

User Manual

AiM SW4

Release 1.02





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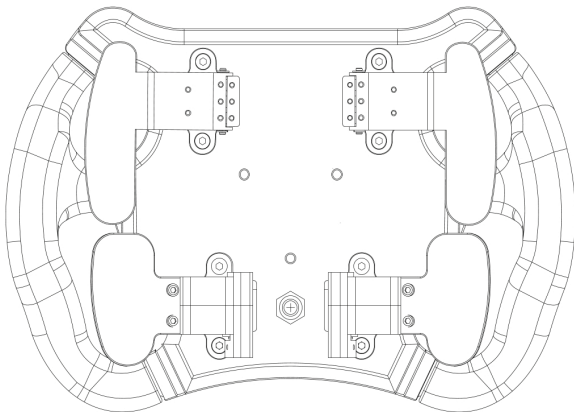
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1 – AiM SW4 in a few words

AiM SW4 is the new range of AiM steering wheel with integrated logger, properly designed and developed for professional racers; available in different models they feature:

- ECU connection
- 2 CAN
- AiM CAN Expansion
- Colour TFT display
- 10 freely configurable pushbuttons
- 3 freely configurable rotary switches
- Freely configurable alarm display icons
- 4 configurable alarm RGB LEDs
- 8 RGB LEDs configurable as shift lights or predictive time
- Internal datalogger with 4 Gb internal memory

SW4 accessories



Paddle shifts and Paddle clutches are available as option

SW4 Expansions

SW4 can be connected to AiM GPS09 Module, Channel Expansion, TC Hub, Lambda Controller, SmartyCam HD and RIO02.

2 – SW 4 models

AiM SW4 range includes different models with different characteristics as shown in the table below.

	SW4 270	SW4 280	SW4 320	SW4 350
Display	4.3" TFT		5" TFT	
Resolution 800x480 pixels	●	●	●	●
Contrast 800:1	●	●	●	●
Brightness	800cd/m2 – 1,100 Lumen		800cd/m2 – 1,200 Lumen	
Ambient light sensor	●	●	●	●
Configurable Alarm icons	●	●	●	●
8 configurable RGB LEDs shift lights	●	●	●	●
4 configurable Alarm RGB LEDs	●	●	●	●
3 CAN connections	●	●	●	●
CAN ECU connections	●	●	●	●
4 GB Internal memory	●	●	●	●
Anodized Aluminium body	●	●	●	●
10 Pushbuttons*	●	●	●	●
Rotary switches*	3	3	3	3
22 pins Deutsch male Autosport Connector	●	●	●	●
Dimensions in mm	270x183.5x42.6	280x183.5x42.6	320x183.5x42.5	350x183.5x45.5
Weight	2400 g	2400 g	2600 g	2600 g
Power consumption: 500 mA	●	●	●	●
Waterproof IP 65	●	●	●	●

* **Please note:** both pushbuttons and rotary switches have RGB backlights.

3 – LEDs, pushbuttons and rotary switches

With reference to the image below, all AiM SW4 feature:

- 2 buttons (Right and Left buttons 1): they work as free contacts, closing the circuit between two pins each in the connector
- 8 pushbuttons freely configurable using RaceStudio3 software
- 4 RGB alarm LEDs, freely configurable using RaceStudio3 software
- 8 top RGB LEDs to be used as shift lights or as predictive lap time, configurable using Race Studio 3 software
- 3 rotary switches, all with RGB backlight freely configurable using Race Studio 3 software



3.1 – Buttons labels set

SW4 comes with a set of stickers that can be used to identify the function buttons as well as the remaining eight pushbuttons. Here below they are shown with the meaning that is typically associated to each stick.

Please note: remove the back protective film before installing any sticks.

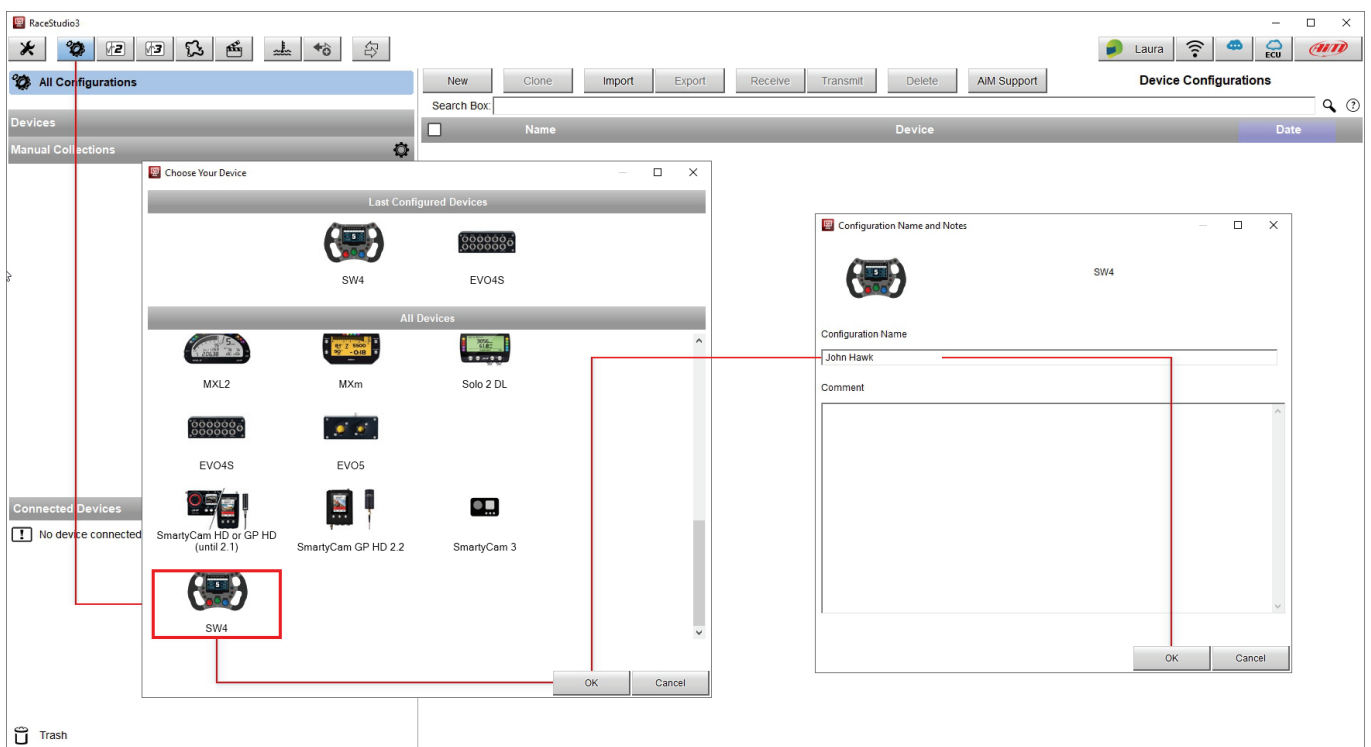
	High Beam		Full Course Yellow: set a steady speed at 80 km/h.		Push to Pass: Increases the engine power during an overtaking.
	Low Beam		Launch Control.		Reverse gear.
	Right arrow		MEM/OK: recalls stored data and enters a page		Rain Setup
	Left arrow		Enters the logger Menu and scrolls the options back.		Activate Start and stop function.
	Horn		Neutral gear.		Navigates data recall and Exit a display page.
	Windscreen wiper		Enters the page and scrolls the options forward .		
	Allows the communication with the team in the paddock (Radio).		Limits the vehicle speed in the pit lane .		

Each button can be configured as Momentary Toggle or Multiposition and is to be configured according to the function it is associated with (see paragraph 4.1.2 for further information).

4 – SW4 Configuration

In order to configure your SW4, please execute the following steps:

- Run RaceStudio3 and press the setting icon
- “Choose your Device” window is prompted: scroll it up to SW4 icon and select it
- Press “OK”
- “Configuration name and notes” window is prompted: fill in Configuration Name and note if you wish (John Hawk in this case); if you don't the configuration is named as the device and progressively numbered if more configuration of the same devices are created
- Press “OK”

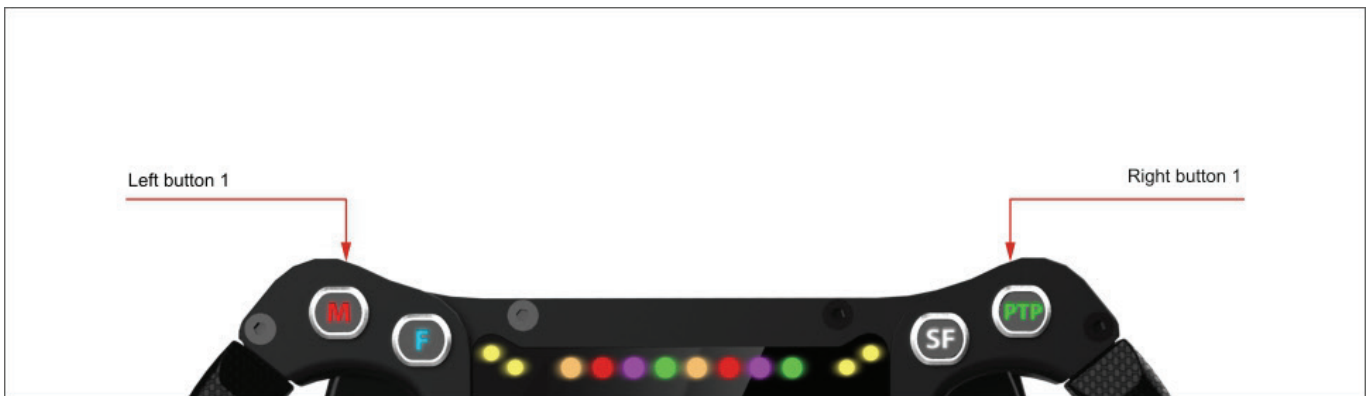


4.1 – Buttons, rotary switches and paddles

SW4 features 12 pushbuttons and 3 eight positions rotary switches.

4.1.1 – Free contact pushbuttons

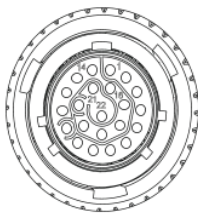
Two buttons, Left Button 1, and Right Button 1, shown in the picture, simply close a free contact.



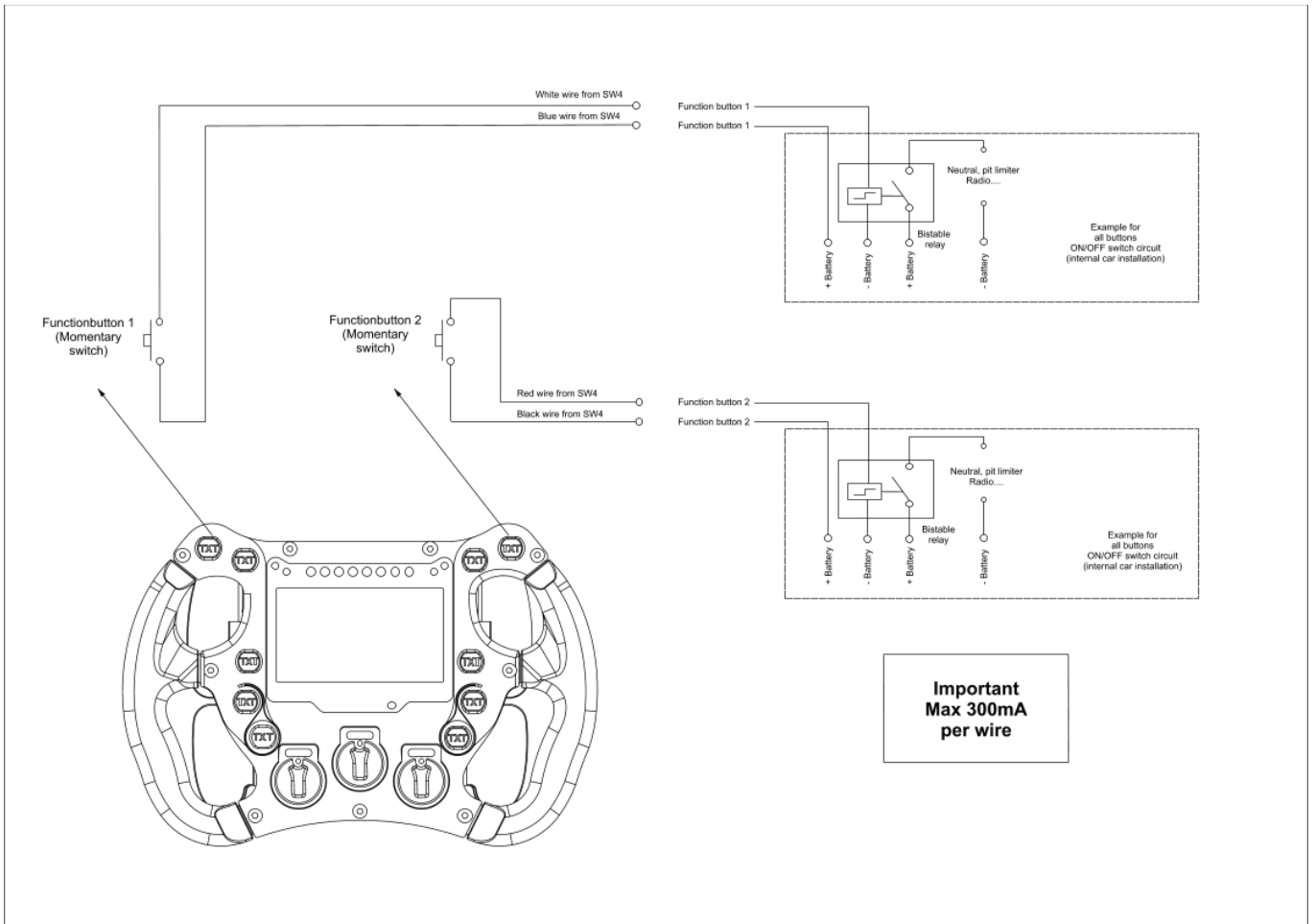
The pins of 22 pins Deutsch male connector correlated to these two pushbuttons are:

- Left button (Function button 1): pin 10 and pin 20
- Right button (Function button 2): pin 7 and pin 18

22 pins Deutsch male connector
Code AS-612-35PN
external view



Pin	Signal	Pin	Signal
1	9-15V Power input	12	USB D-
2	CAN ECU+	13	CAN AIM +
3	CAN ECU-	14	GND
4	Left Paddleshift	15	CAN AIM -
5	Right Paddleshift	16	RPM
6	Paddleshift COM	17	N.C.
7	Function Button 2	18	Function button 2
8	CAN 2+	19	GND
9	CAN 2-	20	Function button 1
10	Function button 1	21	+Vbext CAN
11	USB D+	22	+Vbout CAN



4.1.2 – CAN Output pushbuttons

The other 8 pushbuttons, which status is to be transmitted through a CAN connection, need be configured in order to be used. This is possible through our software Race Studio3, selecting “Buttons” layer. The pushbuttons may be used in the following ways:

- **Momentary pushbuttons:** when the button is pressed output sets to “Active” status: as soon as it is released it goes back to its “Not active” status. **This working mode is to be used to enter SW4 Menu as explained in the following page.** The pushbuttons may be:
 - **Time Independent:** in this case, the pushbutton may have only two statuses: “Active” when pushed and “Not Active” when released.
 - **Time Dependent:** when the button is short time pressed output sets to “Short time” status; when the button is long time pressed, output sets to “Long Time” status; as soon as it is released output comes back to its “Not Active” status
- **Toggle pushbuttons:** when the button is pressed output sets to “Active” status even after releasing the button; when pressed again output comes back to its resting “Not active” status. Here too, a pushbutton may be configured in two ways:
 - **Time Independent:** in this case, the pushbutton may have only two status: “Active” and “Not Active” .
 - **Time Dependent** when the button is short time pressed output sets to “Short time” status even after releasing button; when button is long time pressed, output sets to “Long Time” status even after releasing button. The pressure time allows you to switch between these 2 statuses; when pressed again using the same pressure time, it goes back to its “Not Active” status;
- **Multiposition:** each time the button is short time pressed, output sets to next status even after releasing the button; after last status it repeats the cycle starting from the first one. Here too, the actions for passing from a status to another status can be **Time Dependant:** the next status depends upon how long you push the pushbutton.

Please note: to enter SW4 Display MENU you need to associate this function to a specific pushbutton (Left button 4 in the example) setting it as Momentary as shown here below.

When the pushbutton matched to this function is pressed left and right pushbuttons 2 and 3 backlight switches on white to indicate the user the pushbuttons to use for navigating SW4 Menu as shown in the image of following page.

'Left Button 3' Setting

Name:

WorkAs: Momentary Toggle Multiposition

Use timing Time threshold between short and long status sec:

Rest Status		Active Status		Long Status	
Label	Value	Label	Value	Label	Value
OFF	0	ON	1	LONG	2

Set Trigger Comm...
 Display Page Command
Enter Menu
 ResetAlarms Command

LED Configuration

Set Color: Off when following condition is verified for at least sec

Left Button 3 equal to ON

Buttons

Available buttons and leds

Key N	Name	WorkAs	Color
<input checked="" type="checkbox"/>	1 [Ext Left Button 1]	[none]	off
<input checked="" type="checkbox"/>	2 Left Button 2	Toggle	off
<input checked="" type="checkbox"/>	3 Left Button 3	Toggle	off
<input checked="" type="checkbox"/>	4 Left Button 4	Momentary with trigger command	off
<input checked="" type="checkbox"/>	5 Left Button 5	Toggle	off
<input checked="" type="checkbox"/>	6 [Ext Right Button 1]	[none]	off
<input checked="" type="checkbox"/>	7 Right Button 2	Toggle	off
<input checked="" type="checkbox"/>	8 Right Button 3	Toggle	off
<input checked="" type="checkbox"/>	9 Right Button 4	Toggle	off
<input checked="" type="checkbox"/>	10 Right Button 5	Toggle	off
<input checked="" type="checkbox"/>	11 RotaryLeft	Rotary steps	off
<input checked="" type="checkbox"/>	12 RotaryMiddle	Rotary steps	off
<input checked="" type="checkbox"/>	13 RotaryRight	Rotary steps	off

As far as channels management are concerned Momentary and Toggle working modes are shown here below.

The screenshot shows the 'Left Button 2' Setting window. At the top, 'Button use' is set to 'as Channel'. The 'Name' field contains 'Left Button 2'. Under 'Work As', 'Momentary' is selected. Below this, there are three status configuration tables: 'Rest Status', 'Active Status', and 'Long Status'. Each table has 'Label' and 'Value' columns. The 'Rest Status' table shows 'OFF' with value '0'. The 'Active Status' table shows 'ON' with value '1'. The 'Long Status' table shows 'LONG' with value '2'. A 'Time threshold between short and long status' is set to '0.5' seconds. Two callout boxes provide details for the Momentary and Toggle modes.

When button is pressed, output sets to 'Active' status. As soon as it is released, output comes back to its resting 'Not active' status. You can edit labels for the two status.

When button is pressed, output sets to 'Active' status even after releasing button. When pressed again, output comes back to its resting 'Not active' status. You can edit labels for the two status.

The screenshot shows the 'Left Button 2' Setting window with 'Use timing' checked. The 'Work As' options are 'Momentary', 'Toggle', and 'Multiposition'. Three callout boxes explain the timing behavior. The 'Rest Status', 'Active Status', and 'Long Status' tables are visible, along with the 'Time threshold between short and long status' set to '0.5' seconds.

When button is short time pressed, output sets to 'Short time' status. When button is long time pressed, output sets to 'Long time' status. As soon as it is released, output comes back to its resting status: 'OFF' label is shown. You can edit labels for the short and long pressure status and time transition.

When button is short time pressed, output sets to 'Short time' status even after releasing button. When button is long time pressed, output sets to 'Long time' status even after releasing button. The pressure time allows You to switch between these 2 status. When pressed again using the same pressure time, output comes back to its resting 'Not active' status. You can edit labels for the short and long pressure status and time transition.

Check here to use short and long pressure time. At start, without pressing button, the resting status is with Rest label shown. When button is short time pressed, output sets to 'Short time' status. When button is long time pressed, output sets to 'Long time' status. You can edit labels for the short and long pressure status. You can set the transition time between short and long state.

Multiposition working mode is shown here below.

'Left Button 2' Setting

Button use for Display as Channel

Name

WorkAs Momentary Toggle Multiposition

Use timing Time threshold between short and long status sec

Position	Label	Value	Short Press leads to	Long Press leads to	
0	<input type="text" value="S0"/>	<input type="text" value="0"/>	<input type="text" value="S1"/>	<input type="text" value="S1"/>	<input type="button" value="+"/>
1	<input type="text" value="S1"/>	<input type="text" value="1"/>	<input type="text" value="S0"/>	<input type="text" value="S0"/>	<input type="button" value="+"/>

Each time button is pressed, output sets to next status even after releasing button. After last status, its repeats the cycle starting from the first one. You can edit all the status labels.

'Left Button 2' Setting

Button use for Display as Channel

Name

WorkAs Momentary Toggle Multiposition

Use timing Time threshold between short and long status sec

Position	Label	Value	Short Press leads to	Long Press leads to	
0	<input type="text" value="S0"/>	<input type="text" value="0"/>	<input type="text" value="S1"/>	<input type="text" value="S1"/>	<input type="button" value="+"/>
1	<input type="text" value="S1"/>	<input type="text" value="1"/>	<input type="text" value="S0"/>	<input type="text" value="S0"/>	<input type="button" value="+"/>

Check here to use short and long pressure time. At start, without pressing button, the resting status is with Rest label shown. When button is short time pressed, output sets to 'Short time' status. When button is long time pressed, output sets to 'Long time' status. You can edit labels for the short and long pressure status. You can set the transition time between short and long state.

Each time button is short time pressed, output sets to next status even after releasing button. After last short time pressed, its repeats the cycle starting from the first one. Each time button is long time pressed, output sets to a wanted status (set by third column and different from starting state). For each status You can edit labels and, when long time pressed, the wanted ending status

4.1.3 – Pushbutton LEDs

Every pushbutton has an associated RGB LED, used for enlightening it in night usage or even as a feedback after having required an action: you may choose the colour depending upon a single status and the logic for turning it ON. Finally, the lights may be slow or fast blinking.



'Left Button 2' Setting
□
×

Button use for Display as Channel

Name

Work As Momentary Toggle Multiposition

Use timing Time threshold between short and long status sec

Rest Status		Active Status		Long Status	
Label	Value	Label	Value	Label	Value
OFF	0	ON	1	LONG	2

Led Configuration

Set Color White when following condition is verified for at least sec

Off
 Red
 Green
 Amber
 Blue
 Magenta
 Cyan
 White

continuously
 slow blinking
 fast blinking

Click to add another condition

sec

Condition

Always TRUE Always FALSE

TRUE after a time of sec in which it is verified FALSE after a time of sec in which it is no longer verified

You can configure every LED in order to be turned ON in different colours in dependence upon the conditions you may describe through math channels.

The screenshot shows the 'Left Button 2' Setting dialog box. At the top, there are radio buttons for 'for Display' and 'as Channel' (selected). The 'Name' field contains 'Left Button 2'. Below that are radio buttons for 'Work As': 'Momentary', 'Toggle' (selected), and 'Multiposition'. There is a checkbox for 'Use timing' with a 'Time threshold between short and long status' field set to 0.5 sec.

Below the timing options are three tables for status configurations:

Rest Status		Active Status		Long Status	
Label	Value	Label	Value	Label	Value
OFF	0	ON	1	LONG	2

The 'Led Configuration' section contains three output states:

- Blue State:** Set Color: Blue, continuously. Conditions: Left Button 2 equal to OFF (OR), RPM less than 500 rpm.
- Red State:** Set Color: Red, continuously. Conditions: Left Button 2 equal to ON (AND), RPM greater than 500 rpm.
- Green State:** Set Color: Green, continuously. Condition: GPS Speed greater than 250 kmh.

Each state has a 'when following condition is verified for at least 0 sec' duration. A 'priority' gear icon is on the right of each state. A context menu on the right side of the dialog provides actions: 'Add New Output State', 'Remove This Output State', 'Maximize Priority for This Output State', 'Move Up Priority for This Output State', 'Move Down Priority for This Output State', and 'Minimize Priority for This Output State'. 'Save' and 'Cancel' buttons are at the bottom.

