

CAN DRIVER BUILDER

The CAN Driver Builder is a utility included in RaceStudio3, intended for developing a software driver capable to read a CAN datastream coming from an ECU or a different device. The driver produced can be used on one of the following devices:

MXG, MXS, MXL2, EVO4S, EVO5.

In case the device for which you are to develop the driver is an ECU, it can be used only on CAN1, else on both CAN 1 and CAN2.

In order to activate the DriverBuilder, press the following pushbutton:



The main page is shown:

🧧 RaceStudio3				– 🗆 X
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	New Clone Import	Export Delete	Authorizations	Custom CAN Protocols
CAN Custom CAN				٩ (?
Manufacturers (4)	Manufacturer Model	CAN Device Bus Speed	Date File	
Manual Collections				
Trash				

and the following pushbuttons are available:

New	Clone	Import	Export	Delete	Authorizations
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The last pushbutton is intended for managing the "Authorizations":



CAN Driver Builder offers TWO different Authorizations:

- 1. **Protocol Password**: the password that you are supposed to have in your PC for EDITING the protocol
- 2. Measure Protection Key: the key that you are supposed to have in your PC for using, seeing in online, downloading and seeing in Analysis the measures defined as "locked" in your protocol. The "locked" measures cannot be shown on the display, but are recorded like any other measure. If you download the data into a PC with the Measure Protocol Key installed, the locked measures are completely visible, else they are hidden and crypted.
- 1. Selecting 'Protocol Password', this window appears:

Protocol Passwords						—			×
Select or Add a Password									
Label	Password) Show	Pass	words	5			
				Add	New P	asswo	rd		La Ca
		Remove Selected Passwords				ords			
			Exp	port S	elected	l Pass	wor	rds	
				Impo	ort Pas	sword	s		
					OK			Canc	el

Here you can create and edit a list of passwords and associate each password to the protocols you are going to create.



Click 'Add New Password'.

This page is shown:

Protocol Passwords			– 🗆 X
Select or Add a Pas	Sword	ocol Password	< ds
	Edit new pro	tocol password	Password
	Label		cted Passwords
	Password		ted Passwords
		Show Password	asswords
	_	Add Cancel	
			OK Cancel

Here you have to choose a label for the password, and then the password itself.

If you flag 'Show Password', the password will be shown in clear text, else as a row of asterisks.

To add a password to the list, press **OK**.

🔄 Protocol Passwords		- 🗆 X
Select or Add a Pass	sword	
Label	Password	Show Passwords
pro1	******	Add New Password
sport	*****	
		Remove Selected Passwords
		Export Selected Passwords
		Import Passwords
L		
		OK Cancel

You will at anytime be able to remove all the passwords you need from the list, or export/import them to/from a file.

Click **OK** to save the changes.



2. Selecting 'Measure Protection Keys', this window appears:

Measure Protection Keys	- 🗆 ×
Select or Add a Protection Key	
Key Labei	Add New Key
keyPro1 keySport	Remove Selected Keys
	Export Selected Keys
	Import Keys
	OK 📐 Cancel

Exactly like for passwords, here you can create/edit a list of keys and choose - for each protocol - which key will be used to hide/encrypt the measures you wish to be protected by keys.

For each new key you will just have to indicate a label, as the value will be software generated.

Click **OK** to save the changes.

In the main page, press "NEW" for creating a new protocol.

This window appears:

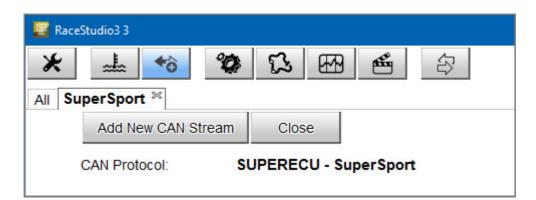
📴 New Custom CAN Protocol			-		×
Select a Manufacturer		Edit New Model Name			
Steve ECU	^	SuperSport			
SUBARU					
SUPERECU					
SUZUKI		CAN Device Type			
SYBELE					
SYVECS		ECU			\$
TEVES					
TEXYS					
TIRE_WATCH		CAN Bus Speed			
TOMS		500 Kbit/sec			\$
ΤΟΥΟΤΑ		1			
TRIJEKT					
TRIUMPH					
TURNER					
UNICHIP	~				
Add Manufacturer					
					- 1
		OK		Cano	el



