

# User Manual

## LCU1S + LCU2

Release 1.00





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## 1 – Introduction

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LCU1S and LCU2 are the new small, light and fast AiM Lambda Controller expansions supported by all the last car-bike AiM devices.

**Please note:** the only systems that do not support LCU1S and LCU2 are MXL, MXL2 and MyChron.

LCU1S and LCU2 allow you to perfectly tune the carburation of the engine as well as to improve the engine performances. They both use a Bosch LSU4.9 probe that saves the original calibration for the duration of the sensor life and lasts for more that 100.000 km on a stock car.

## 2 – Available kits, optionals and spare parts

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Available LCU1S kits are:

**LCU1S complete kit;** part number:

**X08LCU1SAC090**

- LCU1S
- Bosch LSU 4.9 Lambda probe
- Thread iron ring for installation

**LCU1S kit without Lambda probe;** part number:

**X08LCU1SAC0**

- LCU1S

Available LCU2 kits are:

**LCU2 complete kit;** part number:

**XLCU2AC090**

- LCU2
- Bosch LSU 4.9 Lambda probe
- Thread iron ring for installation

**LCU2 kit without Lambda probe;** part number:

**XLCU2AC0**

- LCU2

**Optionals<sup>7</sup> and spare parts:**

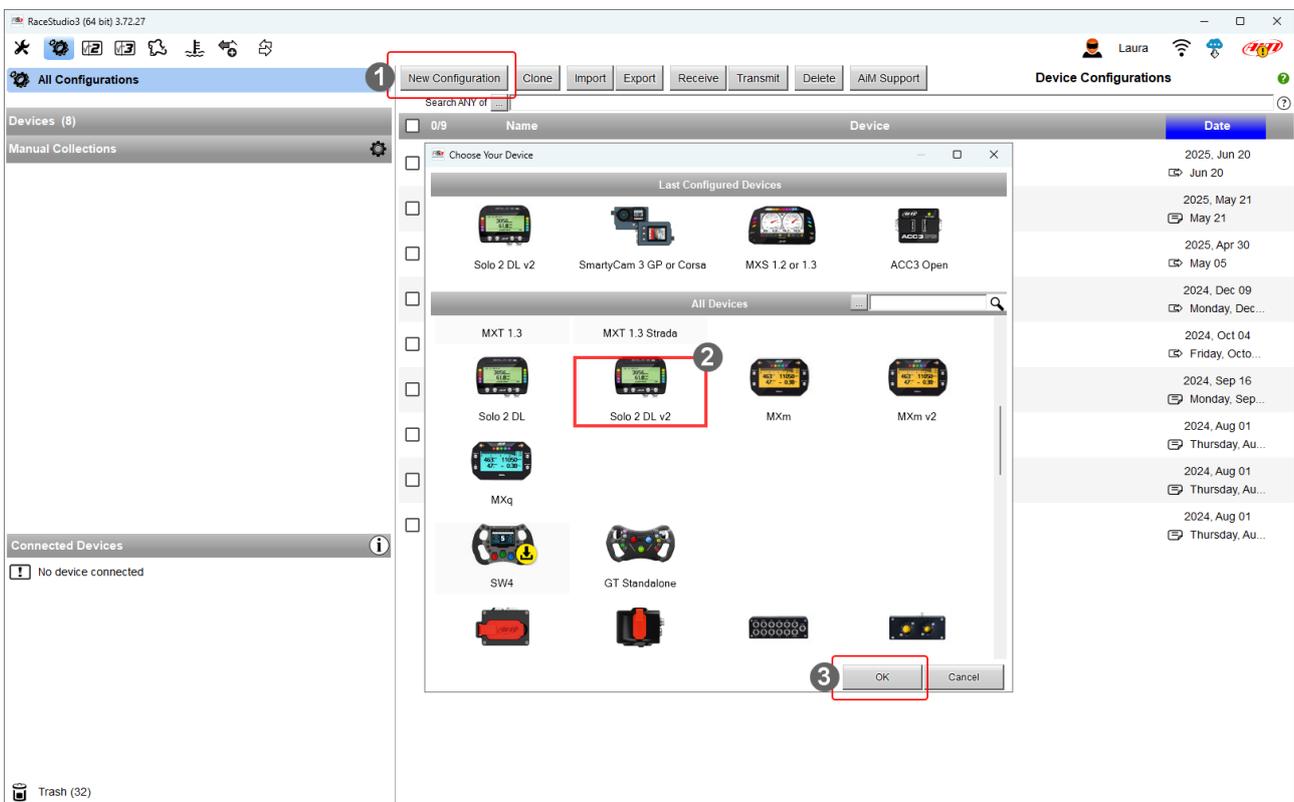
- Bosch LSU 4.9 Lambda probe **X05LSU490**
- Thread iron ring for installation **LBS552680**
- 50cm AiM CAN cable **V02552690**
- 100cm AiM CAN cable **V02552700**
- 200cm AiM CAN cable **V02552720**
- 400cm AiM CAN cable **V02551070**