4.1.4 – Rotary switches

The three rotary switches may be set in eight different positions, each one recognized through a numeric value and a label. The RGB LEDs colour may be defined in dependence of a freely configurable rule.



Per every position, you can:

- name each status setting the corresponding Label, for eventually show the status on your display
- set different values corresponding to different positions
- set the rotary LED colour per every position.

'RotaryLeft' Setting
— □ ×

Name

Position	Label	Value
1	<input type="text" value="L1"/>	<input type="text" value="0"/>
2	<input type="text" value="L2"/>	<input type="text" value="1"/>
3	<input type="text" value="L3"/>	<input type="text" value="2"/>
4	<input type="text" value="L4"/>	<input type="text" value="3"/>
5	<input type="text" value="L5"/>	<input type="text" value="4"/>
6	<input type="text" value="L6"/>	<input type="text" value="5"/>
7	<input type="text" value="L7"/>	<input type="text" value="6"/>
8	<input type="text" value="L8"/>	<input type="text" value="7"/>

LED Configuration

Set Color Off when following condition is verified for at least sec

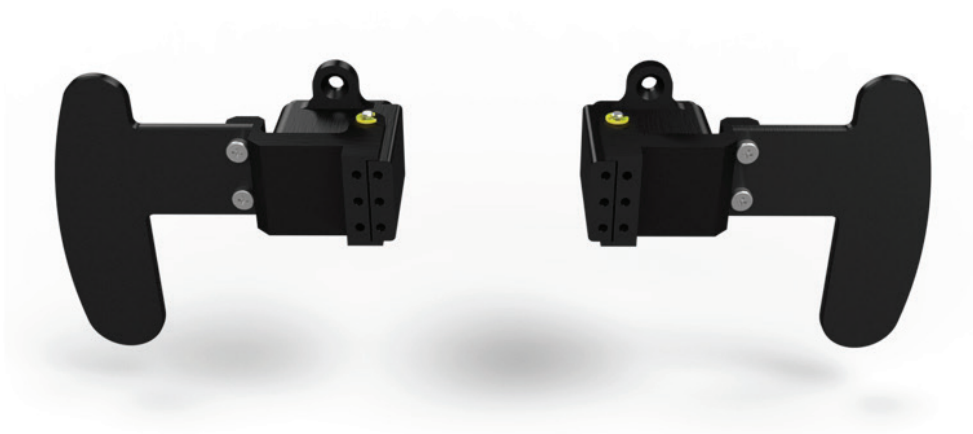
RotaryLeft equal to L1 Add

↑ priority

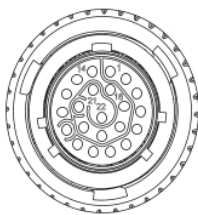
Save Cancel

4.1.5 – Gear Paddles

The two optional Gear Paddles have two contacts each. One closes a free contact, while the other is managed by the internal processor and may be transmitted to the CAN connection.



22 pins Deutsch male connector
Code AS-612-35PN
external view



Pin	Signal	Pin	Signal
1	9-15V Power input	12	USB D-
2	CAN ECU+	13	CAN AiM +
3	CAN ECU-	14	GND
4	Left Paddleshift	15	CAN AiM -
5	Right Paddleshift	16	RPM
6	Paddleshift COM	17	N.C.
7	Function Button 2	18	Function button 2
8	CAN 2+	19	GND
9	CAN 2-	20	Function button 1
10	Function button 1	21	+Vbext CAN
11	USB D+	22	+Vbout CAN

4.1.6 – Clutch Paddles

The Clutch Paddles move two internal analog potentiometers, managed by the processor and whose value may be transmitted to the external device through the CAN connection. Being SW4 clutches optional the related channels are by default disabled. To use them enable the left checkbox.

ID	<input checked="" type="checkbox"/>	Name	Function	Sensor	Unit	Freq	Parameters
RPM	<input checked="" type="checkbox"/>	RPM	Engine RPM	RPM Sensor	rpm	20 Hz	max: 16000 ; factor: 1 ;
LClh	<input checked="" type="checkbox"/>	Left Clutch	Percent	Percentage Pot. Calib	%	100 Hz	
RClh	<input checked="" type="checkbox"/>	Right Clutch	Percent	Percentage Pot. Calib	%	100 Hz	
LPS	<input checked="" type="checkbox"/>	Left PadShift	Digital Status	Status		20 Hz	
RPS	<input checked="" type="checkbox"/>	Right PadShift	Digital Status	Status		20 Hz	
PAccu	<input checked="" type="checkbox"/>	GPS PosAccuracy	GPS Accuracy	GPS	m 0.01	10 Hz	
Spd	<input checked="" type="checkbox"/>	GPS Speed	Vehicle Spd	GPS	km/h 0.1	10 Hz	
Alt	<input checked="" type="checkbox"/>	Altitude	Altitude	GPS	m	10 Hz	
OdD	<input checked="" type="checkbox"/>	Odometer	Odometer Total	Odometer	km 0.1	1 Hz	
Luma	<input checked="" type="checkbox"/>	Luminosity	Brightness	Luminosity	%	1 Hz	
Tlog	<input checked="" type="checkbox"/>	LoggerTemp	Temperature	Logger Temperature	C	1 Hz	

4.1.7 – Buttons/Rotary/Paddles status transmission

The status of the buttons, of the rotary switches and of the paddles are intended to be transmitted to an external device through the CAN connection: you have to create a CAN message, using the “CAN Output” layer:

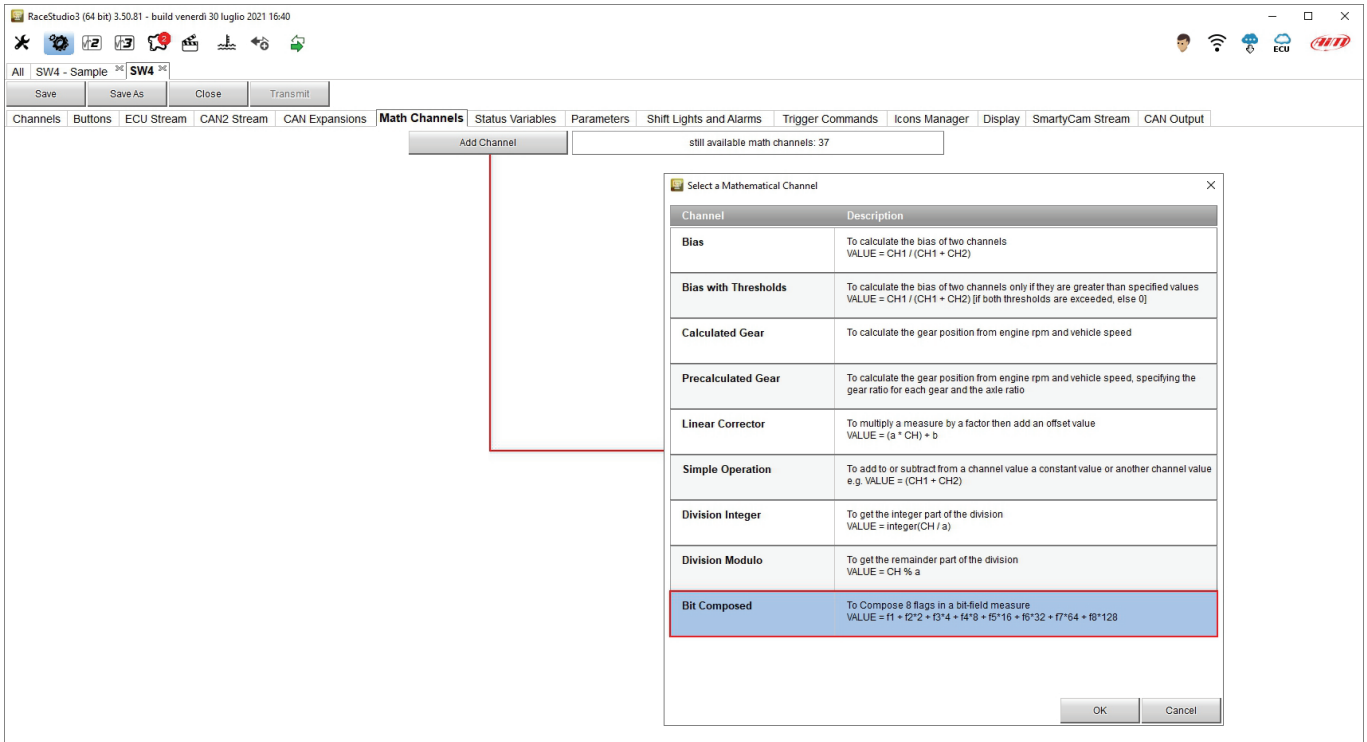
Bit Rate Protocol (bits/s): 1 M bits/s

Name: _____

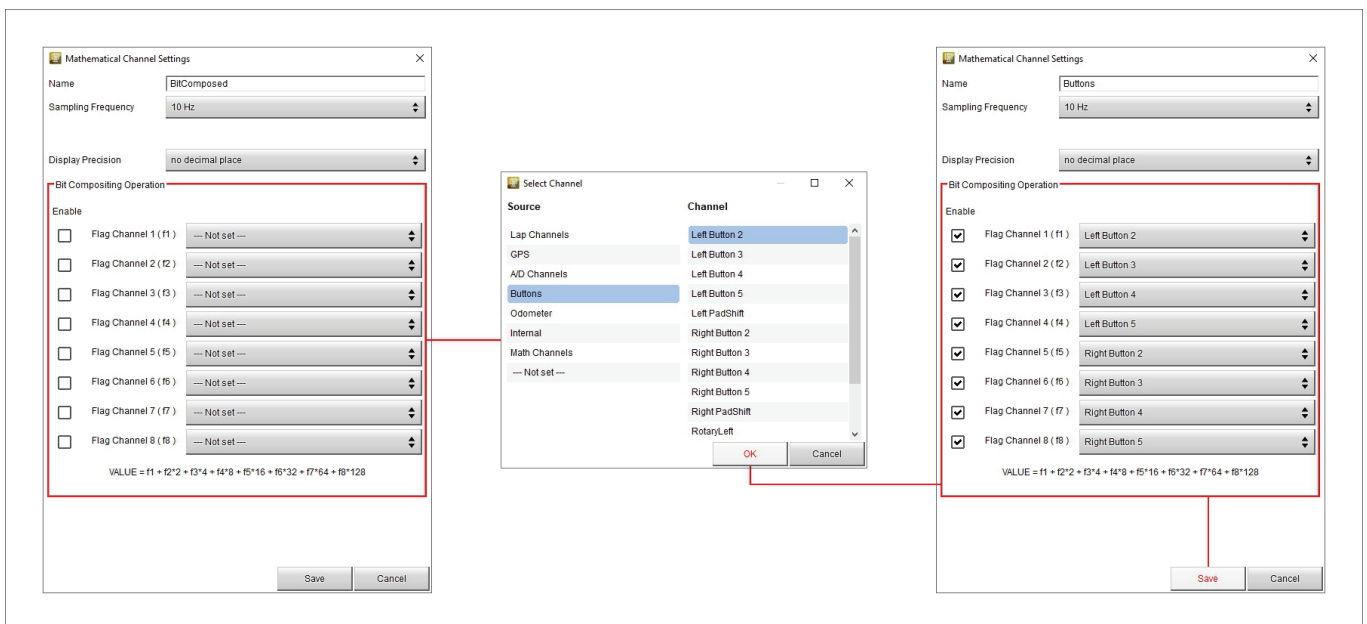
<input checked="" type="checkbox"/>	CAN ID (hex)	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<input checked="" type="checkbox"/>	0x100	Left Button 2	Left Button 3	Left Button 4	Right Button 2	Right Button 2	Right Button 3	Right Button 4	Right Button 5

In this example we have created a message at ID 0x100 with 8 fields, one per every pushbutton status.

In case you need to transmit the pushbutton status as bits, one bit per every pushbutton, you have to create a math channel, called Bit Composed, in which one byte is composed by 8 different bits, one per every pushbutton:



You need to create a channel including the status of all the pushbuttons:





Finally you may transmit this channel through CAN:

The screenshot shows the RaceStudio3 (64 bit) 3.50.83 interface. The 'CAN Output' tab is active, showing configuration for 'Can 1'. The 'Bit Rate Protocol (bit/s)' is set to '1 M bit/s'. The 'Name' field is empty. The 'CAN ID (hex)' is '0x100'. The payload is configured as follows:

CAN ID (hex)	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x100	Left Button 2	Left Button 3	Left Button 4	Right Button 2	Right Button 2	Right Button 3	Right Button 4	Right Button 5

Buttons for '+ Add New Payload', 'Export', and 'Import' are visible at the bottom of the configuration area.



5 – Channels

Once the configuration created, the software “Channels” page is prompted. It shows the logger default channels.

They come from the paddles, clutch or gear, from internal sensors or calculations (Odometer, Luminosity and internal temperature), from the RPM connection and from the optional GPS: Accuracy, Speed, Altitude

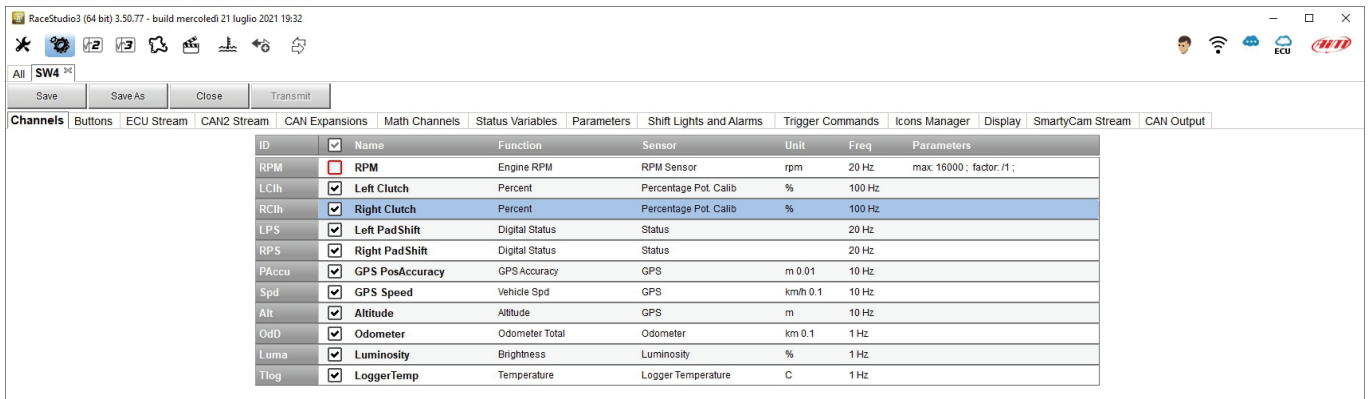
The first channel is RPM and it is enabled by default. When you load your vehicle ECU in SW4 configuration (see paragraph 6.4) the software detects that the ECU supplies RPM channel and disables the channel. In the rare cases where RPM channel is not included in the ECU protocol the software detects it and this RPM channel stays enabled.

Left and Right clutch are disabled by default; in case please enable the corresponding channels.

ID	<input checked="" type="checkbox"/>	Name	Function	Sensor	Unit	Freq	Parameters
RPM	<input checked="" type="checkbox"/>	RPM	Engine RPM	RPM Sensor	rpm	20 Hz	max: 16000 ; factor: f1 ;
LClh	<input type="checkbox"/>	Left Clutch	Percent	Percentage Pot. Calib	%	100 Hz	
RClh	<input type="checkbox"/>	Right Clutch	Percent	Percentage Pot. Calib	%	100 Hz	
LPS	<input checked="" type="checkbox"/>	Left PadShift	Digital Status	Status		20 Hz	
RPS	<input checked="" type="checkbox"/>	Right PadShift	Digital Status	Status		20 Hz	
PAccu	<input checked="" type="checkbox"/>	GPS PosAccuracy	GPS Accuracy	GPS	m 0.01	10 Hz	
Spd	<input checked="" type="checkbox"/>	GPS Speed	Vehicle Spd	GPS	km/h 0.1	10 Hz	
Alt	<input checked="" type="checkbox"/>	Altitude	Altitude	GPS	m	10 Hz	
OdD	<input checked="" type="checkbox"/>	Odometer	Odometer Total	Odometer	km 0.1	1 Hz	
Luma	<input checked="" type="checkbox"/>	Luminosity	Brightness	Luminosity	%	1 Hz	
Tlog	<input checked="" type="checkbox"/>	LoggerTemp	Temperature	Logger Temperature	C	1 Hz	

5.1 – RPM Channel

As explained before once the ECU protocol loaded in SW4 configuration if, like in this case, the ECU supplies RPM channel, the similar channel in “Channel” layer is automatically disabled.



You have two ways for getting RPM value of your engine:

RPM from ECU

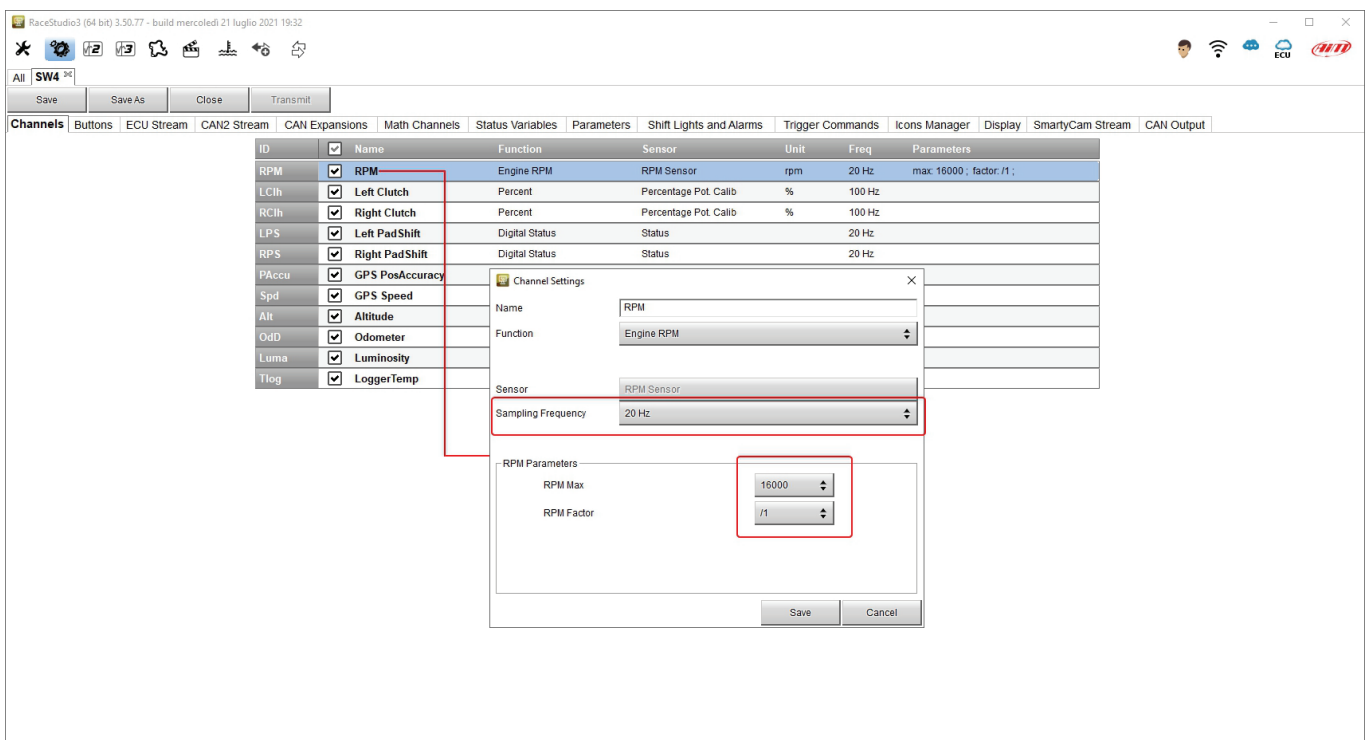
To get the RPM from the ECU just connect SW4 to the ECU and it will automatically sample that value.

RPM via a 5-50V square wave or coil (150-400V)

If the vehicle has no ECU, please connect pin 16 of the 22 pins connector harness to the low voltage of the coil (whose peak can be from 150 to 400 V) or eventually to a possible square wave (the peak can be from 5 to 50 V).

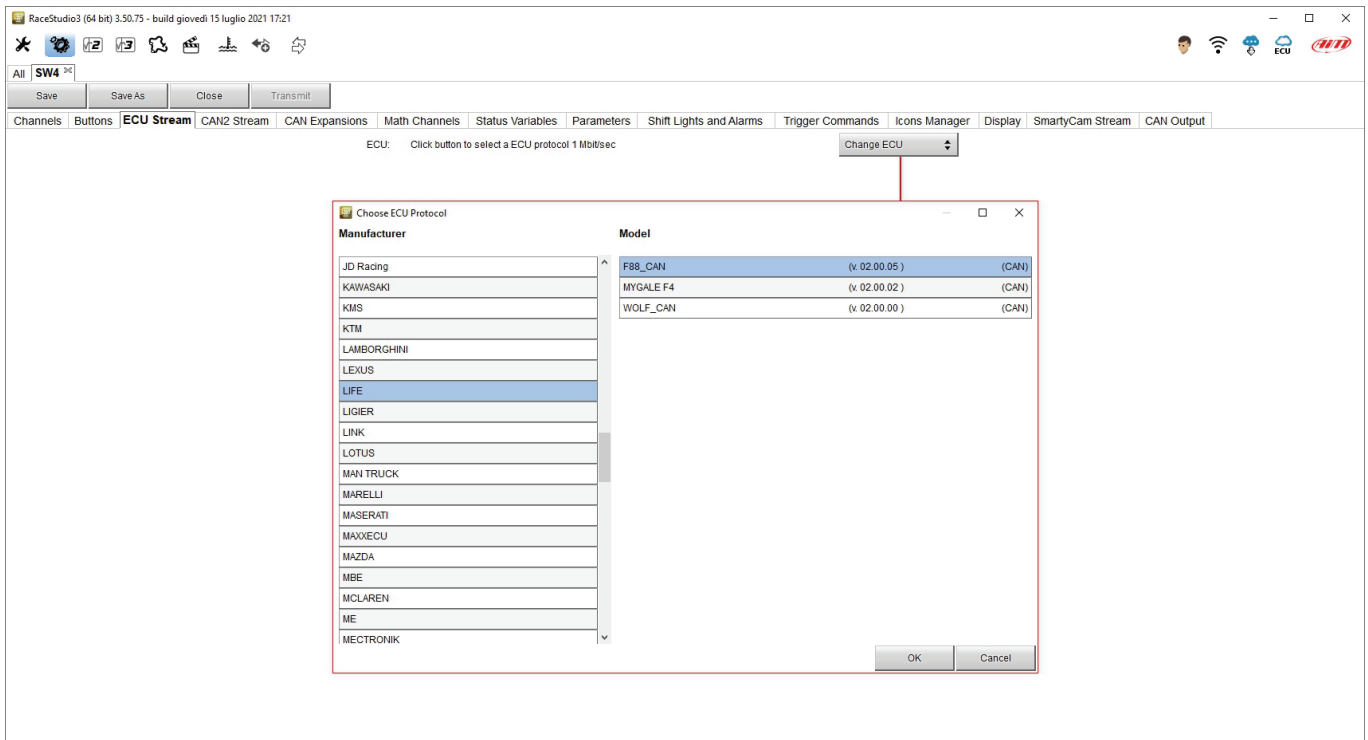
Finally, enable the RPM channel and set its parameters in the Channels page of Race Studio.

Once SW4 connected to RPM signal enable it and set its parameters in “Channels” layer of Race Studio.



5.2 – ECU Stream

As all AiM loggers SW4 can be connected to your vehicle ECU. Race Studio3 database includes more than 2000 ECU protocols. To set your ECU protocol in SW4 configuration press “Change ECU” and select your vehicle Manufacturer and model.





After setting the protocol the system comes back to “ECU Stream” layer and two checkbox appears:

- “Enable the CAN Bus 120 Ohm Resistor” (enabled by default and to be disabled in case SW4 logger is additional to the vehicle dash); the CAN Bus needs two 120 Ohm resistors at its two extremes. In case SW4 is the only device connected to the ECU the 120 Ohm resistor should be enabled, else, very easily, it is already present in the existing network and should be disabled;
- “Silent on CAN Bus” (disabled by default): usually the ECU expects an acknowledge signal when transmits a message and, as default, SW4 transmits this signal. Sometimes, particularly when there are other devices in the network, SW4 should not transmit it; enabling this flag SW4 remains completely silent.