Here you can set:

the Device manufacturer and the Model name, for then being able to select the new protocol, that you will find in the Protocols Database. In case the Device Manufacturer is not in the list, you can add it.
the Device Type: it can be ECU (in this case it can be managed only in CAN1 of the Aim Loggers/dashes) or Another CAN device (in this case it can be managed both in CAN1 and in CAN2)
the CAN bus speed

After having set the proper fields, this page appears:



You have two pushbuttons:

1) Add New can Stream

2) CLOSE

Click on "ADD NEW CAN STREAM" and the new window appears:

CAN Stream Settings			×
CAN ID	Stream Byte Order		?
0x0	Low to High (Little End	ian or Intel)	¢
Enable Row Counter			
	1	ОК	Cancel

The fields to be set are:

- CAN ID

- Stream Byte Order. This last can be Little or Big Endian, in dependence upon the processor of the device.



Here an example of the different formats:

Big-endian (POWER family)								
	89	AB	CD	EF				
Address	0	1	2	3				
Little-endian (x86 family)								
	EF	CD	AB	89				
Address	0	1	2	3				

- Enable Row Counter: this field is used when we have to define a multiplexed stream, that is to say a stream where the format depends upon a field, called Row Counter.

🔄 CAN Stream Settings			×
CAN ID 0x11	Stream Byte Ord Low to	er High (Little Endian	or Intel)
Enable Row Counter	Row Counter 0x1	RC Start Bit	RC Number of Bits
			OK Cancel

If you enable the Row Counter, you have to specify its Start Bit, its Number of bits and the Value for each single row to be defined.

After having set the different parameters, you click OK and a new window appears:

			_					
					1940 - 11			
				4	oit 3	2		0
Dute 0								
	7	6	5	4	3	2	1	0
Byte 1	Water	Tem	p (ch)			10		8
	Water				11	10	9	<u> </u>
Byte 2	23 23	22	21	20	19	18	17	16 ^C
Byte 3								
	31	30	29	28	27	26	25	24
Byte 4	39	38	37	36	35	34	33	32
Byte 5	47	46	45	44	43	42	41	40
Byte 6	55	54	53	52	51	50	49	48
Byte 7	63	62	61	60	59	58	57	56
	Byte 2 Byte 3 Byte 4 Byte 5 Byte 6	7 Byte 1 31 Byte 2 31 Byte 3 31 Byte 4 39 Byte 5 47 Byte 5 47 Byte 5 55	T 6 Byte 1 5 14 Byte 2 3 3 Byte 3 31 30 Byte 4 39 38 Byte 5 47 46 Byte 6 55 54	7 6 5 Byte 1 5 14 13 Byte 2 2 22 22 21 Byte 3 31 30 29 35 37 Byte 4 39 38 37 39 36 37 Byte 5 47 46 45 53 54 53 Byte 6 55 54 53 54 53 Byte 7 4 45 45 55 54 53	7 6 5 4 Byte 1 15 14 13 12 Byte 2 2 22 22 2 2 Byte 3 31 30 29 28 29 28 Byte 4 39 38 37 36 37 36 Byte 5 47 46 45 44 Byte 6 55 54 53 52 Byte 7 29 38 37 36	7 6 5 4 3 Byte 1 WaterTemp (ch) 11 12 11 Byte 2 WaterTemp (ch) 12 11 12 11 Byte 2 WaterTemp (ch) 20 19 19 Byte 3 31 30 29 VaterTemp (ch) Byte 4 39 38 37 36 35 Byte 5 47 48 45 44 43 Byte 6 55 54 53 52 51 Byte 7 Mater 7 Mater 7 Mater 7 Mater 7	7 6 5 4 3 2 Byte 1 Veter Temp (ch) 1 1 1 10 Byte 2 Veter Temp (ch) 1 1 10 10 Byte 2 Veter Temp (ch) 20 19 18 Byte 3 31 30 29 Veter Temp (ch) 20 27 26 Byte 4 39 38 37 36 35 34 Byte 5 47 46 45 44 43 42 Byte 6 55 54 53 52 51 50 Byte 7 46	7 6 5 4 3 2 1 Byte 1 ValetTemp (ch) 15 11 10 11 10 9 Byte 2 ValetTemp (ch) 23 22 21 20 19 18 17 Byte 3 31 30 29 ValetTemp (ch) 28 27 28 25 Byte 4 39 38 37 36 35 34 33 Byte 5 47 46 45 44 43 42 41 Byte 6 55 54 53 52 51 50 49 Byte 7 43 42 44



