User Manual

AiM Steering Wheel 4

Release 1.00







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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
- CAN 2
- 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



SW4 Expansions

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



2 – SW4 models

AiM Steering wheel 4 (from here onwards 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	٠	٠	•	•
Contrast 800:1	٠	٠	•	•
Brightness	800cd/m2 –	1,100 Lumen	800cd/m2 –	1,200 Lumen
Ambient light sensor	٠	٠	•	•
Configurable Alarm icons	•	•	•	•
8 configurable RGB LEDs shift lights	•	•	•	•
4 configurable Alarm RGB LEDs	•	•	•	•
3 CAN connections	•	•	•	•
4 GB Internal memory	•	•	•	•
Anodized Aluminium body	•	•	•	•
10 Pushbuttons*	•	•	•	•
Rotary switches*	3	3	3	3
22 pins Deutsch male Autosport Connector	٠	٠	٠	٠
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	٠	٠	٠	•
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, SW4 features

- 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



From 1 to 3 rotary switch(es)



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.



Each button can be configured as momentary toggle or Multiposition and is to be configured according to the function it is associated with.



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; if you don't the configuration is named as the device (John Hawk in this case) and progressively numbered if more configurations 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 correlated to these two pushbuttons are:

Let Button : Pin 10 – Pin 20 Right Button: Pin 7 – Pin 18







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 the "Buttons layer"

The pushbuttons may be used in the following ways:

- Display pushbuttons: The display needs, for a complete management, 4 dedicated pushbuttons:
 - **Menu / <<**: Enters the display Menu and scrolls the options back.
 - **View / Quit**: Navigates data recall and leave a display page.
 - >> : Scrolls the options forward.
 - **MEM/OK** : Recalls stored data and enters a page



- **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. 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:
 - o 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.

Momentary and Toggle working modes are shown here below.

	Channel Settings		×
	Name	Left PadShift	
	Function	Digital Status :	;
	Sensor	Status	
	Sampling Frequency	20 Hz	
When button is long time pressed As soon as it is released, output ca You can edit labels for the short as	I, output sets to 'Long time' status ames back to its resting status: 'O nd long pressure status and time t	s. The pressure time allows? You to switch be then pressed again using the same You can edit labels for the short and long	tween these 2 status. ure time, output cames back to its resting 'Not active' status. pressure status and time transition.
	Rest OFF	Momentary O 19gle Multiposition use as button with pressure time dependent status Threshold for shortlying pressure time (sec) 0.5 Short time SHORT Long time LONG	



Multiposition working mode is shown here below.

	🚈 Channel Settings	X
	Name	Left PadShift
	Function	Digital Status
	Sensor	Status
	Sampling Frequency	20 Hz
At start, without pressing When button is short tim When button is long time) button, the resting status is with Res ne pressed, output sets to 'Short time' e pressed, output sets to 'Long time'	st label shown. After last short time pressed, its repeats the cicle starting from the first one. ' status. Each time button is long time pressed, output sets to a wanted status (set by third column and different from starting st status. ' status. For each status You can edit labels and, when long time pressed, the wanted ending status
At start, without pressing When button is short tim When button is long tim You can edit labels for th You can set the transition	y button, the resting status is with Res te pressed, output sets to 'Short time' pressed, output sets to 'Long time' e short and long pressure status. I time between short and long state.	table shown. I status. Statu





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 Bu	tton 2' Setting		- 1	
utton use	O for Display	as Channel		
		Name Left Button 2		
		Work As 🚫 Momentary 💿 Toggle 🚫 Multiposition		
		Use timing Time threshold between short and long status sec 0.5		
		Rest Status Active Status Long Status		
		Label Value Label Value Value		
		OFF 0 0N 1 LONG 2		
Led Co	onfiguration			
et Color	White 🗘	continuously \$ when following condition is verified for at least 0 sec		Ø,
	Off Off	continuously		
	Red	slow blinking		
	Green	fast blinking		
	Blue	Ad	d New Output S	tate
	Magenta			1
	Cyan			
	White			
	Left Button 2 equal to ON	Add		
		Click to add another cond	lition	
Con	ndition		>	al
	Iways TRUE O Alway	s FALSE		
	eft Button 2	▲ equalito ▲ constant 🖌 ON ▲		
	RUE after a time of 0	Sec. in which it is verified FAI SE after a time of Sec. in which it is no longer ver	rified	
			Canaal	
		UN	Calicer	
		s	ave	Cance





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.