ECU: LIFE - F88_CAN (ver. 02.00.05) 1 Mbit/sec

Enable the CAN Bus 120 Ohm Resistor

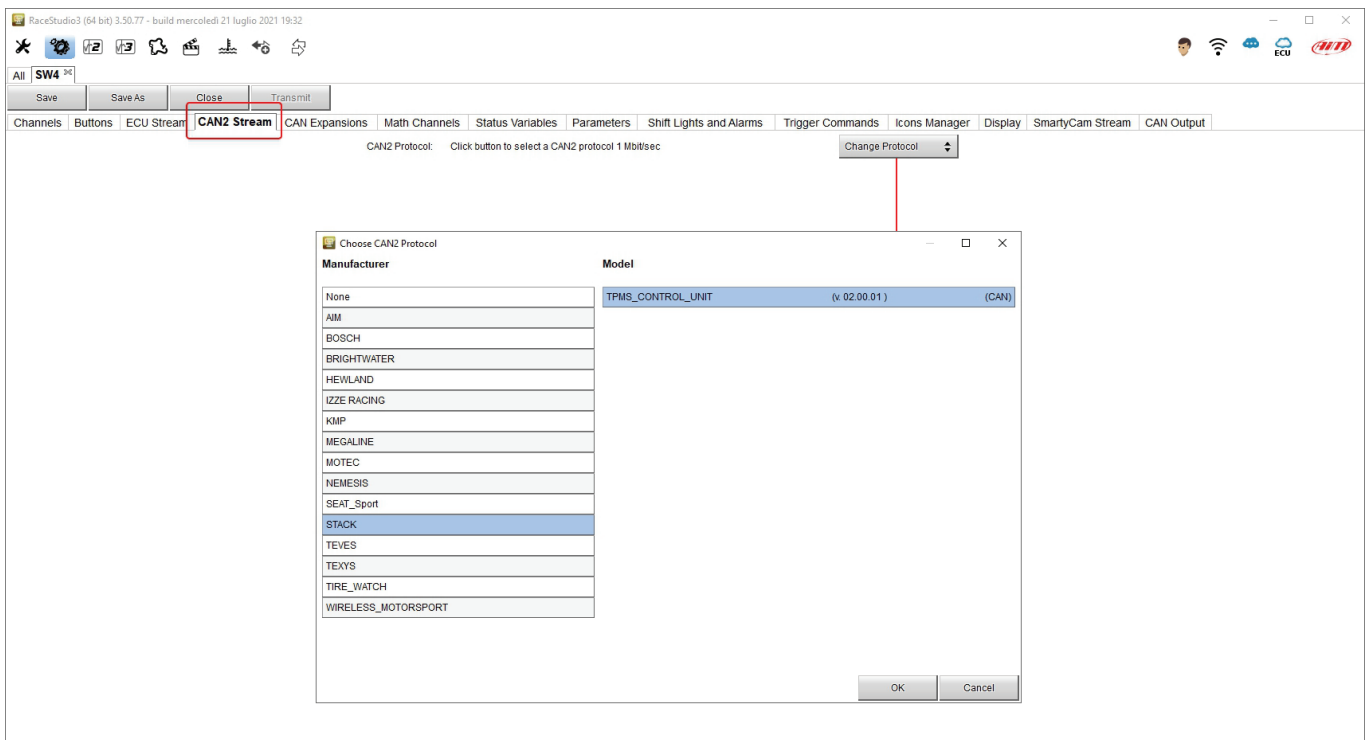
Silent on CAN Bus

ID	Name	Function	Unit	Freq
CC01	F88 RPM	Engine RPM	rpm	10 Hz
CC40	F88 GEAR	Gear	gear	10 Hz
CC47	F88 D SPEED	Vehicle Spd	km/h 0.1	10 Hz
CC48	F88 V SPEED	Vehicle Spd	km/h 0.1	10 Hz
CC43	F88 SPEED RL	Wheel Spd	km/h 0.1	10 Hz
CC44	F88 SPEED FR	Wheel Spd	km/h 0.1	10 Hz
CC45	F88 SPEED FL	Wheel Spd	km/h 0.1	10 Hz
CC46	F88 SPEED RR	Wheel Spd	km/h 0.1	10 Hz
CC02	F88 LONG ACC	Inline Accel	g 0.01	10 Hz
CC49	F88 LAT ACC	Lateral Accel	g 0.01	10 Hz
CC05	F88 TRBO SPD1	Ang Velocity	deg/s 0.1	10 Hz
CC09	F88 TRBO SPD2	Ang Velocity	deg/s 0.1	10 Hz
CC16	F88 ECT1	Water Temp	C 0.1	10 Hz
CC20	F88 ECT2	Water Temp	C 0.1	10 Hz
CC17	F88 EGT1	Exhaust Temp	C 0.1	10 Hz
CC21	F88 EGT2	Exhaust Temp	C 0.1	10 Hz
CC18	F88 ACT1	Air Temp	C 0.1	10 Hz
CC22	F88 ACT2	Air Temp	C 0.1	10 Hz
CC28	F88 EOT	Oil Temp	C 0.1	10 Hz
CC29	F88 FUEL T	Temperature	C 0.1	10 Hz
CC19	F88 BTMAX	Temperature	C 0.1	10 Hz
CC24	F88 OIL P1	Oil Pressure	bar 0.01	10 Hz
CC25	F88 OIL P2	Oil Pressure	bar 0.01	10 Hz
CC26	F88 OIL P3	Oil Pressure	bar 0.01	10 Hz

5.3 – CAN2 Stream configuration

This page works exactly like ECU Stream one. Here you can find additional CAN modules. To load them on SW4 configuration:

- enter “CAN2 Stream” layer
- at the very first configuration a panel showing all supported non AiM external modules is prompted; afterwards press “Change protocol” button
- select “Manufacturer” and “Model”
- press OK

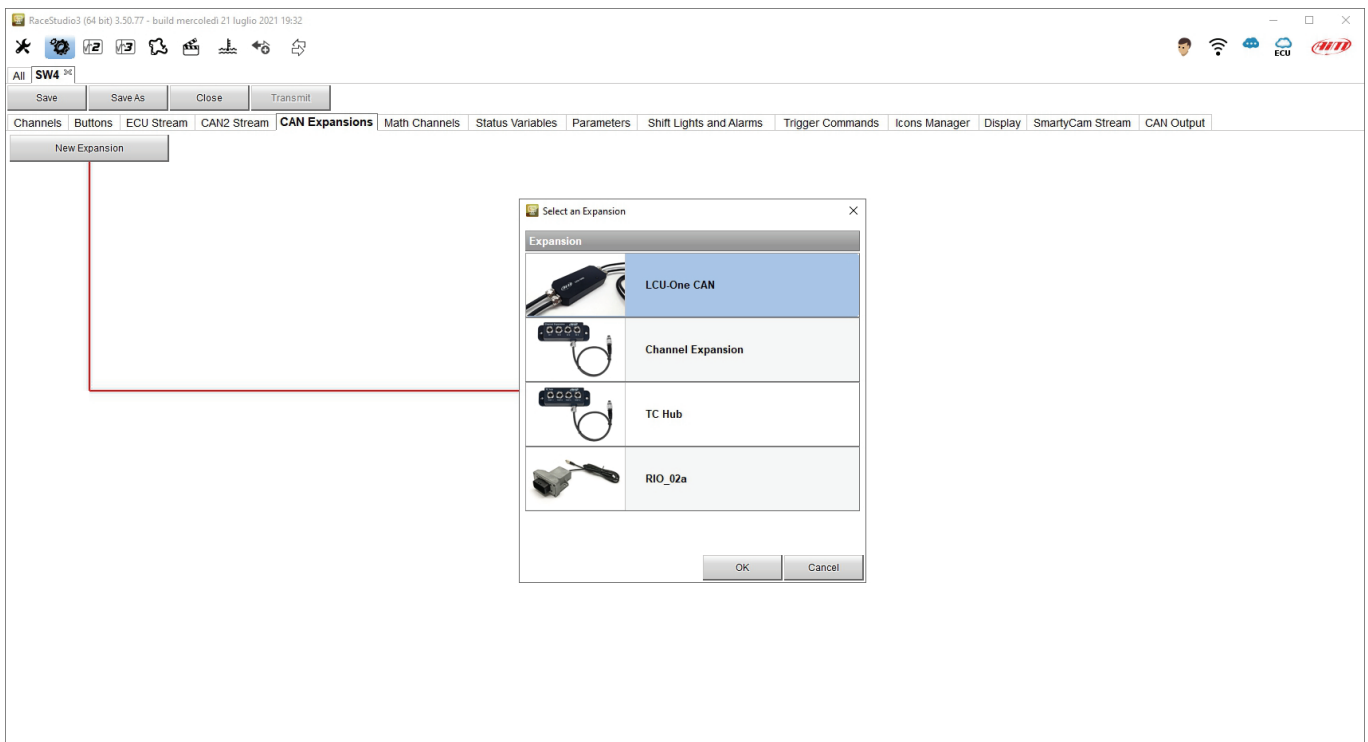


5.4 – AiM CAN Expansions

SW4 can be connected to various AiM CAN expansions:

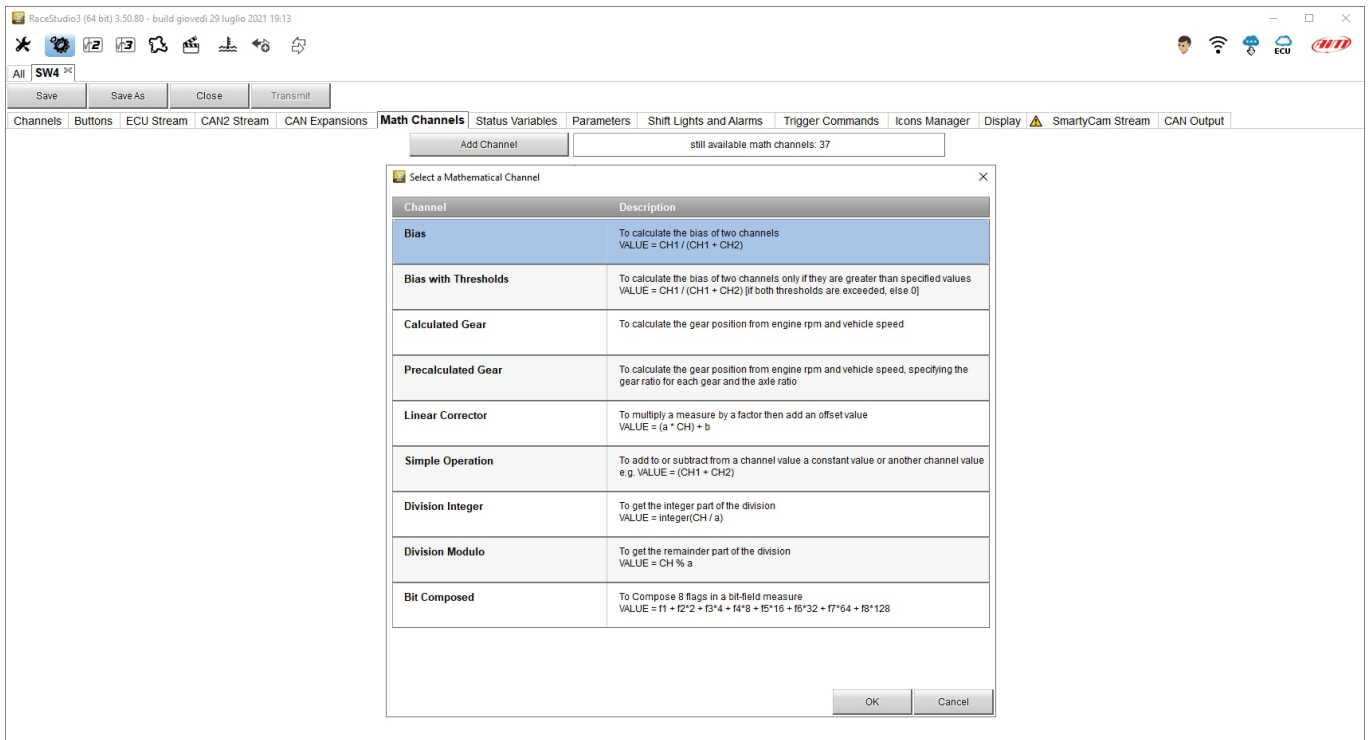
- LCU-One CAN
- Channel Expansion
- TC Hub
- RIO_02A

At the very first SW4 configuration this panel is prompted:



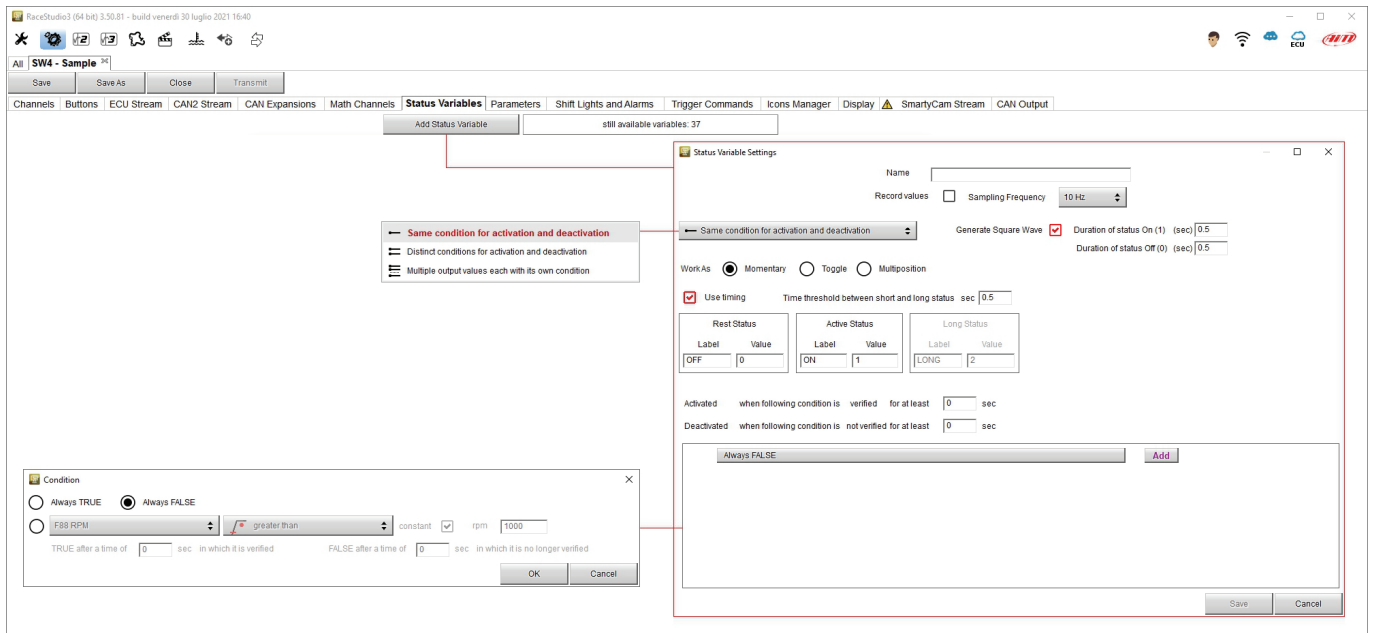
5.5 – Math Channels

Race Studio 3 software supplies nine different types of math channels. At very first configuration this window is prompted. To set each available math channel click on it and the related setting panel is prompted.



5.6 – Status variables configuration

Status Variables are internal math channels that can have only two different values: 1 (TRUE) or 0 (FALSE). They may be useful for simplifying complex configurations, where it is required to evaluate if to activate alarms, LEDs, Icons etc.. Entering the related layer for the very first configuration the panel red squared below is prompted and can be recalled pressing “Add status variable” button. Each status variable can also be set as to generate a square wave like if linked to widescreen wipers for example.





Let us explain with an example: we would like to turn a LED and an Icon ON when Water temperature reaches 100°C and RPM are higher than 2000. Instead of defining the same logic for managing the icon and for managing the LED, we could define a Status Variable, Water Temp Alarm, and link Icon and LEDs to this variable. In this case, we could define:

- Water Temp Alarm is High when:
 - Water Temp is higher than 100°C
 - RPM is greater than 2000.

And use Water Temp Alarm for managing Icon and LEDs.

Here below the conditions of the example above are set.

The image shows a screenshot of the 'Status Variable Settings' dialog box and two 'Condition' dialog boxes. The 'Status Variable Settings' dialog is for 'WaterTemp' and has the following settings:

- Name: WaterTemp
- Record values: Sampling Frequency: 10 Hz
- Same condition for activation and deactivation:
- Generate Square Wave: Duration of status On (t): 0.5 sec
- Duration of status Off (d): 0.5 sec
- Work As: Momentary Toggle Multiposition
- Use timing: Time threshold between short and long status: 0.5 sec
- Rest Status: OFF 0
- Active Status: ON 1
- Long Status: LONG 2
- Activated: when following condition is verified for at least 0 sec
- Deactivated: when following condition is not verified for at least 0 sec

The 'Condition' dialog boxes are:

- Top Condition: Always FALSE, F88 RPM, greater than, constant, rpm, 2000. TRUE after a time of 1 sec in which it is verified. FALSE after a time of 4 sec in which it is no longer verified.
- Bottom Condition: Always FALSE, F88 ECT1, greater than, constant, C, 100. TRUE after a time of 2 sec in which it is verified. FALSE after a time of 4 sec in which it is no longer verified.

Red arrows indicate that the 'Add' button in the 'Status Variable Settings' dialog is used to add the conditions from the two 'Condition' dialog boxes.



Once all conditions set press "Save" and the status variable is set.

Status Variable Settings [min] [max] [close]

Name:

Record values: Sampling Frequency:

Same condition for activation and deactivation: Generate Square Wave:

Duration of status On (1) (sec):
Duration of status Off (0) (sec):

Work As: Momentary Toggle Multiposition

Use timing Time threshold between short and long status sec:

Rest Status		Active Status		Long Status	
Label	Value	Label	Value	Label	Value
OFF	0	ON	1	LONG	2

Activated when following condition is verified for at least sec
Deactivated when following condition is not verified for at least sec

AND OR

F88 RPM greater than 2000 rpm (TRUE after 1 sec; FALSE after 2 sec) [X] Add

AND

F88 ECT1 greater than 100 C (TRUE after 2 sec; FALSE after 5 sec) [X] Add

Add

Add

Click to delete this condition Click to add another condition

Save Cancel

Once the status variable set you come back to “Status Variable” layer all set status variables are listed in the page and enabled. Mousing over any of them the related description panel is prompted right of the page and you can edit, delete and log it. To log it enable the related checkbox.

The screenshot shows the RaceStudio3 interface with the 'Status Variables' tab selected. A table lists the status variables, with 'Water Temp' selected. A configuration panel for 'Water Temp' is displayed on the right, showing various settings and a logic description.

Status Variable	Freq	Mem
<input checked="" type="checkbox"/> Water Temp	10 Hz	<input type="checkbox"/>

Water Temp Configuration Panel:

- Name: Water Temp
- Record values: Sampling Frequency: 10 Hz
- Same condition for activation and deactivation:
- Generate Square Wave: Duration of status On (1) (sec): 0.5
- Duration of status Off (0) (sec): 0.5
- Work As: Momentary Toggle Multiposition
- Use timing: Time threshold between short and long status sec: 0.5
- Rest Status: OFF 0
- Active Status: ON 1
- Long Status: LONG 2

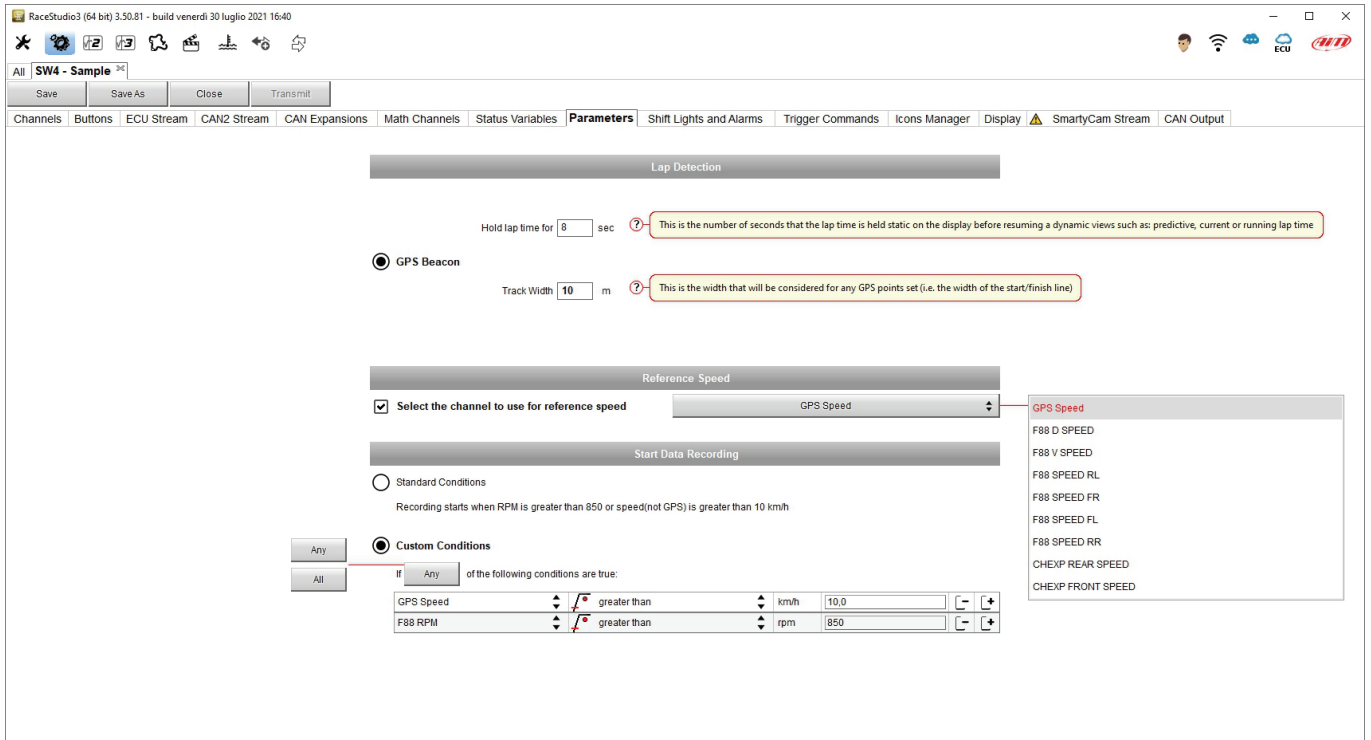
Logic Description:

It is activated (ON) when:
((F88 RPM greater than 2000 rpm (TRUE after 1 sec; FALSE after 2 sec))
AND (F88 ECT1 greater than 100 C (TRUE after 2 sec; FALSE after 5 sec))
)
is verified

It is deactivated (OFF) when:
it is not verified

5.8 – Parameters

To set the optional GPS for lap detection as well as decide Sw4 start recording condition (Start Data Recording).