This page is used for defining a single channel.

You have to define:

- Start Bit
- Number of Bits
- Name to be used in Analysis
- Short Name to be used on the display
- Function
- Max Acquisition Frequency
- Unit of Measure
- If protected by key (In this case the Measure Protection Key set for this protocol)
- Stepped Value this field is used in Analysis: if a value is Stepped, it is not interpolated (for example, the Gear Number, that is to be shown at fixed values).
- Conversion : for every channel you can define a Gain and an Offset (Output = Input Value x Gain + Offset) or an Encoding. In this case, a conversion table is to be defined per every value of the field:

📴 Set Encoding V	/alues		13 <u>111</u>		×
Input Format	O Dec	imal		I	
Value (i	nput)	Label (outp	ut)		
✓ 1		low		[-	[+
2		high][-	[+
			ок 🖓	Cano	el



The window CAN Measure Settings shows on the right the Bit Stream and - in yellow - the corresponding measure.

To set the Start Bit or the Number of Bits for each measure it is possible to drag&drop it into the stream, or even to move just its start/finish point.

🧱 CAN Measure Settings									×
CAN ID Byte Order 0x11 Low to High (Little Endian or Intel)									
Measure Stream Data									
Start Bit 12 Number of Bits 17		7	6	5	4	oit 3	2	1	0
Name WaterTemp	Byte 0								
Short Name wtemp	byte 0	7	6	5	4	3	2	1	0
Protected by Key	Byte 1	Water	Temp 14	_	_	11	10	9	8
	Dute 2	Water	Tem		-	r 11	10	5	0
Function Temperature 🗢	Byte 2	0 23	22	21	20	19	18	17	16 ^C
	Byte 3				WaterTemp (wtemp)			C	
Max. Frequency 50 Hz 🗢 Unit C 🜩		31	30	29	28	27	26	25	24
Stepped Values	Byte 4	39	38	37	36	35	34	33	32
Signed Data Unsigned \$	Byte 5	47	46	45	44	43	42	41	40
	Dute C	41	40	45		45	42	41	40
Convertion Gain 1.000000000 Offset 0.000000000	Byte 6	55	54	53	52	51	50	49	48
O Encoding Set Encoding Values	Byte 7	63	62	61	60	59	58	57	56
									6
					Ok	Ċ		Ca	ncel

After having set all the parameters, click on **OK** and the data stream is shown:

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×	<u></u>	*	* 1	9 E	ĵ					((•	; (11)
All Su	perSp	oort ∞									
	S	ave (Close Set Prot	ocol Password	Set Measures Protect	ion Key Sort Me	asures				
	CAN P	rotocol:	SUPERECU -	SuperSport							
	_	CAN Stream	1				Byte				
	$\mathbf{\nabla}$	CAN Stream					byte				
		Low to High	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
	•	CAN ID:	speed (spd1) RC: (CH (ch) spe	et CH (ch)	CH ([+
		0x11 RC: 0x1		D 15 ¹⁴ 13 ¹² 11 ¹⁰ 9 ⁸	CO 23 22 21 20 19 18 17 16	30 and 28 and 26 and 24	38 36 34 32	46 44 42 40	54 52 50 48	63 62 61 60 59 58 57 56	
l		UXI	7 5 3 1	15 13 11 9	23 21 19 17	31 29 27 25	39 37 35 33	4/ 45 43 41	55 53 51 49	63 61 59 57	