	🔛 'Left Button 2' Setting —	×
	Button use 🔘 for Display 🔘 as Channel	
	Name Left Button 2	
	Work As O Momentary 💿 Toggle O Multiposition	
	Use timing Time threshold between short and long status sec 0.5 Rest Status Active Status Long Status Label Value Label Value	
	OFF 0 ON 1 LONG 2	
	Set Color Blue 💠 continuously 💠 when following condition is verified for at least 0 sec	priçrity
	Conditions OR =	
	Set Color Red \Leftrightarrow continuously \diamondsuit when following condition is verified for at least 0 sec \diamondsuit	
put States	Conditions Add	
	Add	
	GPS Speed greater than 250 km/h Add	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
		Minimize Priority for This Output State



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 RBG 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.

Name	RotaryLeft				
Position	Label	Value			
1	L1	0			
2	L2	1			
3	L3	2			
4	L4	3			
5	L5	4			
6	L6	5			
7	L7	6			
8	L8	7			



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





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.

👛 RaceStud	io3 (64 bit) dev 3.00.19 - buil	d giovedî 24 giu	gno 2021 12:58	i i													1	σ×
*	🀲 🖅 🖓	53 E	_	*0	a) 1	Laura 훅	•	ECU	an
All SW4 3	٩																	
Save	Save As	Close	Transmit															
Channels	Buttons ECU Stream	CAN2 Stre	am CAN E	Expansion	s Math Channels	Status Variables	Parameters	Shift Lights and Alarms	Trigger Co	mmands	Icons Manager E	Display	SmartyCam S	Stream	CAN Output			
			ID		ame	Function		Sensor	Unit	Freq	Parameters							
			RPM	v F	PM	Engine RPM		RPM Sensor	rpm	20 Hz	max: 16000 ; fact	or: /1 ;		1				
			LCIh	1	eft Clutch	Percent		Percentage Pot. Calib	96	100 Hz								
			RCIh	P	ight Clutch	Percent		Percentage Pot. Calib	%	100 Hz								
			LPS	ا ا	eft Pad Shift	Digital Status		Status		20 Hz								
			RPS	• F	ight Pad Shift	Digital Status		Status		20 Hz]				
			PAccu	v (PS PosAccuracy	GPS Accuracy		GPS	m 0.01	10 Hz								
			Spd	v (iPS Speed	Vehicle Spd		GPS	km/h 0.1	10 Hz								
			Alt	V /	ltitude	Altitude		GPS	m	10 Hz								
			OdD	v (dometer	Odometer Total		Odometer	km 0.1	1 Hz]				
			Luma	v 1	uminosity	Brightness		Luminosity	96	1 Hz								
			Tlog	Γ	oggerTemp	Temperature		Logger Temperature	С	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 Tab:

🖥 RaceStudio3 (i	64 bit) 3.50.83 - build mart	tedi 3 agosto 202	1 19:59										
All SW4 34	1 1												
Save Channels B	Save As uttons ECU Stream	Close CAN2 Strea	Transmit CAN Expansions	Math Channels	Status Variables	Parameters	Shift Lights and Alarms	Trigger Commands	k Icons Manager	Display	SmartyCam Stream	CAN Output	
		Bit	Rate Protocol (bit/s)	1 M bit/	в 🜩						Name		
			CAN ID (hex)	Byte	0 E	lyte 1	Byte 2	Byte 3	Byte 4	Byte	5 Byte	6	Byte 7
		6	• 0x100	Left But	ton 2 Left	Button 3	Left Button 4	Left Button 5	Right Button 2	Right Bu	itton 3 Right Bu	itton 4	Right Button 5
		ſ	+ Add New Payload								Expo	rt	Import