Lap Detection: you may set two parameters, necessary for better managing the GPS Beacon

- hold lap time for: the time period for which lap time is shown on SW4 display
- the track width: width that will be considered for any set GPS point

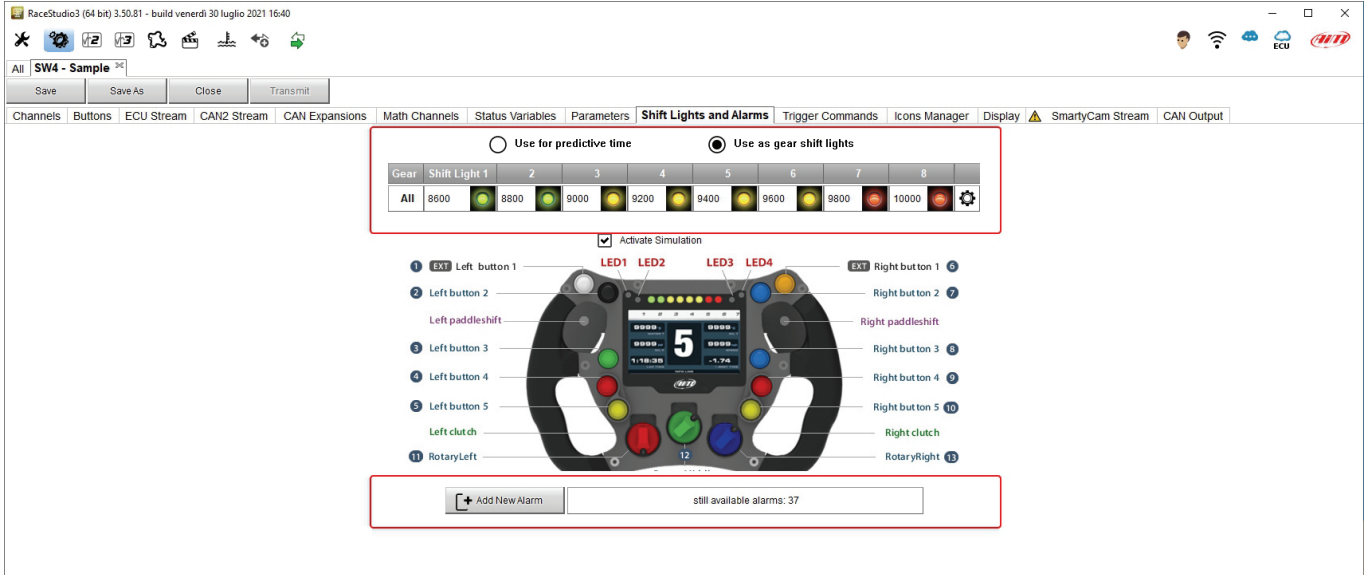
Reference speed: allows to select the channel to use as reference speed among these available

Start Data Recording

- Standard conditions: the logger starts recording with RPM value greater than 850 or speed is higher than 10 km/h
- Custom conditions: to set one or more custom condition(s) to make the logger start recording. Setting more conditions, it is possible to decide whether only one of them or all need to be satisfied.

5.9 – Shift Lights and alarms

To set shift lights (top) and Alarm (bottom) of SW4.

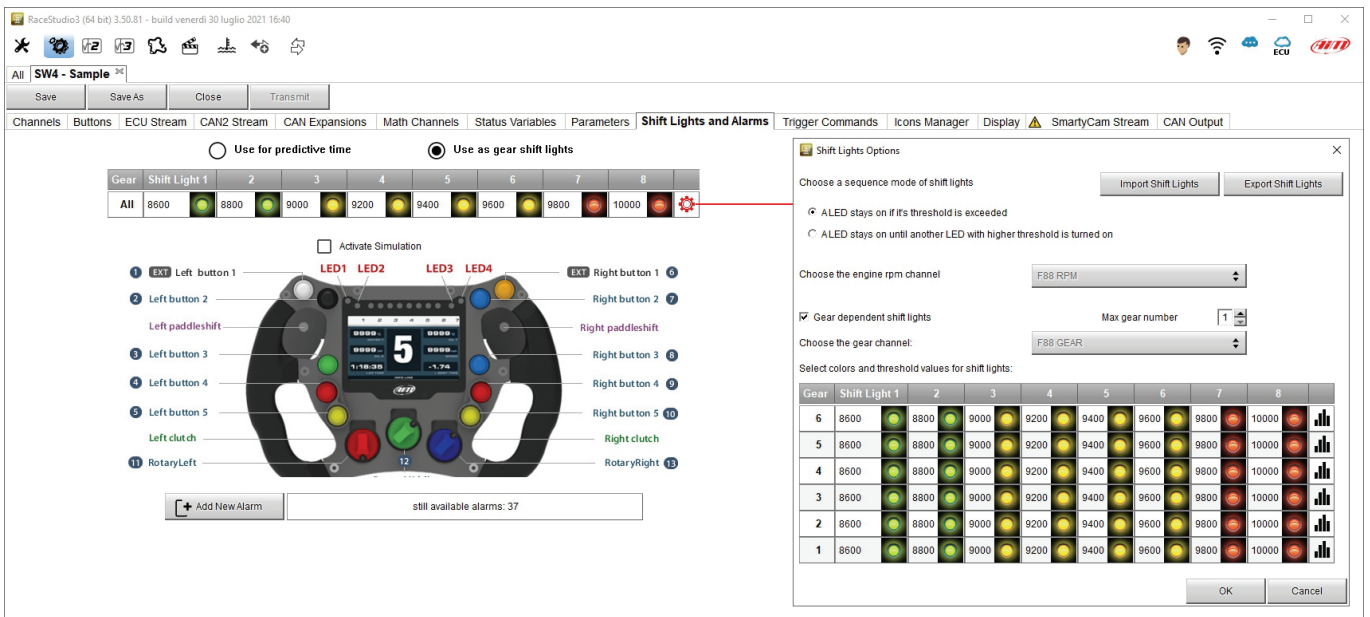


SW4 shift lights can be set as shift lights (default) and as predictive time.

Use as gear Shift Lights To use the led bar as shift lights click the setting icon highlighted below and set:

- RPM value that turns the single LED on
- the sequence mode of the LEDs enabling the desired option:
 - a LED stays on if its threshold is exceeded
 - a LED stays on until another LED with higher threshold turns on or
- link the shift lights to the engaged gear enabling the related checkbox.

Shift Lights can also be imported/exported through the dedicated buttons.

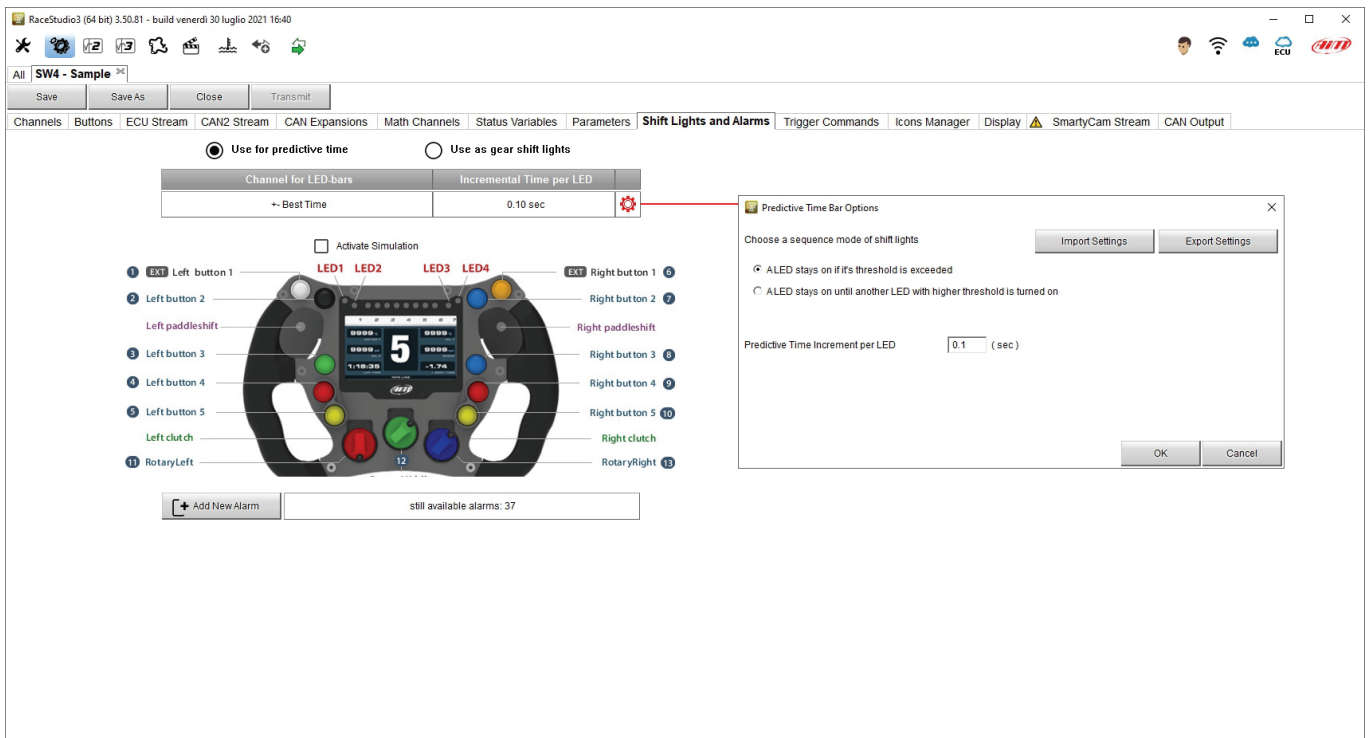


Use for predictive time. Click the setting icon highlighted in red below.

In this case the LEDs colour are fixed in:

- Green if the lap time is improving in relation to the reference lap
- Red if the lap time is worse

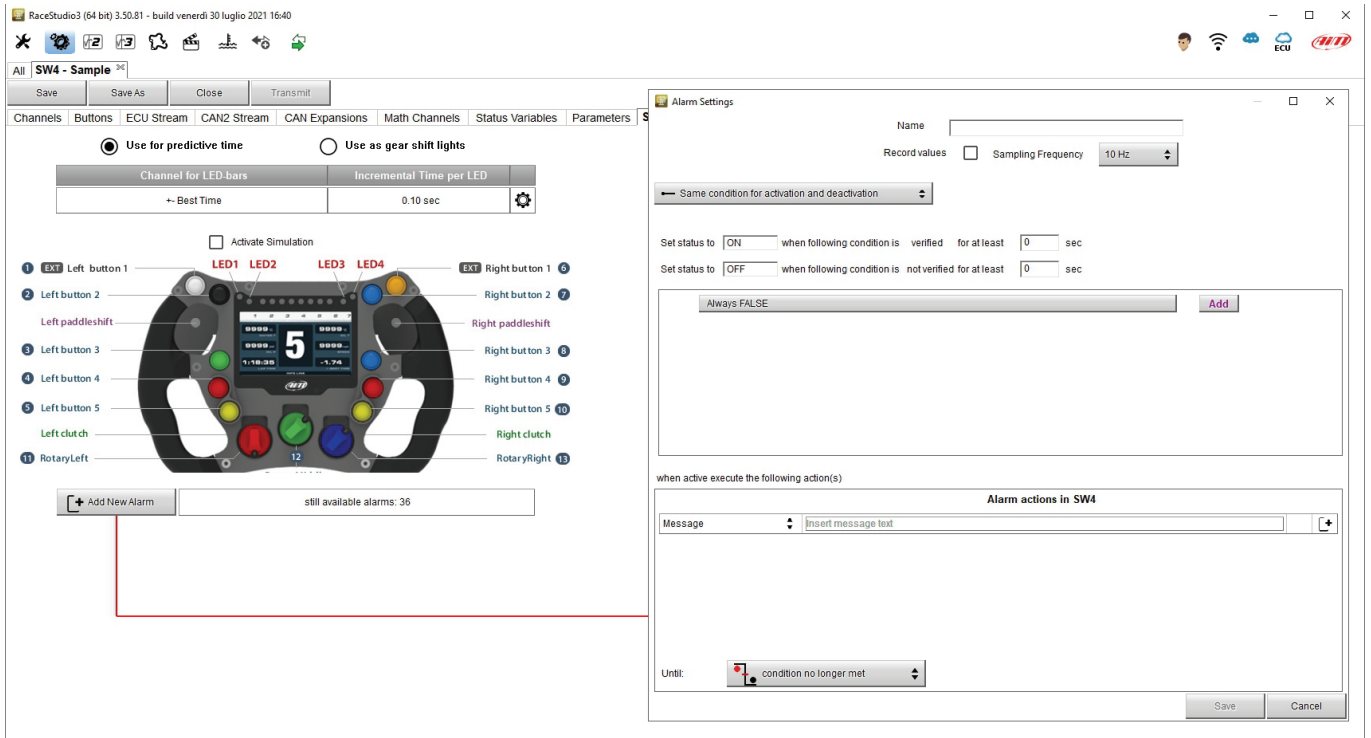
The threshold at which one LED is turned ON can be customized. Assuming "0.10 sec" is fixed and the lap time is improving of 0.30 sec toward the reference lap, SW4 will switch on 3 LEDs green; if, on the contrary, the lap time is worsening the LEDs will switch on red. The LEDs colour follows the racer performance so if the lap time starts worse and afterword it improves the LEDs starts red and continues switching on red while the lap is worse. When the lap improves the LEDs comes progressively back to the first one and re-starts green.





Create and set SW4 alarms

To create a new alarm press “Add New Alarm” and the related panel is prompted.



Alarm setting panel allows you to add an action to the same alarm through the bottom part of the panel highlighted below.

Alarm Settings

Name

Record values Sampling Frequency

← Same condition for activation and deactivation

Set status to when following condition is verified for at least sec

Set status to when following condition is not verified for at least sec

Always FALSE

when active execute the following action(s)

Alarm actions in SW4

Message

Until:

To set the new alarm:

- Name the Alarm filling in the related box top of "Alarm Settings" dialog window and decide if log it or not and at which frequency
- Select the condition for activation/deactivation
- To fix the condition that activates the alarm click it and, as shown here below, a "Condition" dialog window is prompted; in the example we have decided to use the status variable to activate an alarm
- Select the action to execute filling in the bottom part of the dialog window

The image illustrates the step-by-step process of configuring an alarm in the software. It consists of four main dialog windows:

- Alarm Settings:** The user enters the name "Water" and sets the condition to "Always FALSE".
- Condition:** The user selects "F88 RPM" as the variable, chooses the "greater than" operator, and sets a constant value of "1000".
- Select Channel:** The user navigates to "Status Variables" and selects "Water Temp".
- Alarm actions in SW4:** The user selects "LED 1" and configures it to be "continuously" lit in "Red".

When all conditions are fixed press “Save” and the Alarm is added to “Shift Lights and Alarm” layer.
Through the setting icon right of the alarm row you can edit and delete the Alarm.

Channel for LED-bars: Incremental Time per LED: 0.10 sec

Use for predictive time Use as gear shift lights

Activate Simulation

1 EXT Left button 1 LED1 LED2 LED3 LED4 EXT Right button 1 6
2 Left button 2 Right button 2 7
Left paddleshift Right paddleshift
3 Left button 3 Right button 3 8
4 Left button 4 Right button 4 9
5 Left button 5 Right button 5 10
Left clutch Right clutch
11 RotaryLeft RotaryRight 13

+ Add New Alarm still available alarms: 35

Event	Alarm
Water	LED: 1

Alarm Settings

Name: Water

Record values Sampling Frequency: 10 Hz

Same condition for activation and deactivation

Set status to ON when following condition is verified for at least 0 sec

Set status to OFF when following condition is not verified for at least 0 sec

Water Temp equal to ON Add

When active execute the following action(s)

Alarm actions in SW4

LED 1 continuously Red

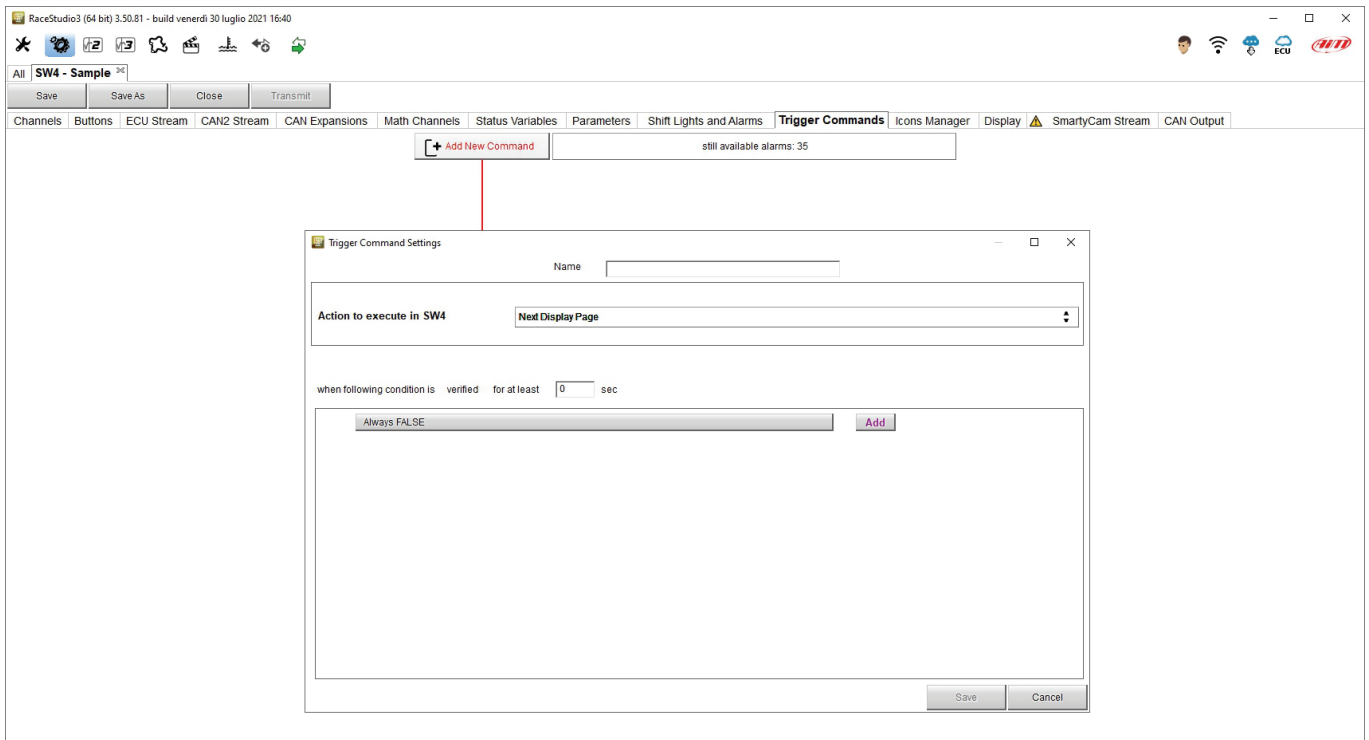
Until: condition no longer met

Save Cancel

Edit Selected Alarm
Delete Selected Alarm

5.10 – Trigger Commands

A trigger command make SW4 executing a specific action. To set a trigger command enter “Trigger Commands” layer and press “Add new command” button. The corresponding dialog window is prompted.



The window offers different trigger commands option that can be executed when one or more condition(s) is/are verified. Let's imagine you want your SW4 goes in data recall mode at the end of the race. First of all you decide the **Action** to execute in SW4, to say: "Display Button Command -> Simulates "MEM" Button"

Trigger Command Settings

Name: Data Recall

Action to execute in SW4

Display Next Page

Display Page Command

Display Button Command

Reset Alarms Command

Simulates 'MENU / <<<' Button

Simulates '>>' Button

Simulates 'VIEW' Button

Simulates 'MEM / OK' Button

Display Next Page

Display Previous Page

Goto Page Number

Reset all alarms

Reset alarms whose end condition is 'the device is turned off'

Reset alarms whose end condition is 'a button is pushed'

Reset alarms whose end condition is 'data is downloaded'

when following condition is verified for at least 0 sec

Always FALSE

Add

Save Cancel

Once fixed the action to perform you need to decide the condition that make this action being performed. In this case you want data recall mode to be activated when Speed is lower than 50 km/h and RPM value is lower than 800 for 5 seconds. To set them:

- Press any of the button in condition panel ("Always FALSE" or "Add" in the image below)
- Select the channel to set as condition "GPS -> GPS Speed" and press OK
- Select "Less than" and fill in the GPS speed value (50kmh in the example)
- Fill in the time period for "TRUE" and "FALSE" ("5" seconds in the example)
- Press OK and the first condition is set.

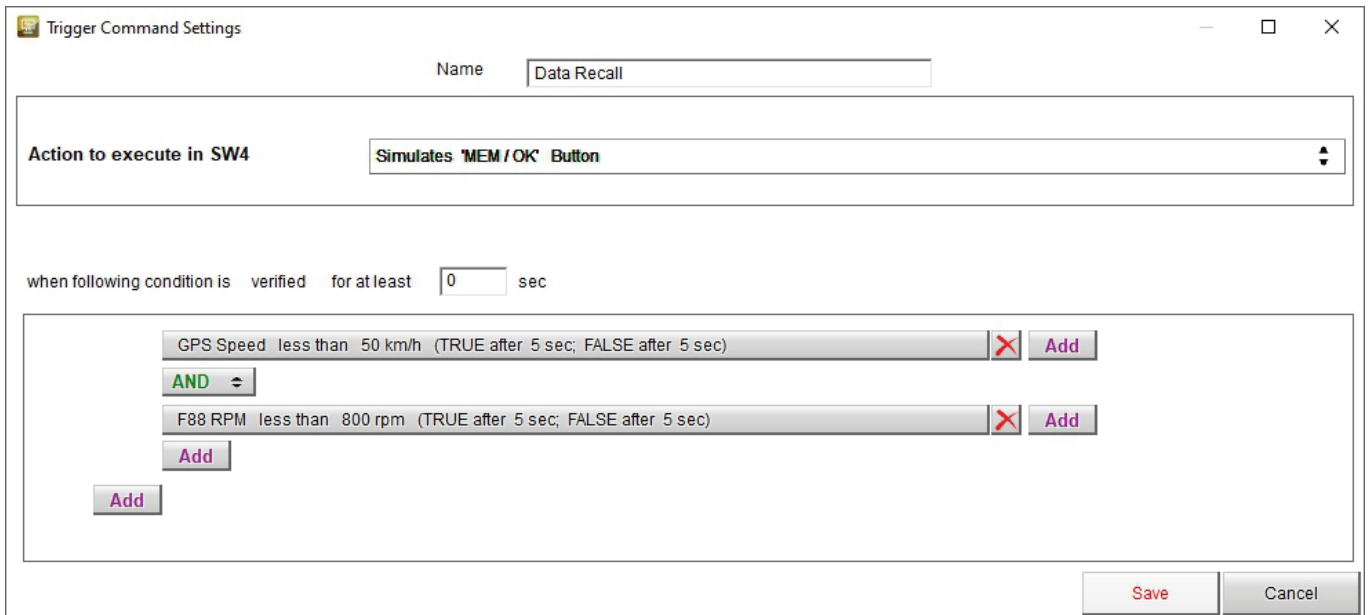
The screenshot illustrates the configuration process for a trigger command. The main window, "Trigger Command Settings", has a dropdown menu for "Action to execute in SW4" set to "Simulates 'MEM / OK' Button". Below this, a condition is being defined. A red box highlights the text "when following condition is verified for at least 0 sec". An "Add" button is used to add a new condition. The "Condition" dialog box shows the following settings:

- Condition type: Always TRUE, Always FALSE
- Channel: **Left Clutch**
- Operator: **less than** (highlighted in red)
- Value: **0**
- TRUE after a time of **5** sec in which it is verified
- FALSE after a time of **5** sec in which it is no longer verified

A "Select Channel" dialog is open on the left, showing a list of sources and channels. Under the "GPS" source, "GPS Speed" is selected. A legend at the bottom right of the Condition dialog lists the available operators: greater than, less than, between values, equal to, and different from.

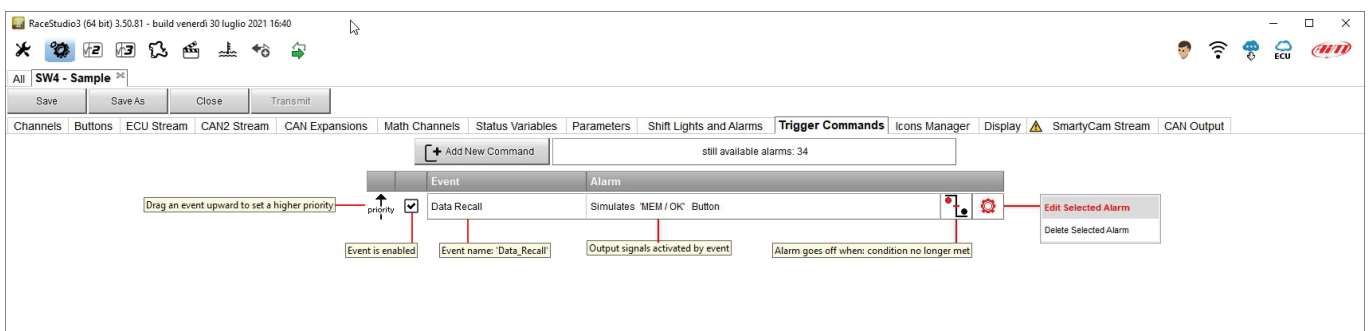
Press "Add" button to set the second condition

- Select channel "ECU -> F88 RPM"
- Select less than 800 RPM
- Set a 5 seconds time period
- Press "OK"
- Decide if all the conditions are to be verified ("AND" as in the example) or if any of them is enough ("ANY")
- Press Save



Once all conditions fixed the Trigger command is shown with its name in the layer as shown below.

