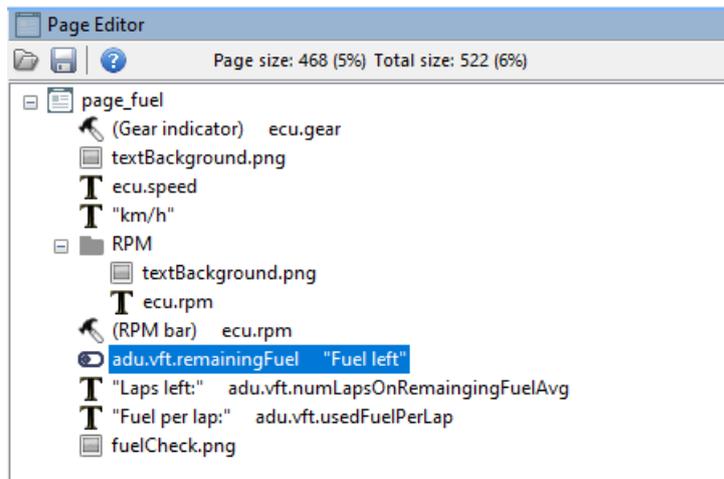
Now, with the VFT configured, let's utilize its abilities.

We'll display the remaining fuel, average fuel usage, and laps left on one page, with a warning if fuel drops below 5 liters. You can easily change an existing page or add a new one using the *Project Tree* panel. We'll use the *Page Editor* and *Dashboard Preview* for simple layout."



The current document covers practical use of the ADU features. For more details on using the *Page Editor*, refer to the ADU Manual.

These are all the elements of our example page:



Firstly add the *Bar graph* to a page.

Position	
Position X	557
Position Y	331
Channel and unit	
Channel	adu.vft.remainingFuel
Decimal places	0
Min	0
Max	37
Display value	<input checked="" type="checkbox"/>
Update frequency	50 Hz
Display unit	<input checked="" type="checkbox"/>
Unit	L
Custom unit	
Description	
Text	Fuel left
Icon	
Use icon	<input type="checkbox"/>
Icon texture	
Icon scale	130 %
Alarm	
Alarm channel	
General	
Bar type	Horizontal
Bar style	Style 1
Length	200
Width	20
Border width	1
Number of ticks	3
Decimal places for tick	0
Colors	
Color	<input type="color" value="#FFFFFF"/> (255,255,255)
Background color	<input type="color" value="#000000"/> (0,0,0)
Bar color	<input type="color" value="#00FF00"/> (0,255,0)
Alarm color	<input type="color" value="#FF0000"/> (255,0,0)
Icon color	<input type="color" value="#FFFFFF"/> (255,255,255)
Value color	<input type="color" value="#FFFFFF"/> (255,255,255)
Text color	<input type="color" value="#FFA500"/> (255,128,64)
Unit color	<input type="color" value="#FF8C00"/> (255,128,0)
Fonts	
Tick font	1
Value font	2
Text font	2
Functions	
Redline when	When value below
Redline start	5
Visibility channel	one

The suggested configuration of the **Bar graph**:

- In the *Channel* field select *adu.vft.remainingFuel*.
- Set *Max* to the value previously input as the *Fuel tank size*.
- You can add some description in *Description / Text*, we entered "Fuel left"

For some extra information, you can define when the bar turns red:

- *Redline when* set to "When value below"
- *Redline start* in our case it's 5 liters
- Leave *Visibility channel* with it's default value "one"

Next, we'll add a **Text** element informing the driver about remaining laps on fuel. The configuration is straightforward, requiring only two parameters to be filled.

- Add text description in field *Text*. We set it to "Laps left: "
- In the *Channel* field select *adu.vft.numLapsOnRemainingFuelAvg*.

[-] Position	
Position X	588
Position Y	304
[-] Text	
Color	<input type="checkbox"/> (255,255,255,255)
Font	4
Italic	<input type="checkbox"/>
Two lines	<input type="checkbox"/>
Text	Laps left:
Text width	0 px
Text align	Left
Channel	adu.vft.numLapsOnRemainingFuelAvg
Decimal places	0
Value width	0 px
Value align	Left
Unit	user
Display unit	<input checked="" type="checkbox"/>
Custom unit	
Color channel	
Visibility channel	one
Update frequency	50 Hz

Similarly, for the "Fuel per lap" element, follow the same steps.

The final step is to set up an alarm that triggers when the fuel level drops below 5 liters. To do this, navigate to the *Project Tree* and add a new *Alarm*. For further instructions on using the *Project Tree*, refer to the ADU Manual.

eDashboardAlarm	
Name	alarm_fuel
General	
Type	Warning
Text (use # to display value)	Fuel low!
Position	Bottom
Channel	
Channel	adu.vft.remainingFuel
Decimal places	0
Unit	L
Display unit	<input checked="" type="checkbox"/>
Condition	
Condition	Less or Equal
Value	5 L
Qualifier	
Use qualifier	<input type="checkbox"/>
Delay	
Guard time	0 s
Acknowledge	
Allow acknowledge	<input checked="" type="checkbox"/>
Step	1 L
Presentation	
Min show time	3 s
Retrigger time	3 s

OK Cancel

In the example, we defined the following parameters, leaving the rest as default:

- Add a meaningful *Name*
- Add an informative *Text* for the driver, such as "Fuel low!".
- In the *Channel* field select *adu.vft.remainingFuel*.
- Set the *Condition* to "Less or equal"
- Set the *Value* to the trigger point for the alarm. In our case that's 5 L.
- Set the *Step* to 1 L. Even if the driver acknowledges the alarm, it will reappear if the fuel level drops by another liter.

3. Document history

Version	Date	Changes
1.0	2024.04.19	Initial release