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:



Math Channels Status Variables Parameters Shift Lights and Alarms Trigger Commands Icons Manager Display SmartyCam Stream CAN Ou

Bias	To calculate the bias of two channels VALUE = CH1 / (CH1 + CH2)								
Bias with Thresholds	To calculate the bias of two channels only if they are greater than specified value $VALUE = CH1/(CH1 + CH2)$ (if both thresholds are exceeded, else 0)								
Calculated Gear	To calculate the gear position from engine rpm and vehicle speed								
Precalculated Gear To calculate the gear position from engine rpm and vehicle speed, speedy gear ratio for each gear and the ante ratio									
Linear Corrector	To multiply a measure by a factor then add an offset value VALUE = (a * CH) + b								
Simple Operation	To add to or subtract from a channel value a constant value or another channel v e.g. VALUE = (CH1 + CH2)								
Division Integer	To get the integer part of the division $\label{eq:VALUE} \begin{tabular}{lll} VALUE = integer(CH / a) \end{tabular}$								
Division Modulo	To get the remainder part of the division $\label{eq:VALUE} \text{ VALUE} = \text{CH } \% \text{ a}$								
Bit Composed	To Compose 8 #ags in a bit-5eld measure VALUE = 11 + 12*2 + 13*4 + 14*8 + 15*16 + 16*132 + 17*84 + 18*128								

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

Math Channels	Status Variables	Parameters	Shift Lights a	and Alarms	Trigger Commands	Icons Manage							
	Add	📓 Mathemati	cal Channel Settin	gs		×							
	ID	Name	Bu	ttons									
	BtC	Sampling Freq	uency 10	10 Hz									
		Display Precisi	on no	decimal place	3	\$							
		-Bit Composit	Bit Compositing Operation										
		Enable											
		Flag	Channel 1 (f1)	Left Button :	2	\$							
			Channel 2 (f2)	Left Button	\$								
		Flag	Channel 3 (f3)	Left Button	4	\$							
		Flag	Channel 4 (f4)	Left Button	5	\$							
		Flag	Channel 5 (15)	Right Buttor	12	\$							
		Flag	Channel 6 (f6)	Right Buttor	13	\$							
		Flag	Channel 7 (f7)	Right Buttor	14	\$							
		Flag	Channel 8 (f8)	Right Buttor	\$								
			VALUE = f1 + f2*2	+ f3*4 + f4*8 +	• f5*16 + f6*32 + f7*64 + f8	*128							
					Court	Cancel							

Finally, you may transmit this channel through CAN:

* 🐲	/2	æ 🧐 e	5 <u>4</u>	*8										
All SW4 *	۰ • ا	Save As	Close	Transmit										
Channels	Buttons	ECU Stream	CAN2 Stre	eam CAN Expansion	s Math Channels	Status Variables	Parameters	Shift Lights and Alarms	Trigger Commands	Icons Manager	Display	SmartyCam Stream	CAN Output	
Can 1 Can	2													
				Bit Rate Protocol (bit/s)	1 M bit	/s 🗢						Name		

Bit Rate Protocol (bibs)	T III DIUS 🗢]				Ivame		
CAN ID (hex)	Byte 0	Byte 1		Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
✓ 0x100	Left Button 2	Left Button 3	Left Button 4	Left Button 5	Right Button 2	Right Button 3	Right Button 4	Right Button 5
✓ 0x200	Buttons	сн►		h	- NO OUTPUT -	h		å.
-	1							
+ Add New Payload							Export	Import

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

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

×								
D								
AII SW4 ¹² SW4 17 02 01 ¹²								
Save SaveAs Close Transmit								

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.