## 3 – Configuring LCU1S and LCU2

LCU1S and LCU2 can only be configured using AiM RaceStudio 3 software you can freely download from AiM website at [www.aim-sportline.com](http://www.aim-sportline.com) download software/firmware area.

To load the expansion in AiM device configuration run the software and select the configuration where to load LCUS1S on or create a new one as shown here below. To create a new configuration:

- Press “New Configuration” (1)
- Select the device you are configuring (Solo 2 DL v2 in the example below 2)
- Press “OK” (3)





The software enters “Channels” tab.

total channels: 25 4%  
total frequency: 1112 22%

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:16000.000000; factor:1;
Acc1	<input checked="" type="checkbox"/>	InlineAcc	Inline Acceleration	Internal Accelerometer	g 0.01	50 Hz	
Acc2	<input checked="" type="checkbox"/>	LateralAcc	Lateral Acceleration	Internal Accelerometer	g 0.01	50 Hz	
Acc3	<input checked="" type="checkbox"/>	VerticalAcc	Vertical Acceleration	Internal Accelerometer	g 0.01	50 Hz	
Gyr1	<input checked="" type="checkbox"/>	RollRate	Roll Rate	Internal Gyro	deg/s 0.1	50 Hz	
Gyr2	<input checked="" type="checkbox"/>	PitchRate	Pitch Rate	Internal Gyro	deg/s 0.1	50 Hz	
Gyr3	<input checked="" type="checkbox"/>	YawRate	Yaw Rate	Internal Gyro	deg/s 0.1	50 Hz	
PAccu	<input checked="" type="checkbox"/>	GPS PosAccuracy	AIM GPS Position Accuracy	GPS	ft	auto (accor...	
Spd	<input checked="" type="checkbox"/>	GPS Speed	GPS Speed	GPS	mph 0.1	auto (accor...	
Alt	<input checked="" type="checkbox"/>	Altitude	GPS Altitude	GPS	ft 0.01	auto (accor...	
POTCA	<input type="checkbox"/>	POTCmtAll	Output Current	Internal Math Channel	A.0.1	10 Hz	

To load and configure LCU1S activate “CAN Expansions” (1) tab as shown here below and follow these steps:

- Press “New Expansion” (2)
- Select LCU1S (3)
- Press “OK” (4)



Once the expansion added, the software enters the related tab (0LC1S). Here it is possible to:

- get the serial number of LCU1S or fill it in manually (1); **please note:** to get the serial number from the connected LCU1S it is necessary to power it and connect the master device LCU1S is connected to the PC via Wi-Fi (or via USB). Please refer to the user manual of each logger to know how to manage Wi-Fi connection;
- select the multiplier to calculate AFR from Lambda value
- manage custom values through the dedicated panel that is prompted clicking the proper button

As far as the channel table (2) is concerned, clicking on each channel it is possible to set sampling frequency, Unit of measure and display precision.

The screenshot displays the RaceStudio3 (64 bit) 3.72.27 interface. The 'CAN Expansions' tab is active, showing a configuration for '0LC1S'. A red box labeled '1' highlights the 'Expansion Name ( 6 Characters Max. )' field containing '0LC1S' and the 'Expansion Serial Number ( S.N. )' field containing '0'. A 'Get Expansion Serial Number' button is also visible.

Below this, a 'Multiplier to calculate AFR (AFR) from lambda' dialog is shown. It features a dropdown menu with options: 6.40 - Methanol, 9.00 - Ethanol, 14.57 - Gasoline (highlighted), 14.60 - Diesel, 15.50 - LPG (Propane), and 17.20 - CNG. A 'Manage Custom Values' button is present.