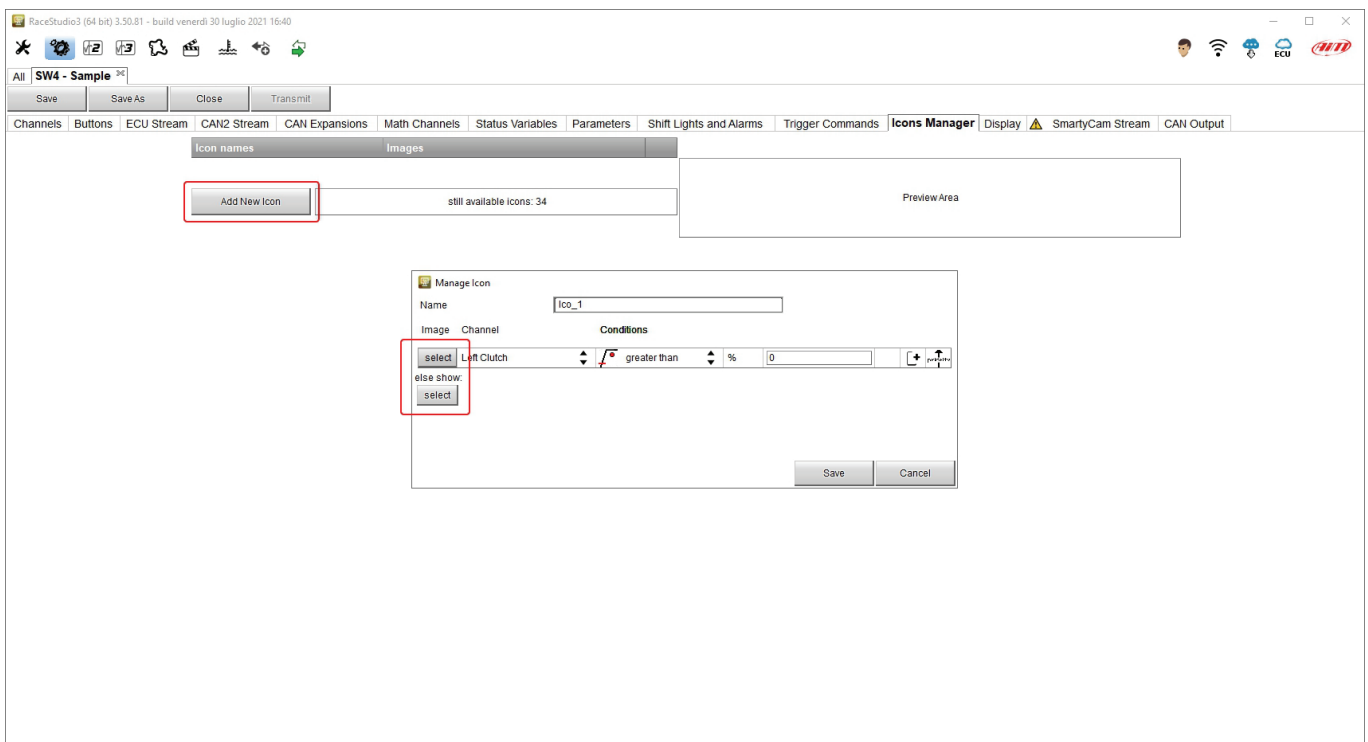
Mousing over any trigger command various tooltips are prompted while using the setting icon far right of the row you can edit to modify or delete the command. Setting more trigger commands the arrow far left of the row allows you to move them up and down changing their priority.



5.11 – Icons Manager

The icons are images that can be shown on SW4 display when a fixed condition is true. At present they are normally placed bottom of it. Entering “Icons Manager” layer for the very first time the dialog window shown below is prompted. Race Studio 3 software provides a set of predefined icons as well as a stock of icons you can colour as you wish. It is also possible to add custom icons.

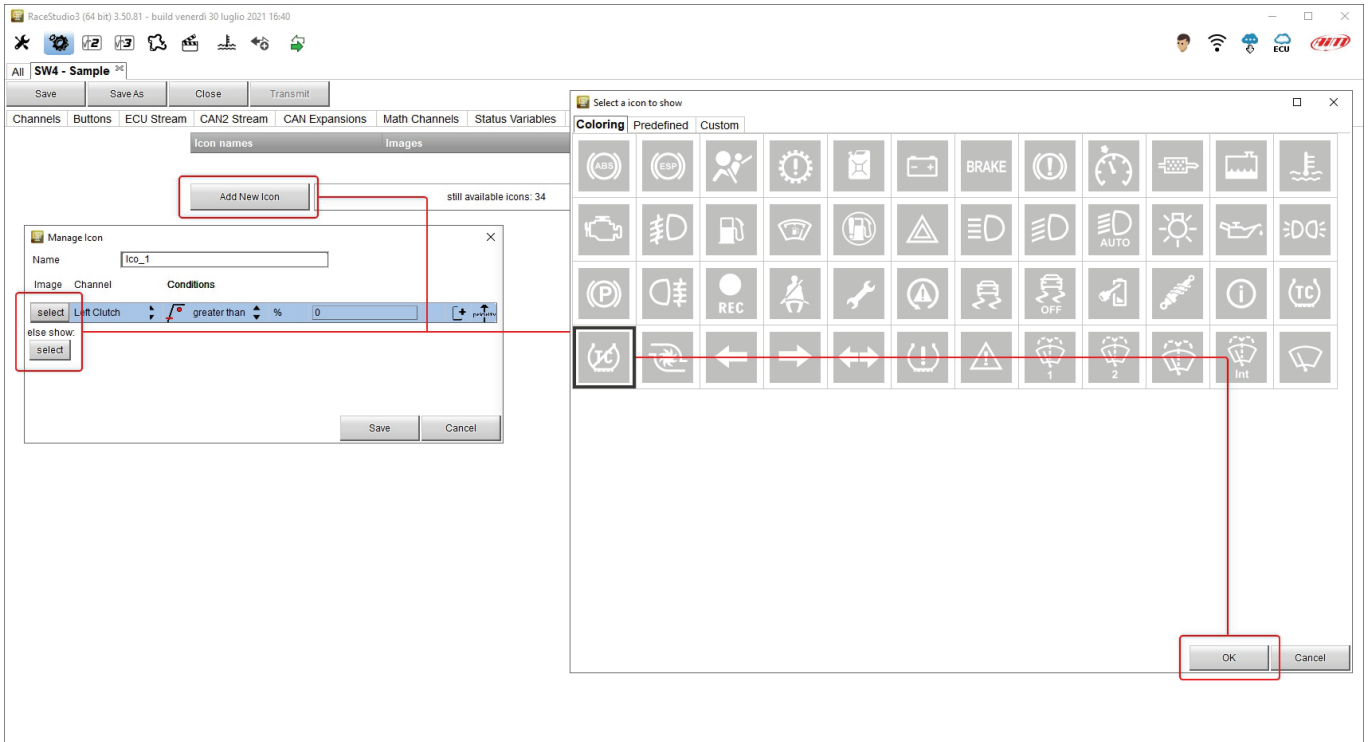
To configure the first Icon press “Select” button. Afterwards new icons will be set pressing “Add New Icon” button.



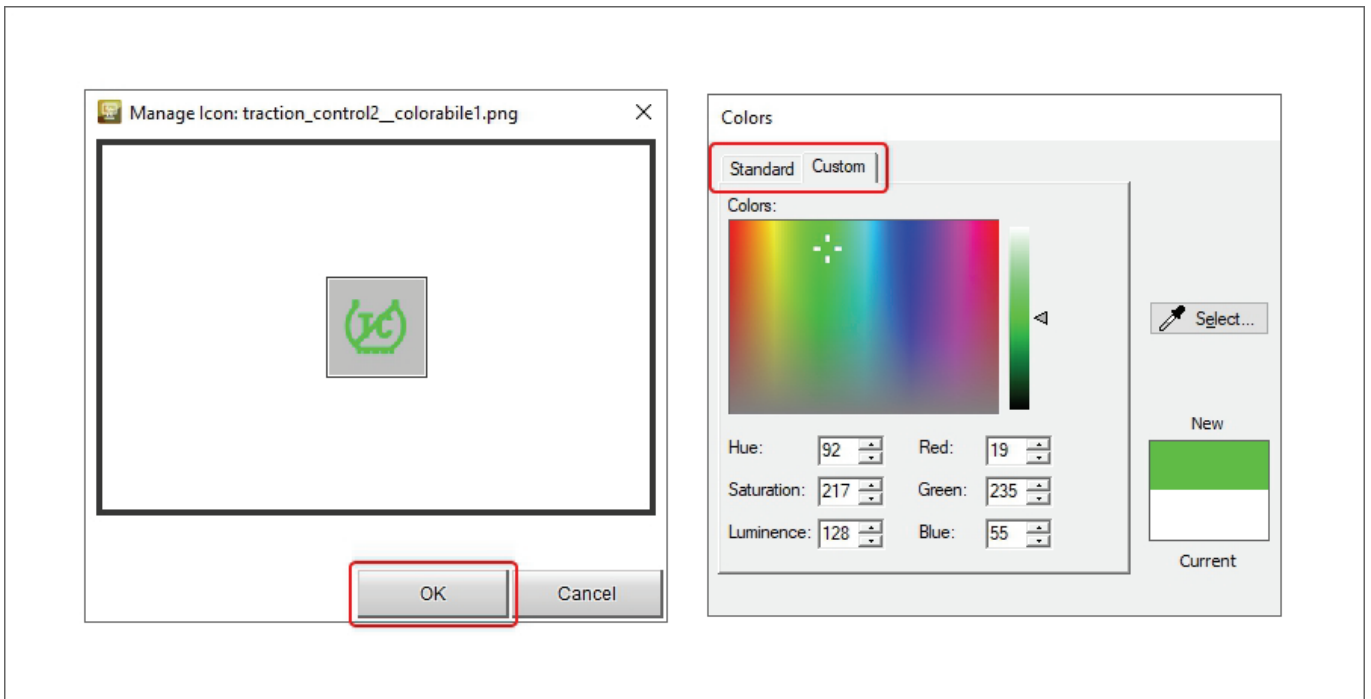
Pressing “Select” or “add new Icon” button the corresponding dialog window is prompted. It is made up of three layers:

- Coloring
- Predefined where stock icons are shown and you can select your icon and
- Custom where you can upload custom icons

By default it shows “Coloring” layer where all icons are white and you can set its colour. Once the icon selected press “OK” bottom right of the icons selection dialog window.

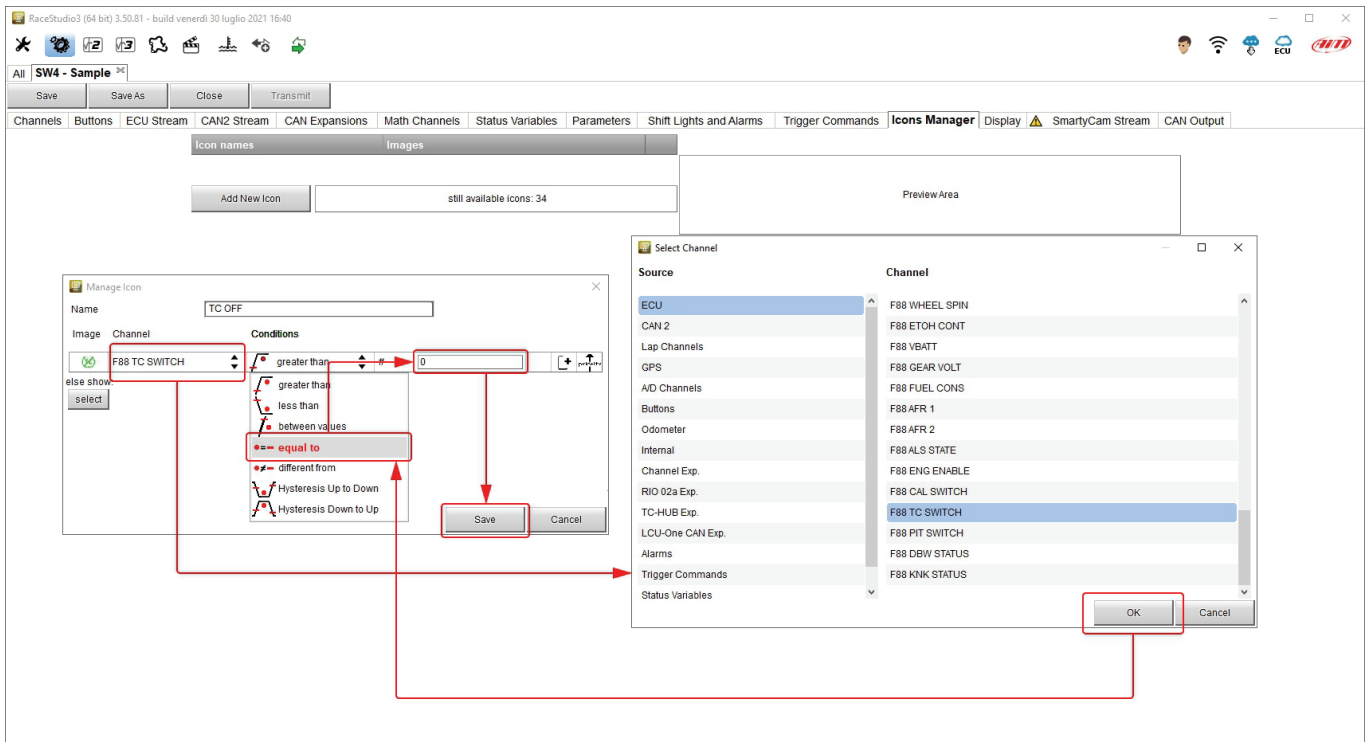


Available colours are shown in a panel and a dialog window is prompted to decide the colour. You can use a standard colour or a custom one as shown here below on the right. Once the colour selected press OK on the icon panel.

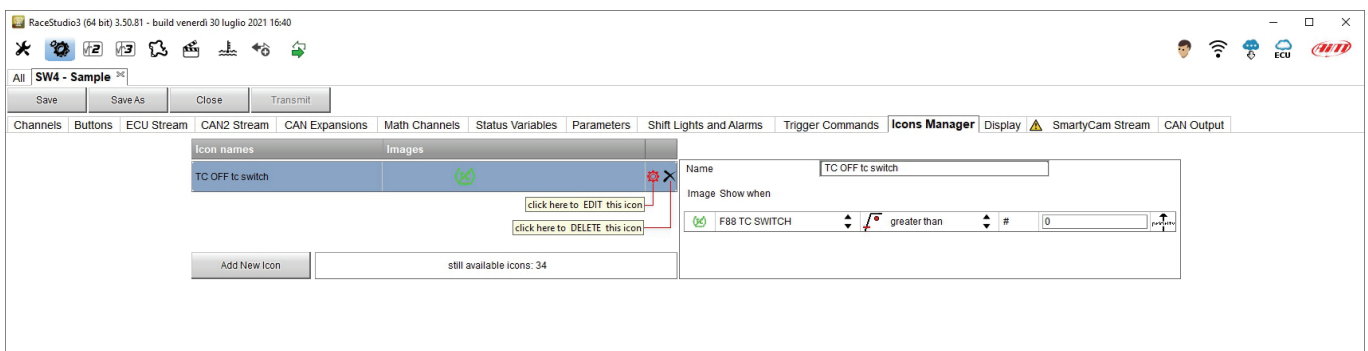


When the icon is set you need to configure its working mode. In the example we have decided to show an icon when traction control is "OFF". To do so:

- Press "Channel box" and "Select Channel panel is prompted"
- Select the right channel ("ECU -> F88 TC SWITCH" in the example and press "OK")
- Set its working condition ("Equal to 0" in the example)
- Press "Save"



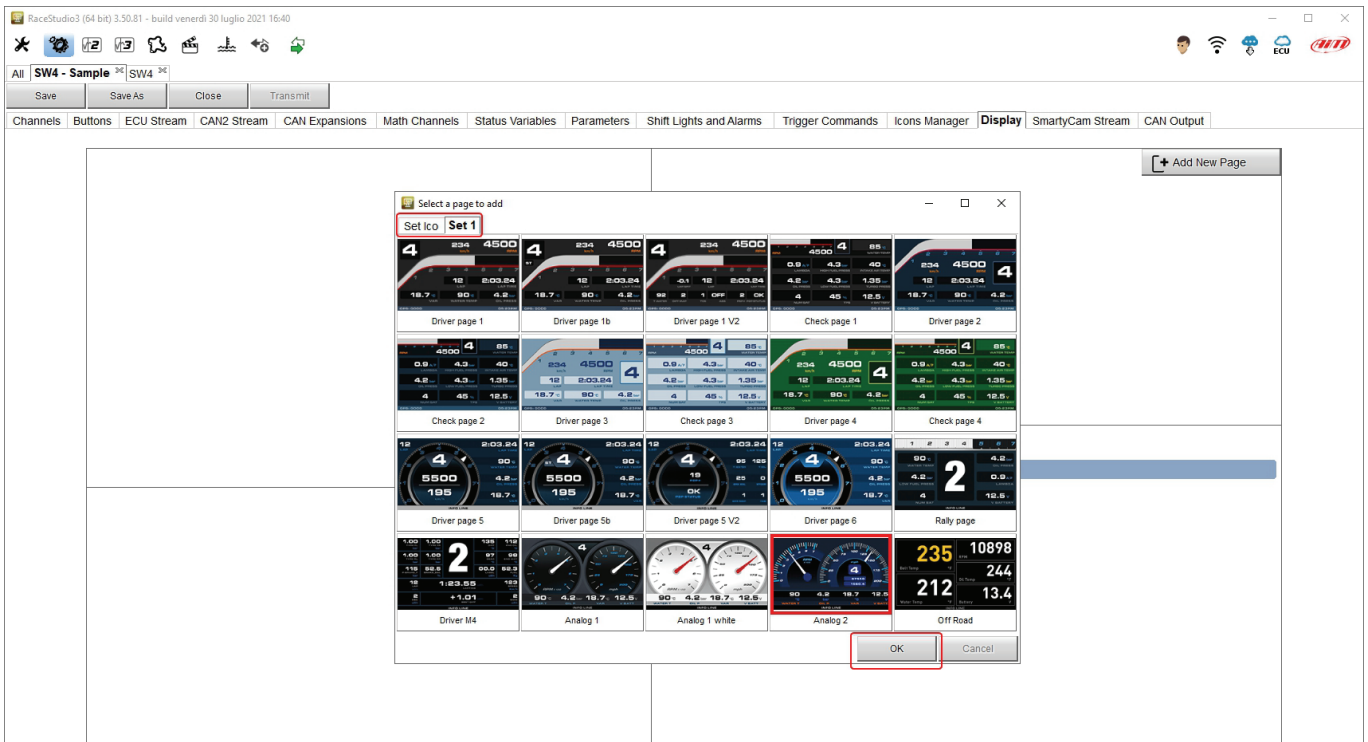
When the icons are set an icon summary is shown in the dedicated layer. All icons can be edited to be modified or deleted.





5.12 – Display

SW4 comes with a default display but it can be changed using Race Studio 3, the software that provides a wide variety of available displays. SW4 supports up to 15 display pages. To set one enter the related layer, select the display you want and press “OK”.





Normally RPM and Speed channels are set by default as:

- RPM from ECU and
- GPS Speed from GPS; pressing the channel you can select the speed to use

The screenshot shows the RaceStudio3 software interface. The main window displays a dashboard titled "Page 1" with two gauges: an RPM gauge (0-18,000) and a Speed gauge (0-240 km/h). Below the gauges is an "INFO LINE" section. To the right, there is a "Channels" panel with a list of channel groups and their corresponding channels. The "Channels" list is currently set to "F88 RPM" and "F88 SPEED".

Channel Group	Channel
ECU	F88 RPM
CAN 2	F88 GEAR
Lap Channels	F88 D SPEED
GPS	F88 V SPEED
A/D Channels	F88 SPEED RL
Buttons	F88 SPEED FR
Odometer	F88 SPEED FL
Internal	F88 SPEED RR
Channel Exp.	F88 LONG ACC
RIO 02a Exp	F88 LAT ACC
TC-HUB Exp.	F88 TRBO SPD1
LCU-One CAN Exp.	F88 TRBO SPD2
Alarms	F88 ECT1
Trigger commands	F88 ECT2



Mousing over the display the software highlights in red the selected box and in light blue the corresponding channel in the table under the display. To set any field click the box and select channel in channel groups as shown here below. You can also drag and drop a channel in the table on the left of the window.

The screenshot shows the RaceStudio3 interface. The main display area contains two gauges: an RPM gauge (0-18,000) and a km/h gauge (0-240). Below the gauges is an 'INFO LINE' table with two columns for 'F88 RPM' and 'GPS Speed', each with a gear icon and a unit dropdown (rpm and km/h). A red box highlights the 'F88 RPM' gauge, and a light blue box highlights the 'F88 RPM' entry in the 'Channels' list. The 'Channels' list is organized into 'Channel Groups' (ECU, CAN 2, Lap Channels, GPS, A/D Channels, Buttons, Odometer, Internal, Channel Exp., RIO 02a Exp., TC-HUB Exp., LCU-One CAN Exp., Math Channels) and 'Channels' (F88 RPM, F88 GEAR, F88 D SPEED, F88 V SPEED, F88 SPEED RL, F88 SPEED FR, F88 SPEED FL, F88 SPEED RR, F88 LONG ACC, F88 LAT ACC, F88 TRBO SPD1, F88 TRBO SPD2, F88 ECT1, F88 ECT2). A configuration panel on the right shows settings for the selected channel, including 'Digit Font' (MicrogrammaDBolExt), 'Position', 'Alignment' (center), and 'Mask Position' (backgr, unset, outline, 0).

Once selected the channel, according to the field you are setting you can configure dimension and colour of all fonts, position of the text, background colour and outline dimensions as shown here below.

The screenshot displays a font configuration interface. On the left is a list of fonts including DINOT-Bold, DINOT-Black, DINOT-Medium, MicrogrammaDBolExt, Basic Sans SF, Basic Sans Heavy SF, AgencyFB Bold Wide, Eurostilish, **HandelGothic** (highlighted with a red mouse cursor), Soviet Program, Raavi, Zekton Free, Prisoner SF, DejaVuSans BoldOblique, MgOpen Modata BoldOblique, Impact, Trebuchet MS, Arial Bold, Bahnschrift SemiBold, Arial, Arial Narrow, Steiner, Evogria, EuropeExt, EuropeExt Bold, Expansiva, Expansiva Bold, Michroma, Overpass, EurostileExtended, and EurostileExtendedBlack. A red line connects the 'HandelGothic' font to the settings panel on the right.

The settings panel includes:

- Digit Font:** MicrogrammaDBolExt, size 42.
- Label Font:** MicrogrammaDBolExt, size 18, with an orange color swatch.
- Unit Font:** MicrogrammaDBolExt, size 23, with a blue color swatch.
- Position:** Alignment dropdown menu with options: left, center, right (selected).
- Mask Position (pixel values):** backg: unset, outline: unset 0.
- Buttons: preview, reset.

Below the settings panel is a 'Colors' dialog box with 'Standard' and 'Custom' tabs. It features a color wheel, a 'Select...' button with a color picker icon, and a 'Current' color swatch.

Repeat the same operation for all the fields and the display preview will show you the layout of your SW4.



The image here below shows a display page configured. Clicking on the setting icon you can name, modify or delete it.