🔤 RaceStudio3 (64 bit) 3.50.77 - build mercoledi 21 luglio 2021 19:32											-		o x
* 🐲 🖻 🖻 ዄ 📥 🕫 🕸									9	((:-	•	0	(III)
All SW4 ³⁴													
Save Save As Close Transmit													
Channels Buttons ECU Stream CAN2 Stream CAN	Expansions Math Channels	Status Variables Parameters	Shift Lights and Alarms	Trigger Con	nmands	icons Manager	Display	SmartyCam Stre	am CAN Outpu				
ID	Name	Function	Sensor	Unit	Freq	Parameters	_						
RPM	RPM	Engine RPM	RPM Sensor	rpm	20 Hz	max 16000; fact	tor: /1 ;						
LCIh	✓ Left Clutch	Percent	Percentage Pot. Calib	%	100 Hz								
RCIh	 Right Clutch 	Percent	Percentage Pot. Calib	%	100 Hz								
LPS	✓ Left Pad Shift	Digital Status	Status		20 Hz								
RPS	Right Pad Shift	Digital Status	Status		20 Hz								
PAccu	GPS PosAccuracy	GPS Accuracy	GPS	m 0.01	10 Hz								
Spd	GPS Speed	Vehicle Spd	GPS	km/h 0.1	10 Hz								
Ait	Altitude	Altitude	GPS	m	10 Hz								
OdD	Odometer	Odometer Total	Odometer	km 0.1	1 Hz								
Luma	Luminosity	Brightness	Luminosity	%	1 Hz								
Tlog	✓ LoggerTemp	Temperature	Logger Temperature	С	1 Hz								

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 a 150-400V low level coil signal.

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.

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.

RaceStudio3 (64 bit) 3.50.75 - build giovedi 15 luglio 2021 17:21								- 0	٦ ×
* 🐲 🖻 🖻 🖾 🏜 🐇 🛠					9	(11-	*	O	an
All SW4 24									
Save SaveAs Close Transmit									
Changele Butters ECII Stream CANG Stream CAN F	wassies Hath Chassele Status Veriables Baras	Potern Chilf Lights and Alarma	Triagos Commando Jacos Manag	or Dioplay ProstyCom	CAN Outs				
Channels Buttons ECO Stream CANZ Stream CANES	parisions mauricitanineis status variables Para	neters Shin Lights and Alarhis	ingger commands i consimanag	er Display SmartyCam	Stream CAN Out	ui			
	ECU: Click button to select a ECU protocol 1 Mbit	sec	Change ECU 🗢						
	Change SCII Bustand								
	Manufacturer	Model		- ~					
	manufactor or	mousi							
	JD Racing	F8B_CAN	(v. 02.00.05)	(CAN)					
	KAWASAKI	MYGALE F4	(v. 02.00.02.)	(CAN)					
	KMS	WOLF_CAN	(v. 02.00.00)	(CAN)					
	ктм								
	LAMBORGHINI								
	LEXUS								
	LIFE								
	LIGIER								
	LINK								
	LOTUS								
	MAN TRUCK								
	MARELLI								
	MASERATI								
	MAIORECU								
	MAZDA								
	MBE								
	MCLAREN								
	ME								
	MECTRONIK	v							
			ОК	Cancel					
	L								



After setting the protocol the system comes back to "ECU Stream" page and two checkbox appears:

- "Enable the CAN Bus 120 Ohm Resistor" (enabled by default; 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, MX Series should not transmit it; in this case, enabling this flag SW4 logger remains completely silent.