To the right, the 'Lambda Multiplier Manager' dialog is open, showing a table of multiplier values:

Lambda Multiplier Values	Value	Label
6.40 - Methanol	14.57	Gasoline
9.00 - Ethanol		
14.57 - Gasoline		
14.60 - Diesel		
15.50 - LPG (Propane)		
17.20 - CNG		

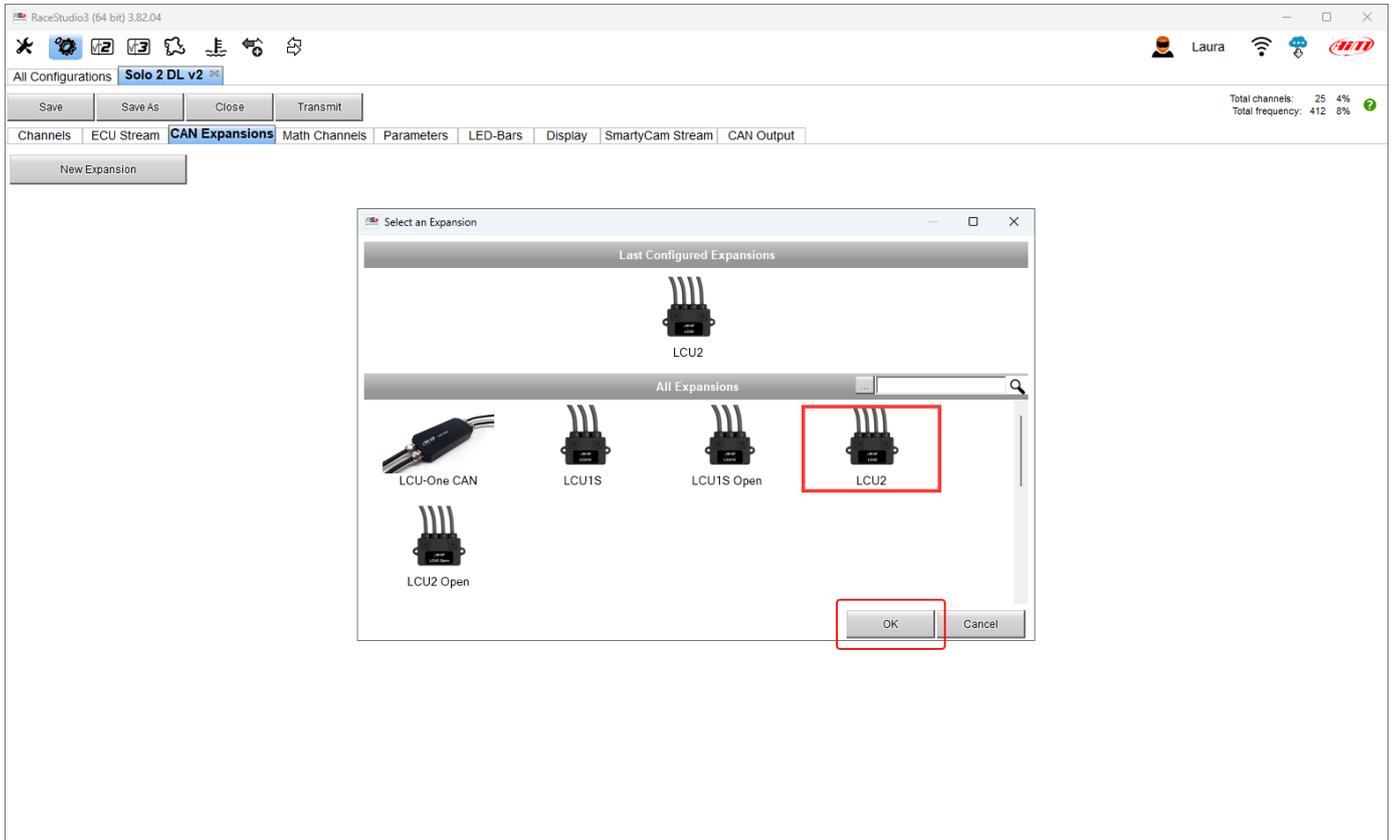
Buttons for 'Change value above and click here to add it', 'Remove Current Item', and 'Restore Default Values' are also visible.