The screenshot shows the RaceStudio3 interface. The main window displays a dashboard for 'Page 1' with two analog gauges (RPM and km/h), a gear indicator showing '5', and four digital readouts: Lap Time (1:18:35), +- Best Time (-1.74), Bias (999.9%), and Water (true). Below these is an 'INFO LINE' table:

Channel	Unit	Value
F88 RPM	rpm	18000
GPS Speed	km/h	240
F88 GEAR	gear	
CHEXP WATER TEMP	C	
CHEXP OILP	bar	
Lap Time		
+- Best Time		
Bias	%	
Water	#	

The right side of the interface shows a 'Display' tab with a 'Page 1' preview and a '+ Add New Page' button. A 'Set Page Parameters' dialog box is open, showing 'Page 1' as the page name. Below this is a 'Channels' configuration panel with a list of channel groups and a 'Bias' channel selected. The 'Bias' channel settings include: Digit Font (HandelGothic, size 42), Label Font (HandelGothic, size 18), Unit Font (HandelGothic, size 23), Position (center), and Mask Position (backgr, outline, size 13).

5.13 – SmartyCam Stream

SW4 can be connected to AiM SmartyCam to show the desired data on SmartyCam video. To set each channel:

- click on it and a setting panel shows up
- it shows all channels and/or sensors that fits the selected function
- in case the desired channel or sensor is not in the list enable “Enable all channels for functions” checkbox and all channels/sensors will be shown

Enable all channels for functions

SmartyCam Function	Channel
Engine RPM	F88 RPM
Speed	GPS Speed
Gear	F88 GEAR
Water Temp	F88 ECT1
Head Temp	TCHUB HEAD TEMP
Exhaust Temp	F88 EGT1
Oil Temp	F88 EOT
Oil Press	F88 OIL P1
Brake Press	--- Not Set ---
Throttle Pos	F88 TPS1
Brake Pos	--- Not set ---
Clutch Pos	--- Not Set ---
Steering Pos	F88 STEER ANGLE
Lambda	LCU-On Lambda
Fuel Level	--- Not Set ---
Battery Voltage	Battery

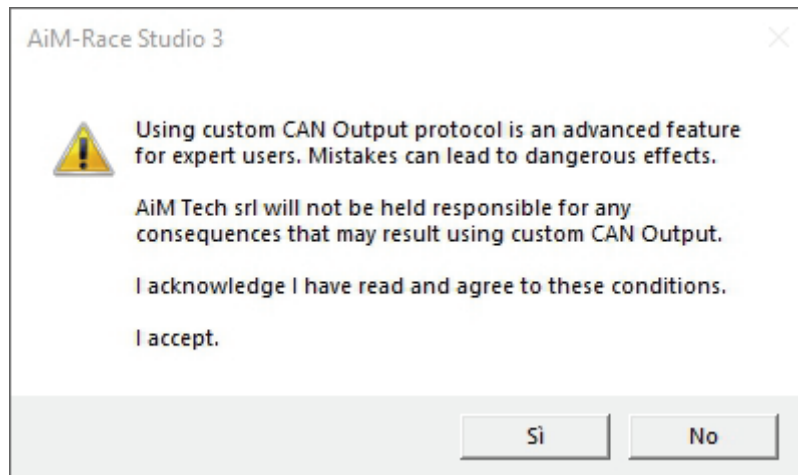
Select Channel

Source	Channel
ECU	F88 FUEL CONS
CAN 2	F88 AFR 1
Lap Channels	F88 AFR 2
GPS	F88 ALS STATE
A/D Channels	F88 ENG ENABLE
Buttons	F88 CAL SWITCH
Odometer	F88 TC SWITCH
Internal	F88 PIT SWITCH
Channel Exp.	F88 DBW STATUS
RIO 02a Exp.	F88 KNK STATUS
TC-HUB Exp.	

OK Cancel

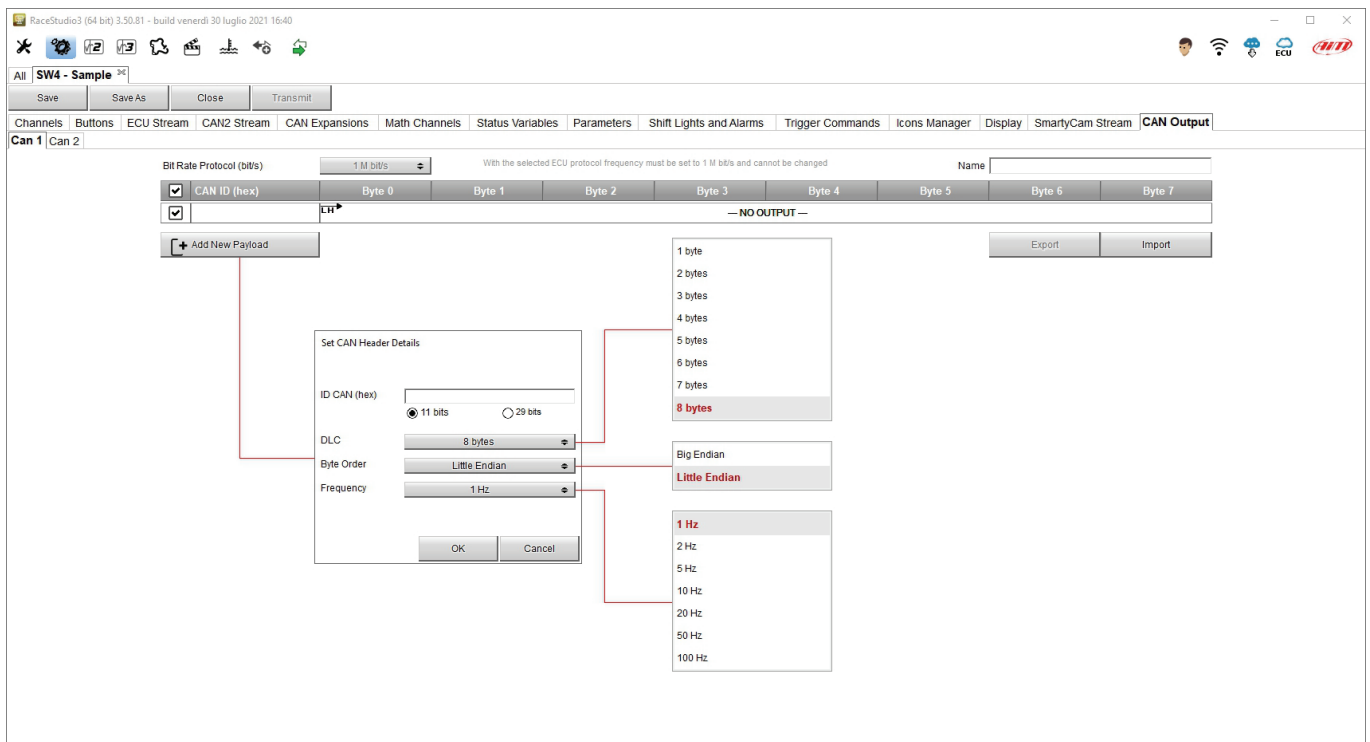
5.14 – CAN Output

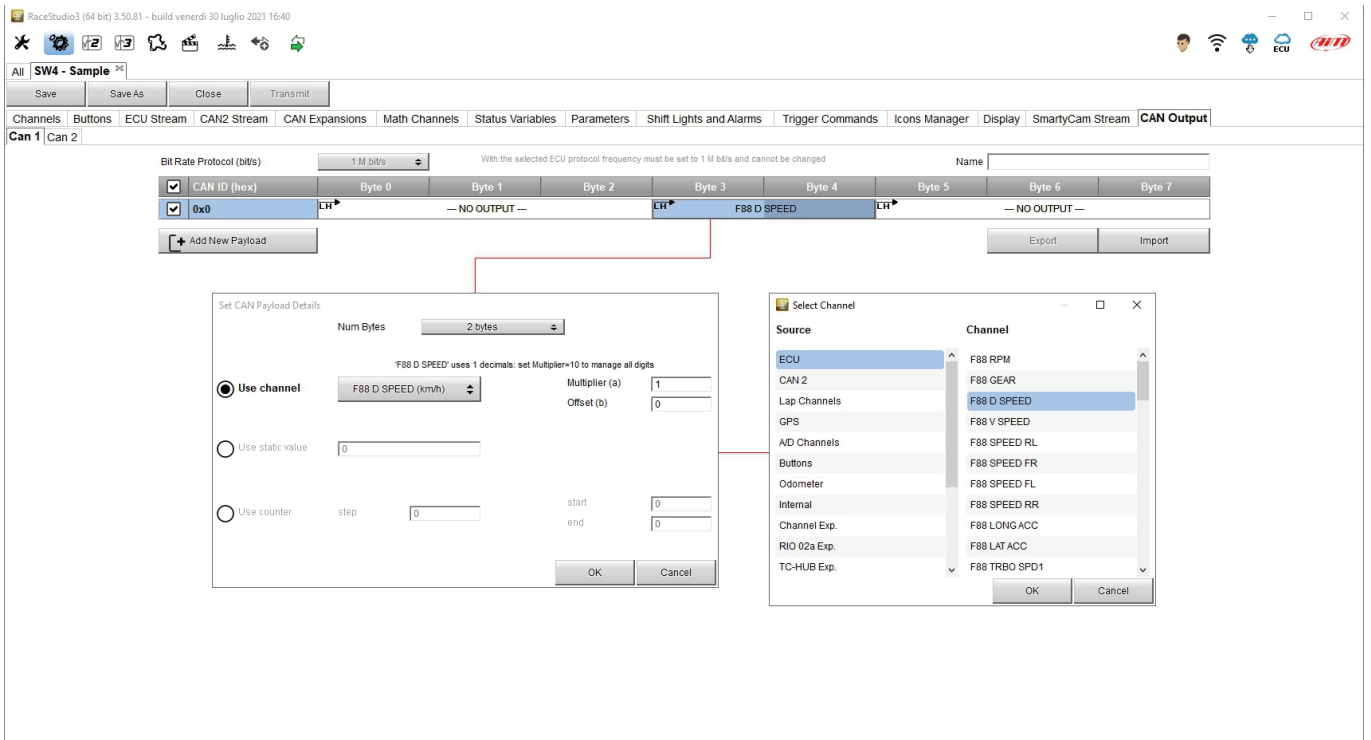
Please note: this function is for expert users only. The logger can transmit a CAN data stream containing the channels required both on CAN1 and CAN2. Pressing "Add New Payload" this warning panel is prompted. Press "Yes" according to you operative system language (SI in the example below). You find an example of this function in paragraph 4.1.7.



To add a payload:

- press “+Add new Payload” and “Set CAN Header details” dialog window is prompted;
- fill in ID CAN (hex), available options are:
 - 11 bits (normal address)
 - 29 bits (extended address)
- select the payload max bytes number (DLC), available options are from 1 to 8 bytes
- select the byte order according to the used processor, available options are:
 - Little endian for Intel processor
 - Big Endian for Motorola processor
- set the sampling frequency among: 1, 2, 5, 10 or 20 Hz





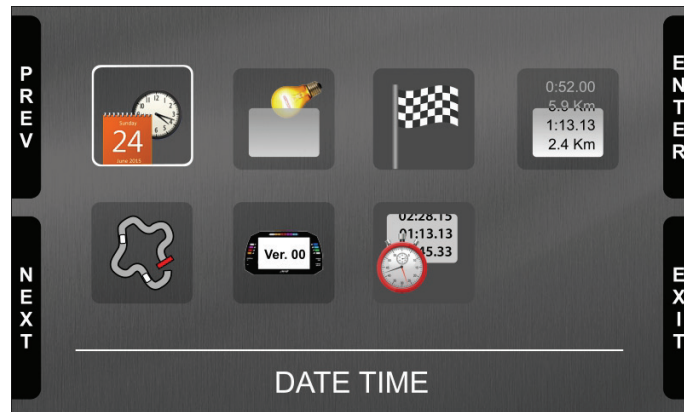
When all channels set the configuration is finished:

- press "Save" on the page top keyboard
- press "Transmit" to transmit the configuration to SW4



6 – Display Menu

When the button to enter SW4 display MENU have been configured you can access the display navigation menu and this page is prompted.



The icons stays for:



Date and time setting



Backlight: setting



Lap Time Setup (with optional AiM GPS Module connected only)



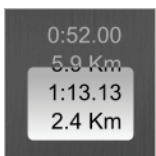
SW4 tracks and GPS management



System information



Data Recall



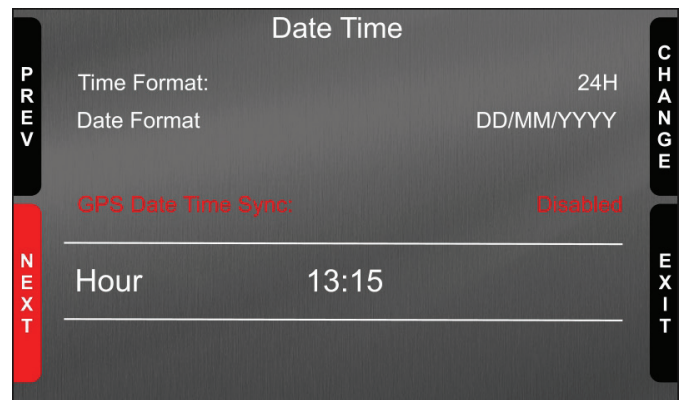
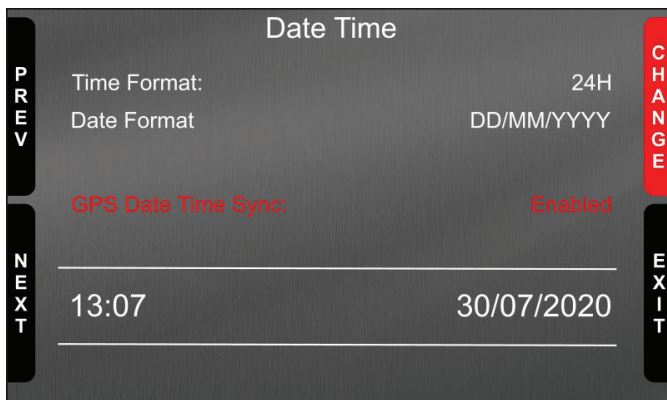
SW4 counters management



6.1 – Setting date and time

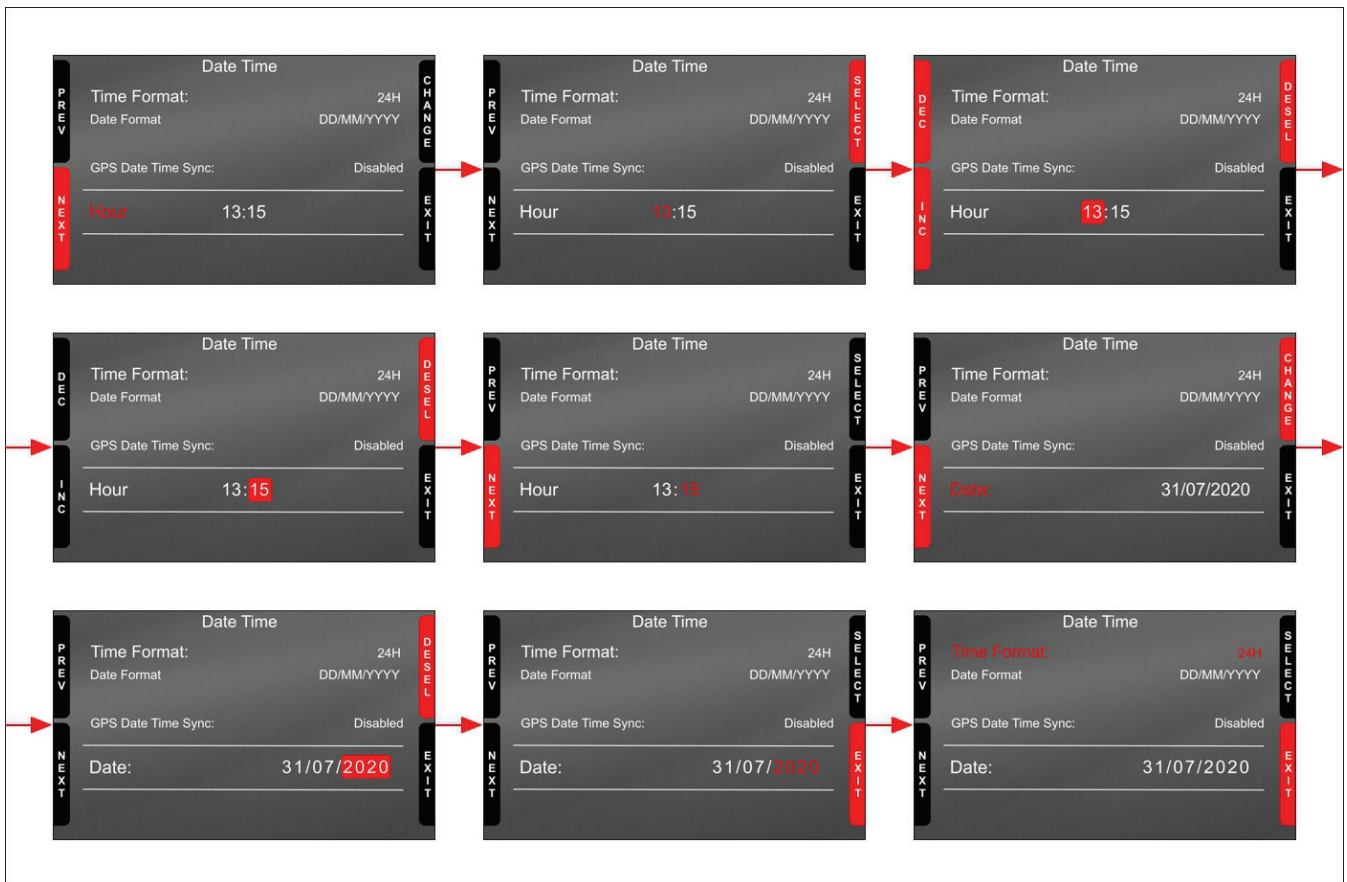
Here you can:

- set time format: 12H or 24h; press “CHANGE” to switch among the options and “NEXT” to scroll to Date format
- set date format: MM/DD/YY or DD/MM/YY or YY/MM/DD; press “CHANGE” to switch among the options
- “GPS Date Time Sync” default setting is “Enabled” (left image below); this means that date and time can come from the optional GPS Module if connected. If no GPS Module is connected or if you prefer to set It manually press “CHANGE” to disable the synchronization
- press “NEXT” so start setting time (right image below)



SW4 enters in manual date/time mode. With reference to the images below:

- press "NEXT" to start setting time -> hour becomes selected (13 in red) -> press "SELECT" and hour becomes editable (13 on red background) -> Use "DEC" and "INC" to set hour ->
- press "DESEL" and "INC" button switches to "NEXT": press it to switch to minute option: press "SELECT" and set minute
- press "DESEL" and then "NEXT" and you come back to "Hour"; press "CHANGE" and "Hour" switches to "Date": press "NEXT"
- set day, month and year as for time setting and press "EXIT"; you come back to "Time Format": press "EXIT" to save and quit





6.2 – Setting Backlight

The brightness of the display and LEDs may be adjusted in two ways, depending on the light captured by a dedicated sensor integrated in the dash

- **AUTOMATIC:** in case ambient light is higher than a defined threshold, the brightness is reduced; you can set day and night brightness level as well as the brightness threshold value that switches from day to night mode (left image below)
- **MANUAL:** you may define the brightness of the display and LEDs choosing among some values: 20%, 40%, 60%, 80%, 100% (right image below).



Press:

- "CHANGE" button to switch from "Auto" to "Manual"
- "NEXT" to scroll the voices
- "CHANGE" button again to select your option
- "EXIT" to save and quit.





6.3 – Lap time setup (GPS09 Module needed)

To get lap times you need the optional GPS09 Module. Once connected you can decide which lap time the system takes as reference to compute predictive lap time. Available options are:

- Best Lap of Test
- Best Lap of Today

Use:

- “CHANGE” button to change the setting
- “EXIT” to save and quit



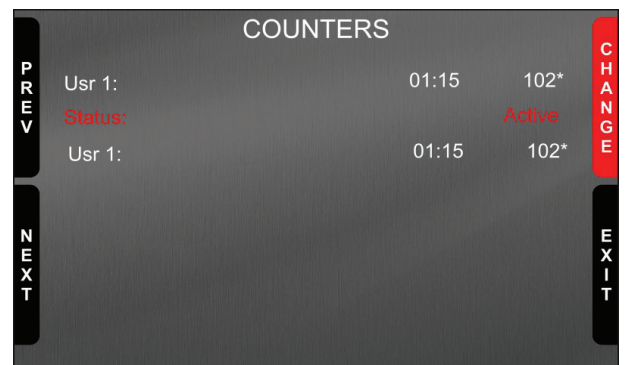
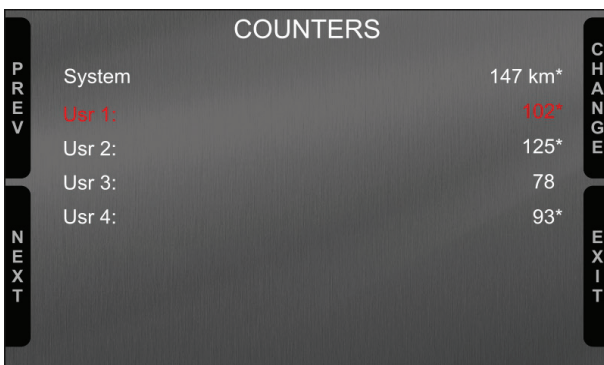


6.4 – Managing SW4 counters

SW4 features 4 user odometers, labelled User 1 – User 4, plus a non-resettable System Odometer. All odometers are shown on the configuration software Race Studio 3 too.

Each odometer can be activated/deactivated and/or reset. To manage an odometer select it and press “CHANGE”. You enter counters management page. Press:

- “CHANGE” button to change the counter status
- “PREV” and “NEXT” button to scroll the options
- “EXIT” button to save and quit





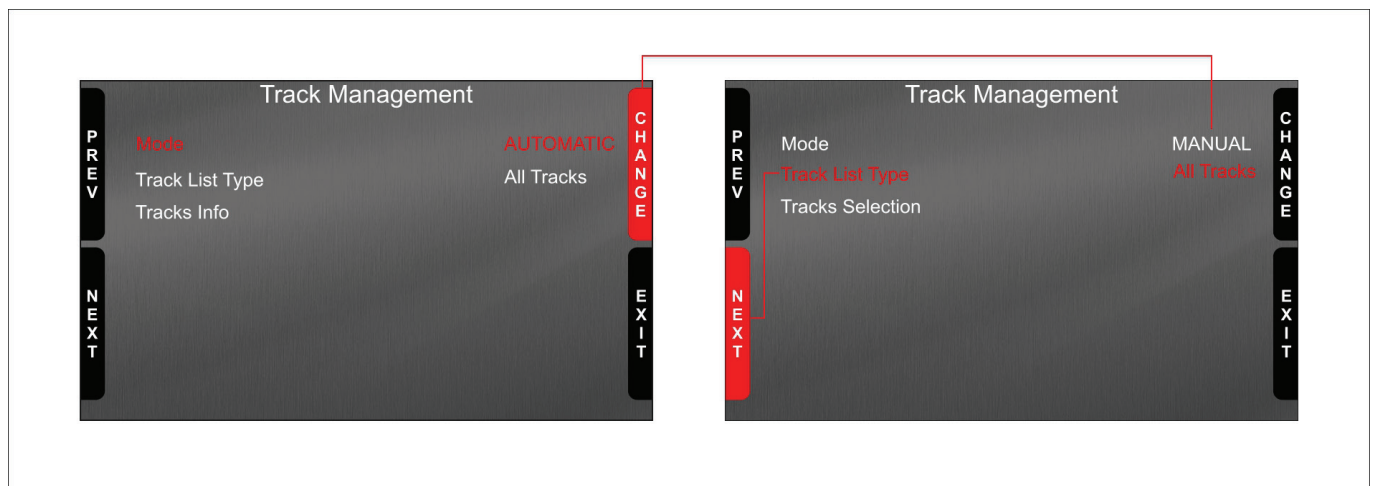
6.5 – Managing GPS & Tracks (GPS09 Module needed)

Pressing the icon above GPS&TRACKS page is prompted: press “ENTER” to enter “Track Management” page. Menu options are:

- Mode: AUTOMATIC (default) or MANUAL
- Track List Type: Nearest (default: it shows only tracks in a 10 km area), All Tracks or Custom
- The bottom line
 - warns if there are no tracks on the device or nearby
 - shows “Tracks info” if in Automatic Mode (left image below)
 - allows “Track selection” if in Manual mode (right image below)

Use:

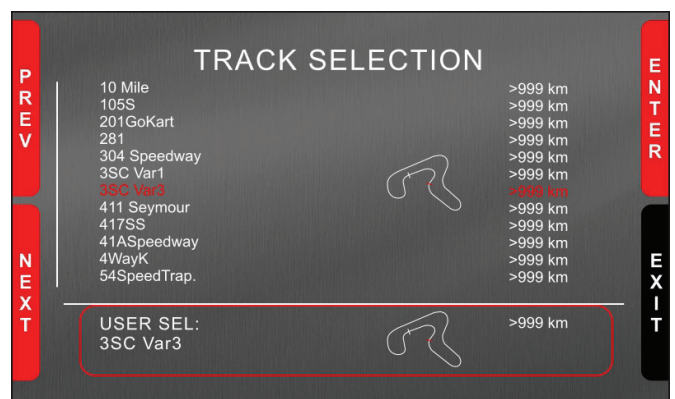
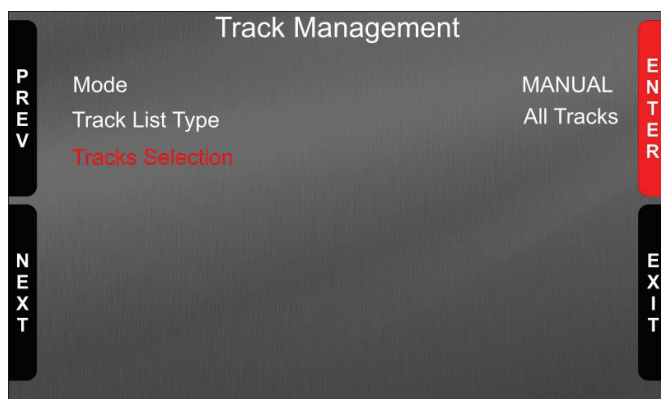
- “CHANGE” to switch the options
- “PREV”/“NEXT” to scroll the options
- “EXIT” to save and quit



When in “MANUAL” mode setting the track list type on “All tracks” you can choose the track to set also if you are not nearby. To do so:

- Scroll the menu up to “Track selection”
- Press “ENTER” (left image below)
- Use “PREV”/“NEXT” buttons to scroll the tracks and “ENTER” to select the desired track. It appears bottom of the page (right image)

In “AUTOMATIC” mode, pressing enter the system shows the tracks it detects in a 10 km distance if available or “NO TRACKS FOUND YET” if there are no tracks in a 10 km area.