	100 100 1.36.77 - 104 10 100 100 1.36.77 - 104 10	enerconed 21 tug	*6 B								0	(1	8	ecu	en
80/0	Save As	Circan	7/2014/8												
Trannels 1	Buttons ECU Stre	am Cause	CAN Expansio	ne Math ("hannak	Status Variables Darameters	Shift Lightle and Alarme Tr	ioner Commanda II.	one Mananer Di	aniau SmartuCam Stream	CAN Over	tet.			
And International Contraction		Chest no	can conception	FOR A	ITE FAR	CAN here AD AD AD A Minister	onin ogna uno Aurita	Change Fold	al al	opay onanyour orcan	Child Colly	ui.			
					ars 199	condition of the second timeses		Change Coo	•						
							Enable the	e CAN Bus 120 Ohm Resi	stor						
				Enabled Cl	hannels	(Max 120) 52 / 52	Silent on C	DAN Bus							
				10		Name :	Function	Unit	Freq						
				CC01		F88 RPM	Engine RPM	(pm	10 Hz ^						
				CC48		FIB GEAR	Gear	gear	10 Hz						
				CC47	•	F88 D SPEED	Vehicle Spd	komih 0.1	10 Hz						
				0048		F88 V SPEED	Vehicle Spd	iomith 0.1	10 Hz						
				CC43		F88 SPEED RL	Wheel Spd	tomits 0.1	10 Hz						
				CC44		F88 SPEED FR	Wheel Spd	konsilh 0.1	10 Hz						
				CC45		F88 SPEED FL	Wheel Spd	kmih 0.1	10 Hz						
				CC45		F88 SPEED RR	Wheel Spd	komith 0.1	10 Hz						
				CC02		F88 LONG ACC	Inline Accel	g 0.01	10 Hz						
				CC49		F88 LAT ACC	Lateral Accel	90.01	10 Hz						
				CC85		F88 TRBO SPD1	Ang Velocity	degis 0.1	10 Hz						
				CC09		F88 TRBO SPD2	Ang Velocity	depis 0.1	10 Hz						
				CC16		F88 ECT1	Water Temp	C 0.1	10 Hz						
				CC36		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						
				CC35		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	4	F88 OIL P1	Of Pressure	bar 0.01	10 Hz						
				CC58		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 additional CAN protocol modules:

- enter "CAN2 Stream" tab
- at the very first configuration a panel showing all supported non AiM external modules shows up; afterwards press "Change protocol" button
- select "Manufacturer" and "Model"
- press OK



							1007	
Racestudios (o4 bit) 3.30.77 - build mercoledi 21 lugilo 2021 19:32							-	
* 🐼 12 12 13 14 16 2					7	-	ECU	am
All SW4 ³⁴								
Save Save As Close Transmit								
Channels Buttons ECU Stream CAN2 Stream CAN E	Expansions Math Channels Status Variables Para	ameters Shift Lights and Alarms Trigge	r Commands Icons Manag	er Display SmartyCam Stream	CAN Output			
	CAN2 Protocol: Click button to select a CAN2 pro	tocol 1 Mbit/sec	Change Protocol					
				-				
	Choose CAN2 Protocol	Madal						
	Manufacturer	model						
	None	TPMS_CONTROL_UNIT	(v. 02.00.01)	(CAN)				
	AIM							
	BOSCH							
	BRIGHTWATER							
	HEWLAND							
	IZZE RACING							
	KMP							
	MEGALINE							
	MOTEC							
	NEMESIS							
	SEAT_Sport							
	STACK							
	TEVES							
			ОК	Cancel				
2								

5.4 – AiM CAN Expansions

SW4 can be connected to various AiM CAN expansions:

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

At the very first MX Series connection this page shows up:





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.