Five pushbuttons are available:

1) SAVE

2) CLOSE

3) Password: to set the password associated to the protocol

4) Protection Key : to set the protection key used for crypting and hiding some measures of the protocol

5) Sort Measures: used for changing the order in which you will see the channels in the final protocol, that will be available in the protocol database and used like any other protocol

To set the protocol editing password just click **'Set Protocol Password'**. This window will appear:

Select Protocol Password		– D X
Select or Add a Password		
Label	Password	Show Passwords
pro1	****	Add New Password
sport sport	*****	
		Export Selected Passwords
		Import Passwords
		Select 🔓 Cancel

Just flag a password from the list and click 'Select'

It is also possible to edit the password list, like:

- 1. Creating a new password.
- 2. Export/import passwords to/from a file.

Double-clicking a password, you will select that pw and de-select all the others included in the list.

Clicking 'Select' all changes to the list will be saved and the selected pw will be associated to the protocol and shown in the Password pushbutton.

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All Su	perSpor	t ∞		-						
	Save	e	Close	Pas	sword L	abel: spo	ort	Prote	ection Key	L
	CAN Prot	ocol:	SL	PERE	CU - Su	perSpor	rt			



To set the protection key of a measure, click **'Set Measures Protection Key'** This window will appear:

🔛 Select Measure Protection Key	- 🗆 ×
Select or Add a Protection Key	
Key Label	Add New Key
keyPro1 keySport	Export Selected Keys
	Import Keys
	2
	Select 🔓 Cancel

The procedure is exactly the same as for protocol passwords.

For adding a channel, please double click in the desired position of the stream.

For modifying a channel, click on it.

For adding another stream, click on the "+" at the right of the stream.

For Sorting the measures in the stream, please, push the pushbutton and the window will appear:

		Function	Unit	Max. Freq
ID:0x11 RC:0x1	speed	Vehicle Spd	km/h	10 Hz
ID:0x11 RC:0x1	СН	Pct Brake Load	%	10 Hz
ID:0x11 RC:0x2	CH_01	Oil Pressure	bar	10 Hz
ID:0x11 RC:0x2	CH_02	Brake Press	bar	10 Hz
ID:0x11 RC:0x2	CH_03	Oil Temp	С	10 Hz



To sort measures:

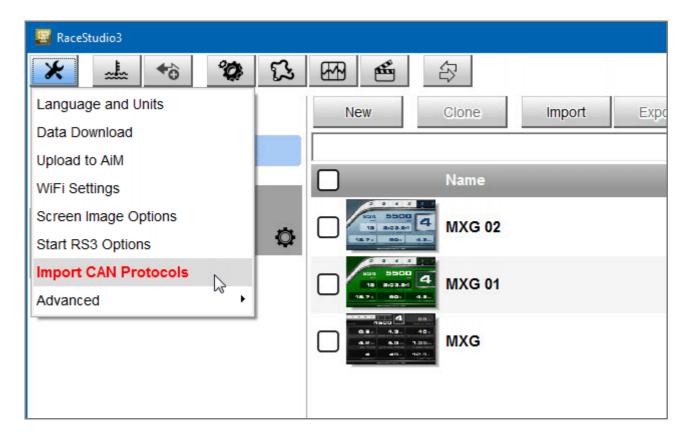
- 1. You can click on a field and move it up and down, dragging and dropping it.
- 2. You can also click the arrows on top of the list to move a measure up/down or in the first/last row
- 3. You can click the fields above the list to automatically sort measures in ascending/descending order.

At the end, "Save" and exit. You will find the new protocol among all the others in the database.

To edit a protocol on a different PC, just click Export - and Import on the destination PC. The same operation has to be performed for Protocol Passwords and for Measure Protection Keys.

To simply use a protocol you need to import it from a file where it had previously been exported.

To import it use the key 'Import CAN Protocols' in the drop down menu lying under this icon





To use measures protected by key it is necessary to import the key from a file where it had been exported. To import it click '**Advanced**' and '**Import Protection Key'** in the same drop down menu.