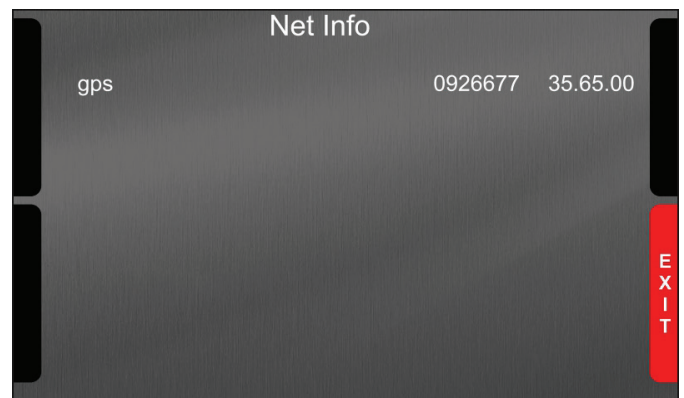
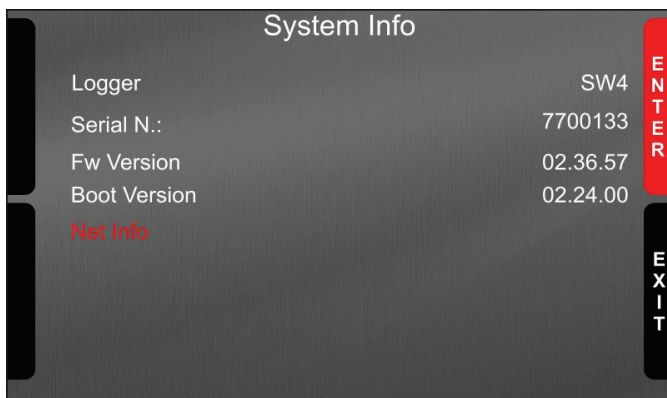




6.6 – System Information

Pressing the icon above “SYSTEM INFORMATION” page is prompted. It shows:

- Logger name (SW4)
- Serial number (7700133)
- Firmware version (02.36.57)
- Boot version (02.24.00)
- Net Info option; pressing “ENTER” “Net Info” page is prompted. It shows all connected devices with the related serial number and firmware version (0926677 and 35.65.00 respectively).





6.7 – Data Recall

Pressing the icon above “Data Recall” page is prompted. It shows:

First is “Today” page.
Press “TESTS”

TODAY 02.02PM

MAX RPM		MAX SPEED	
10048		282	
Lap	Best Laps	RPM	Km/h
4	1:57:56	10048 5592	280 73
11	1:57:94	10100 5450	277 70
8	1:58:02	10300 5700	278 69

Second is “Summary” page that shows all the last tests with date and place. Select the day you see and press “ENTER”.

TEST SESSIONS

TODAY: CGTA Avulin

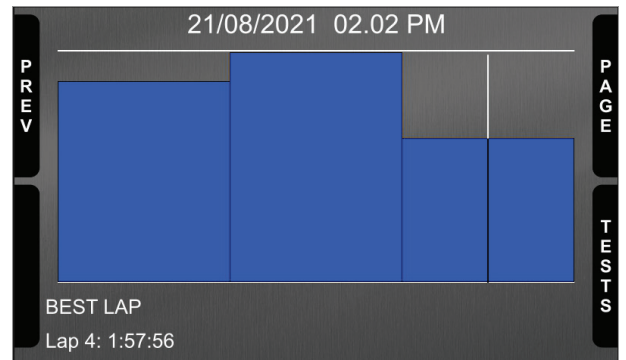
- 21/08/2021: 3SC Var3
- 21/08/2021: 3SC Var3
- 20/08/2021: 3SC Var3
- 20/08/2021: 3SC Var3

Third is “Day Summary” page that shows all tests in a box with time of the test, number of laps and best lap of the test. Select the test to see and press “ENTER”.

TODAY: 3SC Var3

02.02 PM 17 Laps B 1.57.56	12.02 AM 10 Laps B 1.50.46	10.43 AM 11 Laps B 1.54.14
09.52 AM 7 Laps B 1.55.56	09.02 AM 9 Laps B 1.53.46	7.39 AM 10 Laps B 1.55.16

This page is a histogram test summary. Moving the cursor left and right all laps and their lap time are shown.



7 – Managing a track on SW4 with RACE Studio 3

With Track Manager function of Race Studio 3 tracks can be created, deleted and modified, transmitted and received to/from SW4. Press “Tracks” icon.



The main page is divided in three columns; on the **left**:

- on top, the filters that allow to collect many tracks following customized criteria; by default, all tracks are shown (light blue “All Tracks” filter top left in the image below).
- bottom left, the connected devices (in the image, “SW4 ID 7700133”)

The column **in the middle** shows:

- on top a fast search bar that allows to select the tracks which satisfy personal research criteria; pressing “?” tooltip explaining research criteria (highlighted in red below) is prompted, to say:
 - long name is the name in bold in each track box
 - short name is the track name shown on the display of SW4 and is the name shown top right of each track box
 - track city is the name of the city the track is located in
- all the tracks listed in Race Studio 3 database.

The column on the **Right** shows:

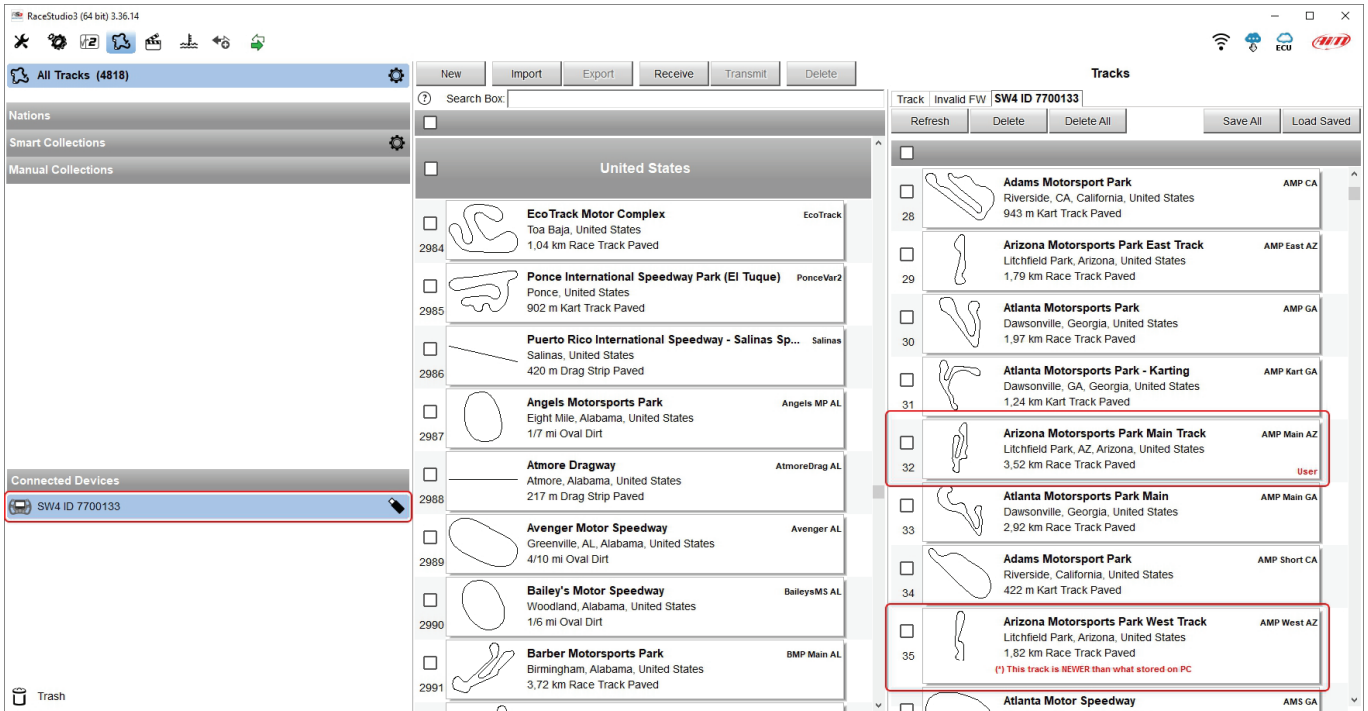
- the data sheet of the track you are mousing over.

The screenshot shows the RaceStudio3 interface with the following components:

- Left Column:**
 - Buttons: All Tracks (4818), Nations, Smart Collections, Manual Collections.
 - Search Bar: A tooltip explains search criteria:
 - track long name contains ...
 - track short name contains ...
 - track city begins with ...
 - Connected Devices: SW4 ID 7700133, Killer E2600 Gigabit Ethernet Controller, Invalid FW.
- Middle Column:**
 - Buttons: New, Import, Export, Receive, Transmit, Delete.
 - Search Box: Search Box
 - Filter: United States
 - Track List:

ID	Track Name	Location	Type
2984	EcoTrack Motor Complex	Toa Baja, United States	EcoTrack
2985	Ponce International Speedway Park (El Tuque)	Ponce, United States	PonceVar2
2986	Puerto Rico International Speedway - Salinas S...	Salinas, United States	Salinas
2987	Angels Motorsports Park	Eight Mile, Alabama, United States	Angels MP AL
2988	Atmore Dragway	Atmore, Alabama, United States	AtmoreDrag AL
2989	Avenger Motor Speedway	Greenville, AL, Alabama, United States	Avenger AL
2990	Bailey's Motor Speedway	Woodland, Alabama, United States	BaileysMS AL
2991	Barber Motorsports Park	Birmingham, Alabama, United States	BMP Main AL
- Right Column:**
 - Section: Tracks
 - Track Name on Device: PonceVar2
 - PR-2 - 00716 - Ponce
 - United States
 - +1 787 290 2000
 - Time Zone: (UTC-04:00) Georgetown, La Paz, Manaus, San Juan (AST)
 - Local: 2021, ago 31 05:01 (NO DST)
 - Map: Aerial view of the track with a blue line indicating the track layout. Location: Autódromo Rafael Hernández Colón.
 - Coordinates: Start/Finish, Latitude 17.9714347° N, Longitude 66.6749550° W

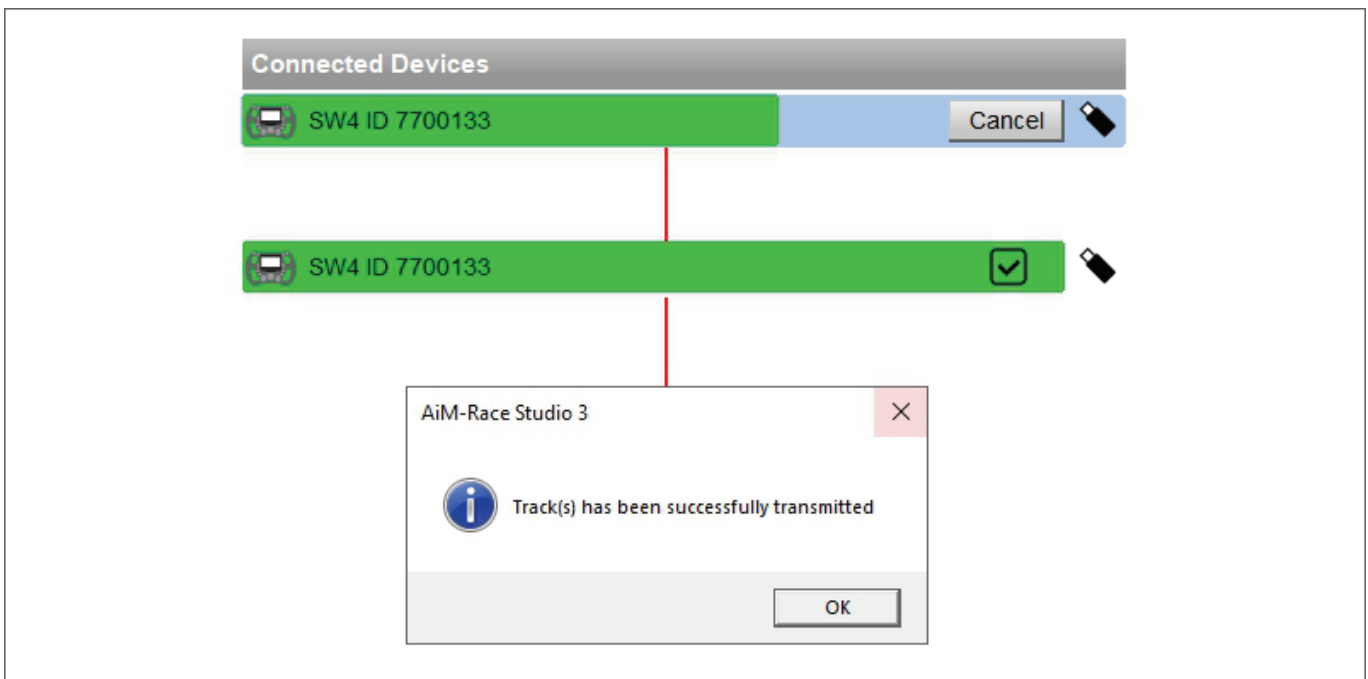
When SW4 is connected it is shown on the left bottom part of the page. Clicking on it all the tracks it contains are shown in the right column of the page.



Tracks created by the user are labelled "User" and if the track stored in SW4 is different from the one stored on AiM database this is notified as shown here above.

To upload tracks to SW4 select them in the central column and drag and drop them in the right column:

- a green waiting bar appears bottom left of the window on the connected SW4
- when the operation is finished a confirmation panel will be prompted.



The keyboard above the central column allows to:



- **New:** create a new track ("Custom"). To create a custom track:
 - press "New" and fill in the panel that is prompted (you can also fill only the start/finish coordinates) or
 - edit an existing track
 - press "Save"
- **Import:** import one or more tracks stored in the device or in another external device
- **Export:** export one or more tracks to a specific PC folder or to another peripheral device
- **Receive:** receive from the connected device tracks user created (if no device is connected the button is disabled)
- **Transmit:** transmit one or more tracks from the PC to the connected device (if no device is connected the button is disabled)
- **Delete:** delete one or more tracks from Race Studio 3 database

The keyboard above the right column allows to:



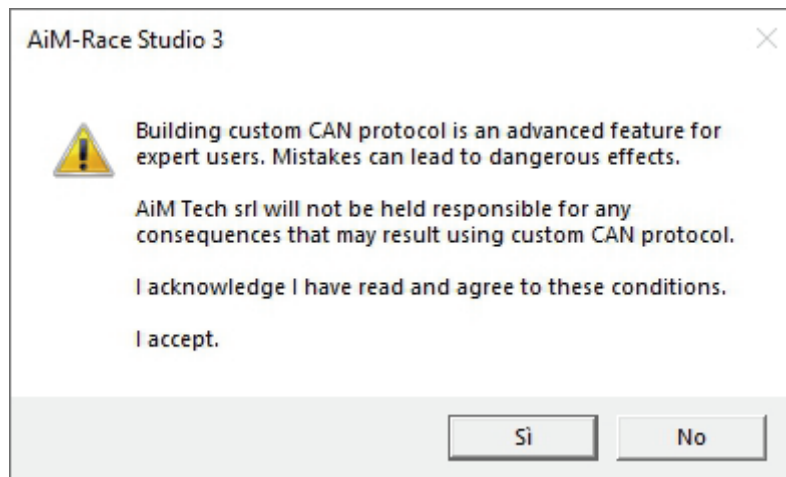
- **Refresh:** refresh the track list stored in the connected device
- **Delete:** delete one or more tracks from the device memory
- **Delete All:** delete all tracks stored in the device memory
- **Save all:** save all the tracks stored in the connected device; it creates a zip file that can be loaded to another AiM device
- **Load Saved:** load the tracks previously saved in the device memory

Since the software is constantly updated, may be other information or features will be available soon. Please check our website www.aim-sportline.com, documentation area, software section "Track Manager" manual.

8 – ECU Driver builder

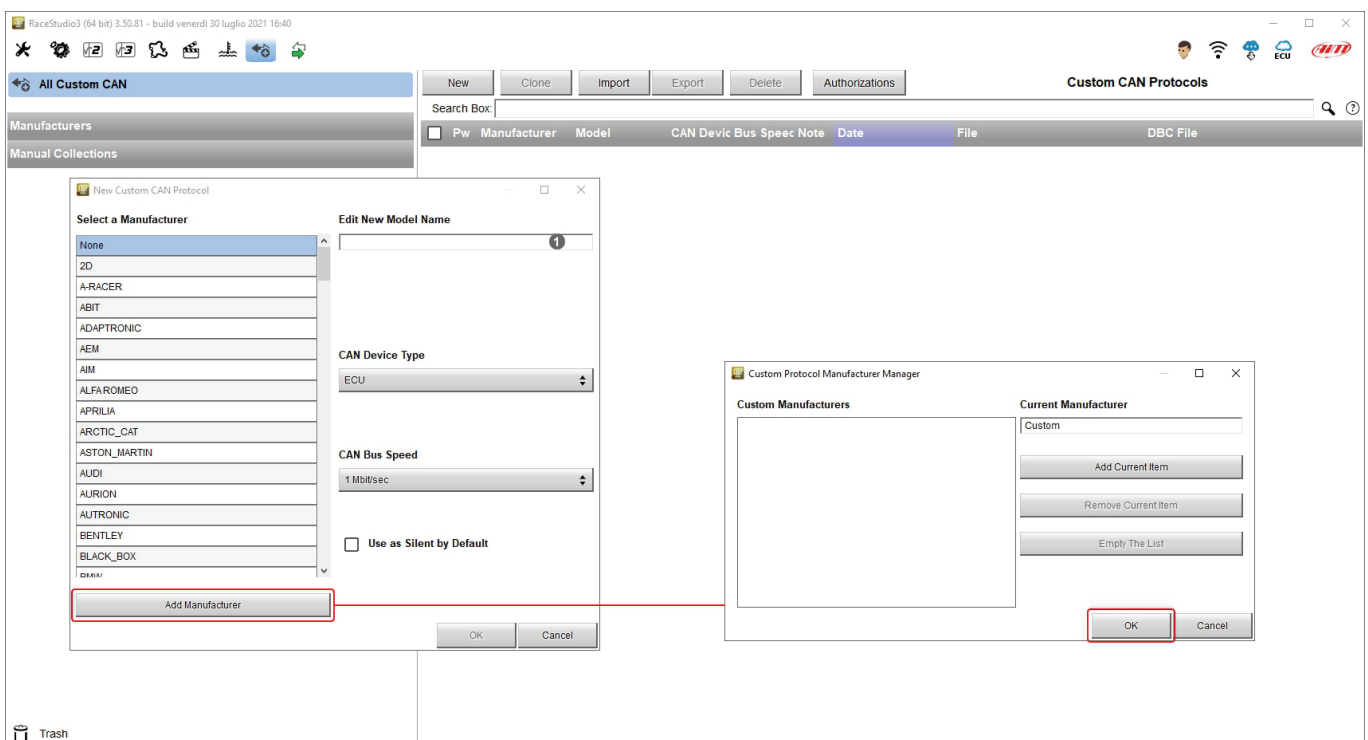


If the vehicle ECU is not included in Race Studio 3 software a specific CAN protocol can be created using CAN Driver builder. **This Race Studio function is for expert users only** as for the panel that is prompted pressing the related button.



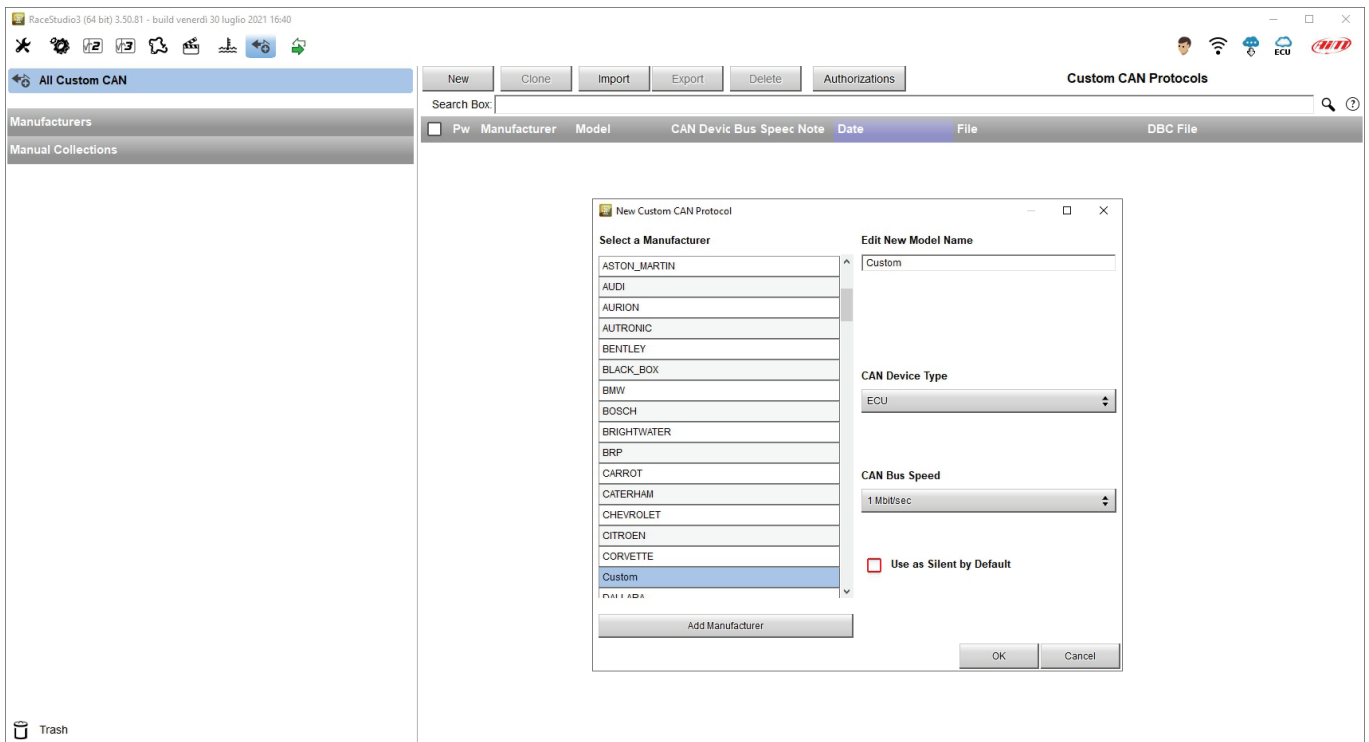
It is possible to add a new ECU Manufacturer and/or a new ECU model. To do so:

- press “New” on the top central keyboard
- “New Custom CAN Protocol” panel is prompted
- press “Add Manufacturer” to add a new Manufacturer and “Custom Protocol Manufacturer Manager” panel is prompted
- fill in the Manufacturer name (“Custom” in the example below)
- press “OK”
- to add a new ECU Model for an existing Manufacturer just select the manufacturer and fill in “Edit new model name” box (1).