Ea RaceStudio3 (64 bit) 3.50.80 - build giovedi 29 luglio 2021 19:13			- 🗆 X
* 🐲 🖻 🖻 🕄 🍝 📥 🄝 谷			🐬 🛜 😤 🔐 🐠
All SW4 200			
Save Save As Close Transmit			
Channels Buttons ECU Stream CAN2 Stream CAN Expansions	Math Channels Status Variables Pa	arameters Shift Lights and Alarms Trigger Commands Icons Manager Display 🛕	SmartyCam Stream CAN Output
	Add Channel	still available math channels: 37	
	Select a Mathematical Channel	X	
	Channel	Description	
	Bias	To calculate the bias of two channels VALUE = CH1 / (CH1 + CH2)	
	Bias with Thresholds	To calculate the bias of two channels only if they are greater than specified values VALUE = CH1 / (CH1 + CH2) [if both thresholds are exceeded, else 0]	
	Calculated Gear	To calculate the gear position from engine rpm and vehicle speed	
	Precalculated Gear	To calculate the gear position from engine rpm and vehicle speed, specifying the gear ratio for each gear and the axle ratio	
	Linear Corrector	To multiply a measure by a factor then add an offset value VALUE = (a * CH) + b	
	Simple Operation	To add to or subtract from a channel value a constant value or another channel value e.g. VALUE = (CH1 + CH2)	
	Division Integer	To get the integer part of the division VALUE = integer(CH / a)	
	Division Modulo	To get the remainder part of the division VALUE = CH % a	
	Bit Composed	To Compose 8 flags in a bit-field measure VALUE = f1 + f2*2 + f3*4 + f4*8 + f5*16 + f6*32 + f7*64 + f8*128	
		· · · · · · · · · · · · · · · · · · ·	
		OK Cancel	



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.

E RaceStudio3 (64 bit) 3.50.81 - build venerdi 30 luglia 2021 1640			
* 🐲 🗈 🖬 ዄ 🖷 🚣 🄝 🔅		🦁 🔶 🛥 🕯	
All SW4 - Sample 34			
Save Save As Close Transmit			
Channels Buttons ECU Stream CAN2 Stream CAN Expansions Math Channels Status	Variables Parameters Shift Lights and Alarms	🔋 Trigger Commands Icons Manager Display 🛕 SmartyCam Stream CAN Output	
Add S	tatus Variable still available va	variables: 37	
		Status Variable Settings	x c
		Name	
		Record values Sampling Frequency 10 Hz	
- Same	condition for activation and deactivation	Generate Square Wave Duration of status On (1) (sec) 0.5	
Distinct	conditions for activation and deactivation	Work & Momentary Toople O Multinosition	
- Multiple	oupur values each with its own condition	(remain a maria man) O reggie O manapasition	
		Use timing Time threshold between short and long status sec 0.5	
		Rest Status Active Status Long Status	
		Label Value Label Value Label Value	
		Arthold when following condition is warflad, for shapet	
		Dearlisated when following containers while or an east of acc	
		Always FALSE Add	
Condition	×		
Always TRUE Always FALSE			
F88 RPM 🗘 🖉 greater than 💠 constant	er rpm 1000		
TRUE after a time of 0 sec in which it is verified FALSE after a time of 0	sec in which it is no longer verified.		
	OK Cancel		
-		Save	Cancel



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
 - o RPM is greater than 2000.

And use Water Temp Alarm for managing Icons and LEDs.

Here below the conditions of the example above are set.





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

Status Variable Settings	22		×					
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)	5							
WorkAs Momentary O Toggle O Multiposition								
Use timing Time threshold between short and long status sec 0.5								
Rest Status Long Status								
Label Value Label Value								
OFF 0 ON 1 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								
AND F88 RPM greater than 2000 rpm (TRUE after 1 sec; FALSE after 2 sec)								
OR F88 ECT1 greater than 100 C. (TRUE after 2 sec: EALSE after 5 sec)								
Add								
Add	to add another con	dition						
	o add another con	altion						
	Save	Cano	el					