At the bottom, a channel table is shown with a red box labeled '2' highlighting the first four rows:

ID	Name	Function	Sensor	Unit	Freq	Parameters
Lmd	<input checked="" type="checkbox"/> 0LC1S Lambda	Lambda	Lambda	# 0.01	10 Hz	
AFR	<input checked="" type="checkbox"/> 0LC1S AFR	AFR	AFR	# 0.01	10 Hz	
L.Tm	<input checked="" type="checkbox"/> 0LC1S LmdTmp	Lambda Temperature	LmdTmp	# 0.1	10 Hz	
LDg	<input checked="" type="checkbox"/> 0LC1S Diagn	Lambda Diagnosis	LCU-One Diagn	#	1 Hz	

To load and configure **LCU2** follow the same steps as for LCU1S:

- select LCU2 as shown here below
- Press “OK”





As for LCU1S, **once LCU2 added to the logger configuration**, the software enters the related tab (0LC2) and you can get its serial number or fill it in manually, select the multiplier to calculate AFR from Lambda value and manage custom values through the dedicated panel that is prompted clicking the proper button. As far as the channel table is concerned, clicking on each channel it is possible to set sampling frequency, Unit of measure and display precision. The only difference between LCU1S and LCU2 is that the configuration table is doubled as shown here below.

Expansion Name ( 6 Characters Max. ) 0LC2

Expansion Serial Number ( S.N. ) 0

Multiplier to calculate AFR (AFR) from lambda (AFR = Air Fuel Ratio = pounds of air / pound of fuel)  
14.57 - Gasoline

ID	<input checked="" type="checkbox"/>	Name	Function	Sensor	Unit	Freq	Parameters
Lmd1	<input checked="" type="checkbox"/>	0LC2 Lambda1	Lambda	Lambda1	# 0.01	10 Hz	
AFR1	<input checked="" type="checkbox"/>	0LC2 AFR1	AFR	AFR1	# 0.01	10 Hz	
Lm1	<input checked="" type="checkbox"/>	0LC2 LmdTmp1	Lambda Temperature	LmdTmp1	# 0.1	10 Hz	
LDg1	<input checked="" type="checkbox"/>	0LC2 Diagn1	Lambda Diagnosis	LCU-One Diagn	#	10 Hz	

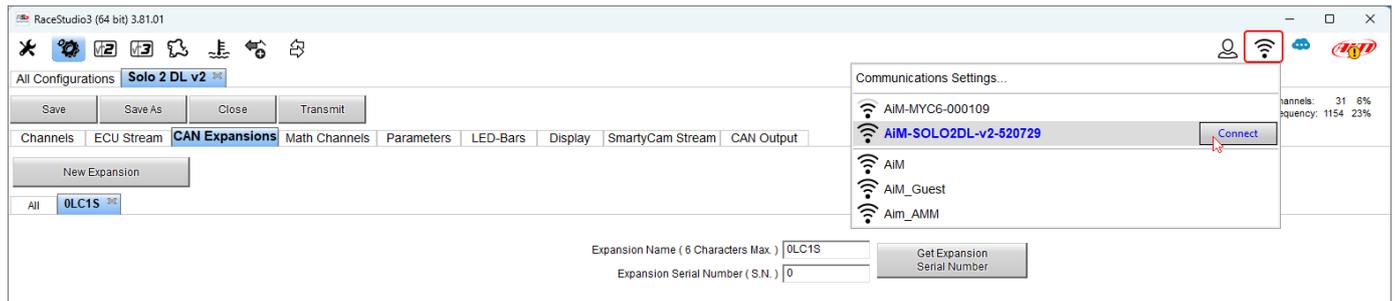
  

Lmd2	<input checked="" type="checkbox"/>	0LC2 Lambda2	Lambda	Lambda2	# 0.01	10 Hz	
AFR2	<input checked="" type="checkbox"/>	0LC2 AFR2	AFR	AFR2	# 0.01	10 Hz	
Lm2	<input checked="" type="checkbox"/>	0LC2 LmdTmp2	Lambda Temperature	LmdTmp2	# 0.1	10 Hz	
LDg2	<input checked="" type="checkbox"/>	0LC2 Diagn2	Lambda Diagnosis	LCU-One Diagn	#	10 Hz	