The software comes back to “New Custom CAN Protocol”:

- select the ECU Manufacturer previously created
- fill in the Model name in the panel top right box
- select the CAN Device type; available options are:
 - ECU
 - other CAN Devices
- select the CAN Bus speed; available options are:
 - 125 Kbit/sec
 - 250 Kbits/sec
 - 500 Kbit/sec
 - 1 Mbit/sec
- if the network features multiple devices we suggest to enable “Use a Silent by Default” checkbox (please refer to paragraph 5.2 for further information concerning this option)
- press “OK” and a new CAN Driver has been added



For further information about how to set the new CAN Driver refer to the CAN Driver builder user manual downloadable from our website www.aim-sportline.com, documentation area software/firmware section.

9 – The device window

The device window is shown clicking the device bottom left of the software page.

The screenshot shows the 'Live Measures' window for device SW4 ID 7700133. The window title bar includes 'Live Measures', 'Download', 'Properties', 'Settings', 'Tracks', 'Counters', 'Logo', and 'Firmware'. The main display area is divided into 'Master' and 'ECU channels' sections. The 'Master' section shows readings for Left Clutch (2%), Right Clutch (1%), Logger Temp (46 C), and Battery (12.4 V). The 'ECU channels' section lists various sensors and their units, such as ECU PPS, ECU SLIP ANG, ECU TPS, ECU ACC LONG, ECU ACC LAT, ECU IGN ANG1, ECU SPARK ADV1, ECU SPARK ADV2, ECU SPARK ANG1, ECU SPARK ANG2, ECU STEER POS, ECU GYRO, ECU STEER SPD, ECU IGN ANG2, ECU LAMB1 ERR, ECU USER06, ECU USER07, ECU USER08, ECU BARO, ECU BOOST, ECU CLUCH P, ECU INJ P1, ECU INJ P2, ECU MAN AIR P, ECU BRK P, ECU BRK P FL, ECU BRK P FR, ECU BRK P RL, ECU BRK P RR, ECU FUEL P, ECU FUEL T, ECU GEAR BOX T, ECU INT AIR T, ECU LAMB T1, ECU LAMB T2, ECU OIL T, ECU ENG T, ECU GEAR TIME, ECU INJ TIME1, ECU INJ TIME2, ECU ENG TORQ, ECU THRT VOLT, ECU V BATT, ECU FUEL LEV, and ECU FUEL USE.

Top of the window (red hedged in the image below) are 8 layers used to:

- **Live Measures:** check device channels and force online values; the buttons of the top keyboard are to:
 - start live measures (1)
 - sort the channel visualization as preferred: as managed by the firmware (sort by configuration), alphabetically, by channel type: they will be shown by device then by channel type and at the end by measure type (2)
 - auto-calibrate sensors that need it (3)
 - show the measure in Mv (4)
 - start recording (5)
 - make the device LEDs blink (6); this is the easiest way to test PC-logger connection
- **Download:** download data stored in SW4
- **Properties:** name the device fill in racer's and vehicle name or number, championship and venue type (generic or qualifying testing, warm up, race, test type)
- **Settings:**
 - set date
 - enable/disable daylight time
 - set time format and time zone
- **Tracks:** manage the tracks stored in the device memory
- **Counters:** set/reset the device odometers
- **Logo:** transmit/receive the logo that shows up when switching the device on; supported image formats are JPEG or BMP; always use the most recent Windows™ versions (Windows8 or Windows10) whose graphic libraries are more updated
- **Firmware:** check or update SW4 firmware version.

9.1 – Online value forcing

Device page Live measures layer features a very useful option: online measure value forcing that allows the user to simulate one or more channels value to test icons, alarms, power output and harnesses behaviour.

With reference to the configuration we created it is possible to verify if Water Alarm status variable works.

The set conditions (paragraph 5.6) are: water Temperature greater than 100 +RPM greater than 2000. To force these values:

- mouse over the value to force and click the setting icon
- a popup menu appears: select “Force Value” option and fill in the panel that appears
- click “OK” and the LED blinks continuously as set in the device configuration.

The screenshot shows the RaceStudio3 interface with the 'Live Measures' window for SW4 ID 7700133. The window displays a table of ECU channels. A 'Choose value' dialog box is open for the 'F88 ECT1' channel, showing '32 bit Float' set to 105 and 'Step' set to 0.1. The 'OK' button is highlighted with a red box. In the background, the 'F88 GEAR VOLT' channel is highlighted with a red box, and its settings are visible: 'Switch to F', '0 decimal places', and 'Force Channel Value'.

Master			
Left Clutch	1 %	Logger Temp	39 C
Right Clutch	1 %	Battery	12.7 V
Luminosity 0 %			
ECU channels			
F88 ETOH CONT	--- %	F88 COOL PRESS	--- bar
F88 PPSA	--- %	F88 CRANK1 PR	--- bar
F88 PPSB	--- %	F88 GEAR PRESS	--- bar
F88 WHEEL SPIN	--- %	F88 MAP1	--- bar
F88 TPS1	--- %	F88 MAP2	--- bar
F88 LONG ACC	--- g	F88 OVERBOOST	--- bar
F88 LAT ACC	--- g	F88 FUEL PR1	--- bar
F88 STEER ANGLE	--- deg	F88 FUEL PR2	--- bar
F88 TRBO SPD1	---	F88 FUEL PR2	---
F88 TRBO SPD2	---	F88 ECT1	---
F88 CAL SWITCH	---	F88 ECT2	---
F88 DBW STATUS	---	F88 GEAR VOLT	---
F88 ENG ENABLE	---	F88 VBATT	---
F88 KNK STATUS	---	F88 FUEL CONS	---
F88 PIT SWITCH	---	F88 AFR 1	---
		F88 AFR 2	---



As shown in the image below, once the values have been forced they are shown right of the page red hedged. With the two “+” and “-” lateral buttons it is possible to change the forced values.

The screenshot shows the RaceStudio3 interface for SW4 ID 7700133. The 'Live Measures' tab is active, displaying a table of ECU channels. Two channels are highlighted with red boxes: 'F88 ECT1' with a value of 105.0 C and 'F88 RPM' with a value of 2500 rpm. To the right of the table, there are two control panels for these channels, each with '+' and '-' buttons for adjustment.

ECU channels		
F88 ETOH CO...	---	%
F88 PPSA	---	%
F88 PPSB	---	%
F88 WHEEL S...	---	%
F88 TPS1	---	%
F88 LONG ACC	---	g
F88 LAT ACC	---	g
F88 STEER A...	---	deg
F88 TRBO SP...	---	deg/s
F88 TRBO SP...	---	deg/s
F88 CAL SWIT...	---	#
F88 DBW STA...	---	#
F88 ENG ENA...	---	#
F88 KNK STA...	---	#
F88 PIT SWIT...	---	#
F88 TC SWITCH	---	#
F88 ALS STATE	---	#
F88 BARO PR	---	bar
F88 COOL PR...	---	bar
F88 CRANK1 ...	---	bar
F88 GEAR PR...	---	bar
F88 MAP1	---	bar
F88 MAP2	---	bar
F88 OVERBO...	---	bar
F88 FUEL PR1	---	bar
F88 FUEL PR2	---	bar
F88 OIL P1	---	bar
F88 OIL P2	---	bar
F88 OIL P3	---	bar
F88 OIL P4	---	bar
F88 D SPEED	---	km/h
F88 SPEED FL	---	km/h
F88 SPEED FR	---	km/h
F88 SPEED RL	---	km/h
F88 SPEED RR	---	km/h
F88 V SPEED	---	km/h
F88 BTMAX	---	C
F88 FUEL T	---	C
F88 ACT1	---	C
F88 ACT2	---	C
F88 EGT1	---	C
F88 EGT2	---	C
F88 EOT	---	C
F88 ECT1	105.0	C
F88 ECT2	---	C
F88 GEAR VOLT	---	mV
F88 VBATT	---	V
F88 FUEL CO...	---	l
F88 AFR 1	---	A/F
F88 AFR 2	---	A/F
F88 GEAR	---	gear


10 – Data download and analysis

Once the test session is over it is possible to download data sampled on a PC. Connect SW4 logger to a PC using the USB cable and click on it bottom left of the software page. Once reached the device page activate “Download”. layer It shows all the information concerning the file stored in the logger: number of laps, best lap, date/time, file dimensions. Select the file(s) to download and press “Download” button.

Through the setting icon far right of the page you can merge sessions of the same day, merge all sessions, change data download settings and format of SW4 thereby erasing all data.

The screenshot shows the RaceStudio3 interface for device SW4 ID 7700133. The 'Download' button is highlighted in red. A context menu is open over the data table, showing options: 'Merge sessions of the same day', 'Merge all sessions', 'Settings...', and 'Format Data Memory'. The data table lists files with columns for date, time, and file size.

Date	Time	File Name	Size
ago 29	01:56	a_0008	Format Data Memory
set 04	01:19	a_0001.xrz	708.00 kB
mar 14	08:42	a_0005.xrz	414.42 kB
mar 14	08:42	a_0010.xrz	1.74 MB
mar 14	08:42	a_0003.xrz	414.52 kB
mar 14	08:40	a_0006.xrz	44.00 kB
mar 14	08:40	a_0009.xrz	845.58 kB
mar 14	08:39	a_0002.xrz	198.47 kB
mar 14	08:39	a_0004.xrz	200.08 kB
mar 14	08:39	a_0007.xrz	526.08 kB

After download press Analysis Icon () and Race Studio Analysis 3 software starts showing all the files available for analysis. Double clicking on the desired one it is possible to start analysing your performance.

Please refer to Race Studio 3 Analysis user manual, that can be freely downloaded from www.aim-sportline.com, download area, software/firmware section, for further information about its working mode.

11 – New firmware upgrade



Our technicians and engineers are constantly working to improve both the firmware (the application that manages the device) and the software (the application installed on the PC).

Each time a new firmware and/or software version is available the icon here above appears with an arrow indicating that something is available for download (otherwise the icon only shows the cloud). They are identified by a red “NEW” label.

Click it and freely download the new applications.

Connected Devices: SW4 ID 7700133

Download | Install SW | Export | Import | Update Device

Software - Installed version: 'RaceStudio3 (64 bit) 3.50.81 - build venerdi 30 luglio 2021 16:40'

<input type="checkbox"/>	Name	On the web	Downloaded	Info
<input type="checkbox"/>	RaceStudio3 (64 bit)	3.50.81	3.50.81	
NEW <input checked="" type="checkbox"/>	SmartyCam HD	01.04.44	01.04.42	
<input type="checkbox"/>	MX2E	02.32.79	02.32.79	
<input type="checkbox"/>	MXG 1.2	02.36.65	02.36.65	
<input type="checkbox"/>	MXG 1.2 Strada	02.36.65	02.36.65	
<input type="checkbox"/>	MXK10	02.28.43	02.28.43	
<input type="checkbox"/>	MXK10(11-15)	02.28.43	02.28.43	
<input type="checkbox"/>	MXP	02.36.65	02.36.65	
<input type="checkbox"/>	MXP Strada	02.36.65	02.36.65	
<input type="checkbox"/>	MXS 1.2	02.36.65	02.36.65	
<input type="checkbox"/>	MXS 1.2 Strada	02.36.65	02.36.65	
<input type="checkbox"/>	MX UTV	02.32.40	02.36.18	
NEW <input checked="" type="checkbox"/>	MXm	02.36.71	02.36.65	
<input type="checkbox"/>	MXsl	02.36.65	02.36.65	
<input type="checkbox"/>	MyChron5-660	02.36.55	02.36.55	
NEW <input checked="" type="checkbox"/>	MyChron5S	02.36.71	02.36.55	
<input type="checkbox"/>	PDM32	02.36.51	02.36.51	
<input type="checkbox"/>	PDM08	02.36.51	02.36.51	
<input type="checkbox"/>	Solo 2	02.36.65	02.36.65	
<input type="checkbox"/>	Solo 2 DL	02.36.65	02.36.65	
NEW <input checked="" type="checkbox"/>	SW4	02.36.66	02.36.71	

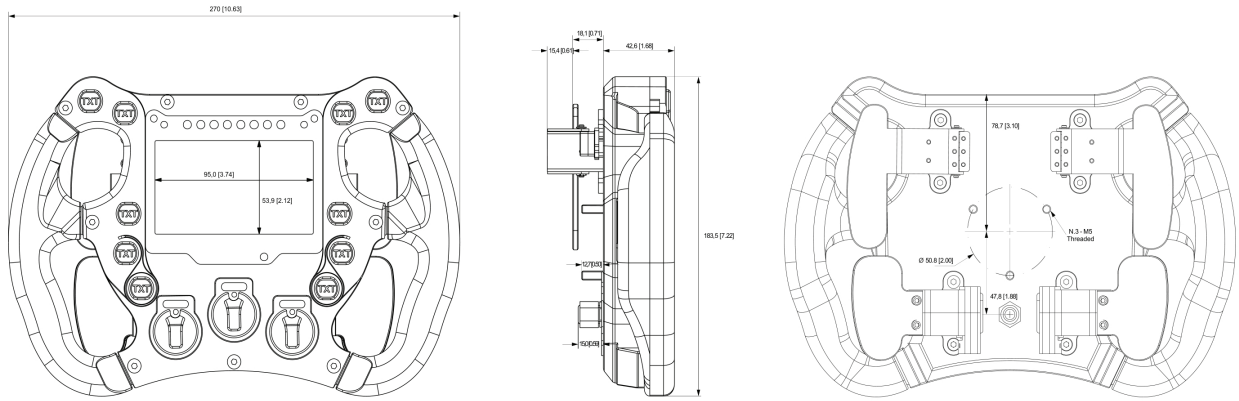


12 – Technical specification and drawings

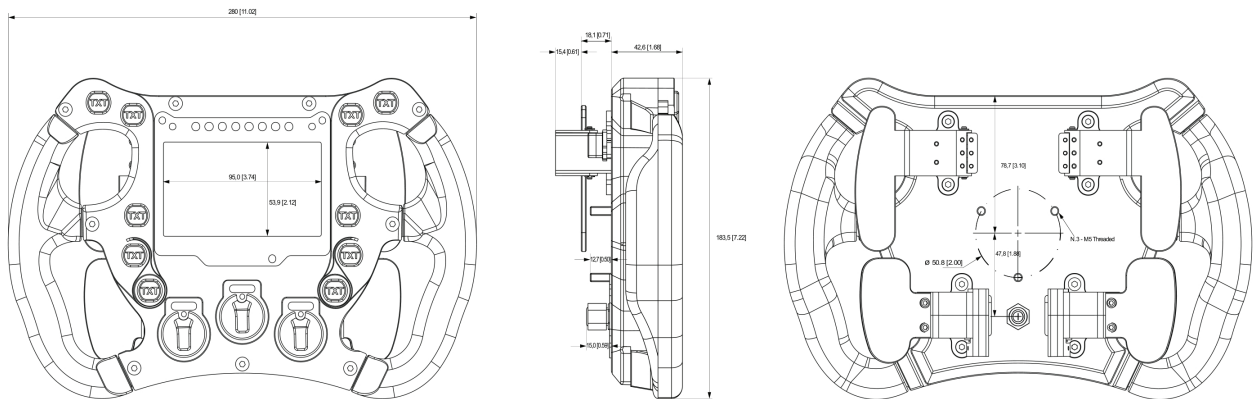
- **TFT Display dimensions** 4.3" TFT (SW4 270 and SW4280)
5" TFT (SW4 320 and SW4 350)
- **Resolution** 800x480 pixels
- **Contrast** 800:1
- **Brightness** 800cd/m² – 1,100 Lumen (SW4 270 and SW4280)
800cd/m² – 1,200 Lumen (SW4 320 and SW4 350)
- **Ambient light sensor** YES
- **Configurable Alarm icons** YES
- **Shift lights** 8 configurable RGB LEDs
- **Alarm RGB LEDs** 4 configurable
- **CAN connections** 3
- **CAN ECU connections** YES
- **Internal memory** 4 GB
- **Body** Anodized Aluminium
- **Pushbuttons** 10 with RGB backlight
- **Rotary switches** 3 with RGB backlight
- **Connector** 22 pins Deutsch male Autosport
- **Dimensions in mm** 270x183.5x42.6 (SW4 270)
280x183.5x42.6 (SW4280)
320x183.5x42.5 (SW4 320)
350x183.5x45.5 (SW4 350)
- **Weight** 2400 g (SW4 270)
2400 g (SW4 280)
2600 g (SW4 .320)
2600 g (SW4 350)
- **Power consumption** 500 mA
- **Waterproof** IP 65



SW4 270 Dimensions in mm [inches]

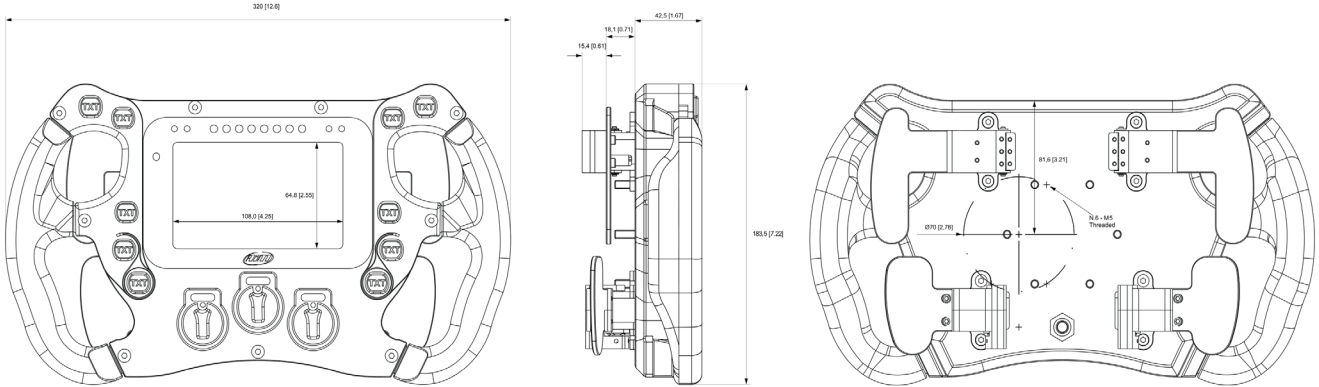


SW4 280 Dimensions in mm [inches]

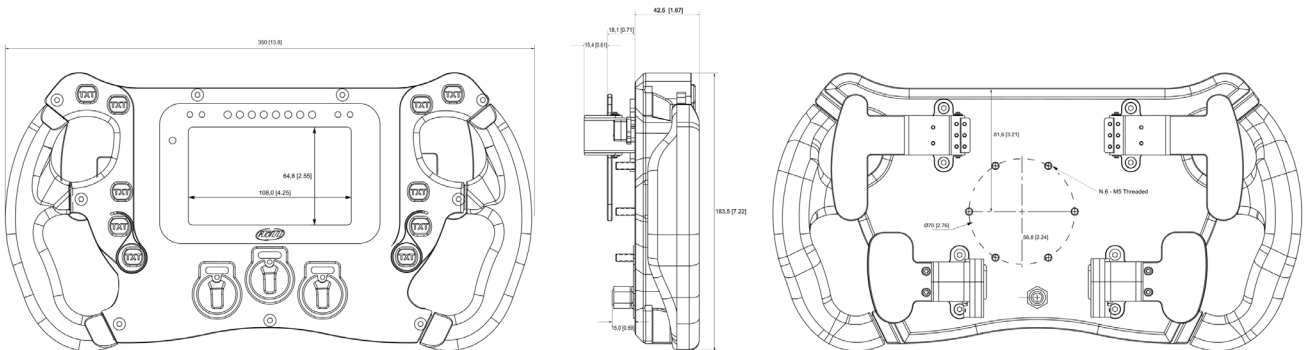




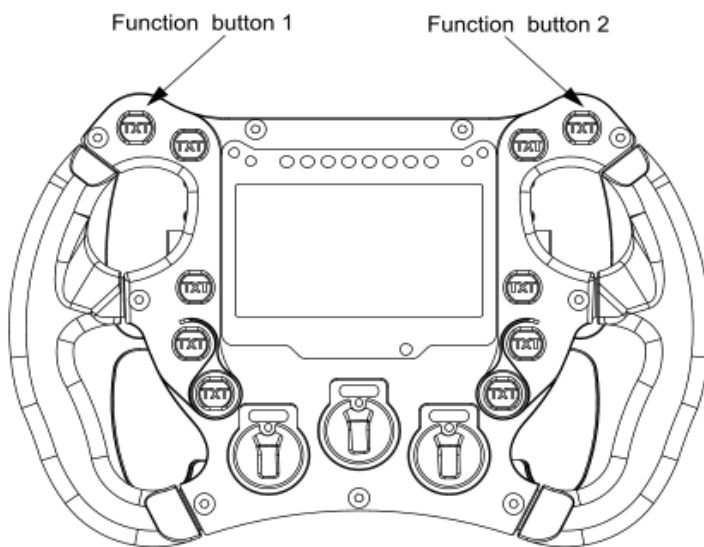
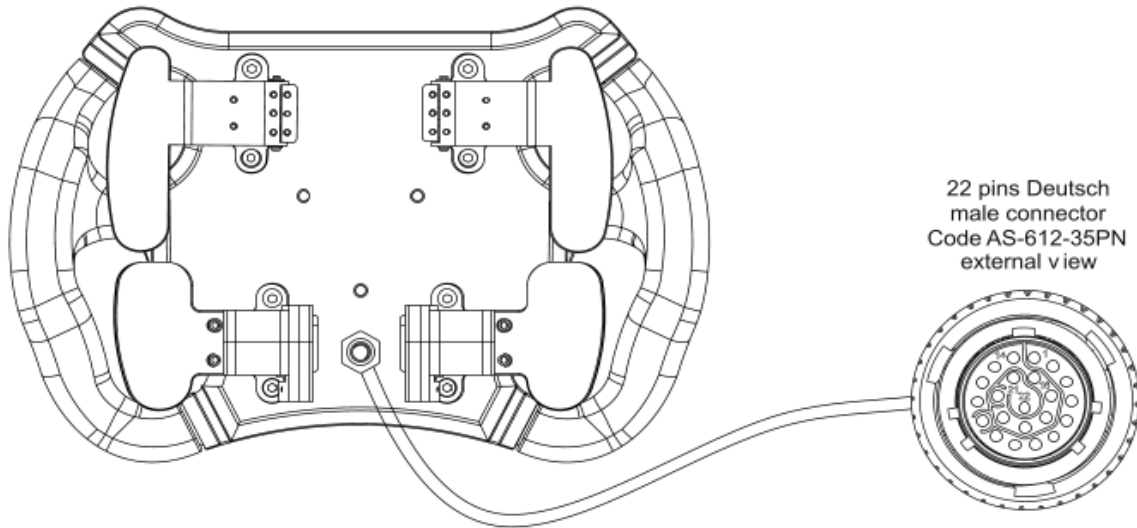
SW4 320 Dimensions in mm [inches]



SW4 350 Dimensions in mm [inches]



SW4 Pinout



Pin	Signal
1	9-15V Power input
2	CAN ECU+
3	CAN ECU-
4	Left Paddleshift
5	Right Paddleshift
6	Paddleshift COM
7	Function Button 2
8	CAN 2+
9	CAN 2-
10	Function button 1
11	USB D+
12	USB D-
13	CAN AiM +
14	GND
15	CAN AiM -
16	RPM
17	N.C.
18	Function button 2
19	GND
20	Function button 1
21	+Vbext CAN
22	+Vbout CAN

All other push buttons and all rotary switches on CAN Bus