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

🔛 RaceStudio3 (64 bit) 3.50.81 - build venerdi 30 luglio 2021 16:40				□ ×			
* 🐲 🖅 🗗 🖾 🎂 📥 🄝 🕾		🔊 🔶		am			
All SW4 - Sample 10							
Save Save As Close Transmit							
Channels Buttons ECU Stream CAN2 Stream CAN Expansions Math Channels	Status Variables Parameters Shift Lights and Alarms Trigger Commands Icons Manager Display 🛕 SmartyCam Stream	n CAN Output					
	Add Status Variable still available variables: 36						
Status Variable Ereg Mem							
V Water Temp	Name Water Temp						
	Record Values Sampling Fraguency 10 Ltz						
Edit Selected Status Variable							
	Same condition for activation and deactivation Generate Square Wave Duration of status On (1) (sec)						
Check to explain terrare of values of this status variable	Duration of status Off (0) (sec) 0.5						
Check to enable storage of values of this status variable	WorkAs 🔘 Momentary 🔿 Toggle 🔿 Multiposition						
	Use timing Time threshold between short and long status sec 0.5						
	Rest Status Active Status Long Status						
	Label Value Label Value						
	OFF 0 0N 1 LONG 2						
	Bio adhiatadi (Abhuthan:						
	((F88 RPM greater than 2000 rpm (TRUE after 1 sec; FALSE after 2 sec))						
	AVUD (POBECTT greater unan 1000 (TRUE anter 2 set, PRESE anter 3 set,)))) is varified						
	is verified						
	it is not verified						



5.7 – Parameters

To set GPS and/or optional optical beacon (Lap detection) as well as decide the logger start recording condition (Start Data Recording).

els	Status Variables	Parameters	Shift Lights and Alarms	Trigger Commands	Icons Manager	Display	SmartyCam Stre
							_
			Lap De	tection			
		Hold lap time for	8 sec ?				
	GPS Beacon						
		Track Width	10 m ?				
Ì.			Referenc	e Speed			
C	Select the channe	l to use for referen	ce speed		GPS Speed		
i.			Start Data	Recording			_
6	Standard Condi	tions					
e	Recording starts v	vhen RPM is great	er than 850 or speed(not GPS)	is greater than 10 km/h			
12							
C	Custom Condition	IS					
	lf Any of	the following cond	litions are true:				
	RPM		greater than	🗘 rpm	850		
	GPS Speed	1	greater than	💲 km/h	10,0] [- [+]

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

- \circ hold lap time for: the time period for which lap time is shown on SW4 display
- o 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 (not GPS) 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.



5.8 – 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 ad set:
- RPM value that turns the single LED on
- the sequence mode of the LEDs enabling the desired option:
 - o a LED stays on if its threshold is exceeded
 - o 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
- Red if the lap time is worse than the reference lap

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 than begins improving 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 alarm

To create a new alarm press "Add New Alarm" and the related panel shows up.

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* 🐲 🖻 🖬 🔂 🎂 🚣 🏀 🖨	🐬 🎅 🚔 💭 🐠
All SW4 - Sample 30	
Save Save As Close Transmit	Alarm Settings – T X
Channels Buttons ECU Stream CAN2 Stream CAN Expansions Math Channels Status Variables Parameters S	Name
Use for predictive time	Record values Sampling Frequency 10 Hz
Channel for LED-bars Incremental Time per LED	
+- Best Time 0.10 sec	Same condition for activation and deactivation
Activate Simulation	Set status to ON when following condition is verified for at least 0 sec
EXT Left button 1 LED1 LED2 LED3 LED4 EXT Right button 1 6	Set status to OFF when following condition is not verified for at least 0 sec
2 Left button 2 Right button 2 7	
Left paddleshift Right paddleshift	AUG
Left button 3 5 0000 Right button 3	
Left button 4	
Left button 5	
Left clut ch Right clut ch	
1 RotaryLeft RotaryRight 1	
	when active execute the following action(s)
+ Add New Alarm still available alarms: 36	Alarm actions in SW4
	Message
	Untit: Condition no longer met
	Save Cancel



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 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		
Always FALSE	Add	
when active execute the following action(s)		
Alarm actions in SW4		
Message 🗘 Insert message text		
Until: condition no longer met		
	Save	Cancel

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







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.

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* 🥙 🕼 🗗 ዄ 🖆 🚣 🕫 🖨		🔊 🛜 😤 🔐 🐠
All SW4 - Sample 📧		
Save Save As Close Transmit		
Channels Buttons ECU Stream CAN2 Stream CAN Expansions Math Channels St	tatus Variables 🛛 Parameters Shift Lights and Alarms 🛛 Trigger Commands 🔤 Icons Manager 🛛 Display 🛕 SmartyCam Strea	m CAN Output
Use for predictive time Use as	s gear shift lights	
Channel for LED-bars Incre	emental Time per LED	
+- Best Time	0.10 sec	— L ×
	Name Water	
Activate Simulation	Record values	Sampling Frequency 10 Hz 🗘
EIL LED2 LED3 LED LED3 LED3 LED LED3 LED3 LED3	Right but ton 1 3 Right but ton 2 3	
Left paddleshift	Right paddleshift	
a left hutton 3	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
(d) Left button 4	Right but ton 4 Water Temp, equal to ON	Add
S Left button 5	Right but ton 5 10	746
	Right clutch	
1 RotaryLeft	RotaryRight () when active execute the following action(s)	
C+ 4dd New Alarm etill available alar	arme: 36	Alarm actions in SW4
	LED 1 Continuously	🗘 🥘 Red 💲 [+
Event Alarm		
priority 🗹 Water LED: 1		
Ī	Edit Selected Alarm	Save Cancel
	Delete Selected Alarm	ол



6 – Display Menu

When the buttons to manage SW4 display have been configured you can access the display navigation menu. Press "MENU" and this page is prompted.



The icons stays for:



Date and time setting



Backlight: setting



Lap Time Setup



SW4 counters management



SW4 tracks and GPS management





System information

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)

PREV	Date Time Format: Date Format	Time 24H DD/MM/YYYY	CHANG
Н		Enabled	E
NEXT	13:07	30/07/2020	EXIT

		Date Time		6
P R E V	Time Format: Date Format		24H DD/MM/YYYY) I A Z G W
Η				
NEXT	Hour	13:15		E X - F
			an atai	L

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).



		BACKLIGHT		
P R			MANUAL	H
E V	Brightness		60%	N G
				E
N E X				E X
Ť				Ť
				-



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



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 (see chapter about SW4 and the PC).

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

	C	COUNTERS	
P R	System	147 km*	C H A
E		102*	NG
	Usr 2:	125*	Ē
H	Usr 3:	78	
NEXT	Usr 4:	93*	EXIT

		COUNTERS			C
P R E V	Usr 1: Status:		01:15	102* Active	HANG
	Usr 1:		01:15	102*	E
NEXT					E X - T

6.5 – Managing GPS & Tracks (GPS09 Module needed)

Pressing the icon above GPS&TRACKS page is prompted: press "ENTER" and "Track Management" page is prompted. 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
 - o allows "Track selection" if in Manual mode

Use:

- "CHANGE" button to switch the options
- "PREV"/"NEXT" to scroll the options
- "EXIT" to guit and save





Track Mana	agement	Track Manag	gement
R Mode Track List Type Tracks Info	AUTOMATIC All Tracks	R Mode Track List Type Tracks Selection	MANUAL All Tracks E E X T

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.

	Track Management				FOTION		
P R U V	Mode Track List Type Tracks Selection	MANUAL N All Tracks R	PREV	IRACK SELI	R	>999 km >999 km >999 km >999 km >999 km >999 km >999 km >999 km >999 km >999 km	ENTER EX
XT		Î	Ť	USER SEL: 3SC Var3	R	>999 km	A I T

6.6 – System Information

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

- Logger name
- Serial number
- Firmware version
- Boot version
- Net Info option: pressing "ENTER" "Net Info" page is prompted. It shows all connected devices with the related serial number and firmware version.



	System Info			Net Info		
Logger Serial N.: Fw Version Boot Version Net Info		SW4 7700133 02.36.57 02.24.00	gps		0926677	35.65.00 E X T