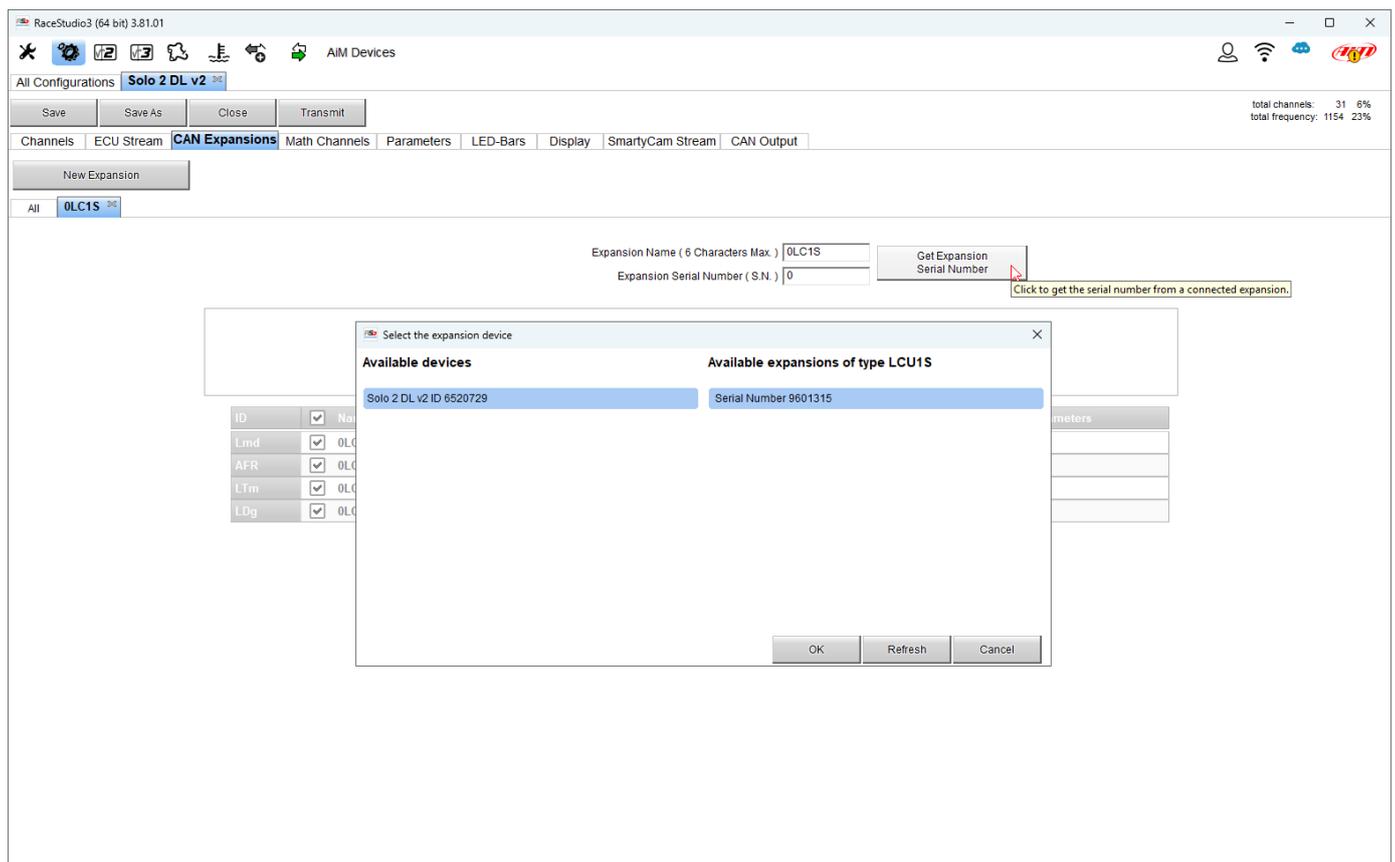
## 4 – Getting the serial number of a connected LCU1S/LCU2

To get the serial number of the connected LCU1S/LCU2 ensure that the expansion is powered and connect the master logger to the PC. To do so:

- click the Wi-Fi icon top right of the software view (or plug the USB cable of the logger in the PC USB port)
- select the logger to connect via Wi-Fi and press “Connect”.



- Once the logger connected press “Get Expansion Serial Number” as shown here below
- A panel is prompted: select the connected expansion to configure and press “OK”





- the software comes back to “CAN Expansions” tab and shows LCU1S/LCU2 Serial number.

The screenshot shows the RaceStudio3 (64 bit) 3.81.01 interface. The 'CAN Expansions' tab is active. The 'Expansion Name ( 6 Characters Max. )' field contains '0LC1S' and the 'Expansion Serial Number ( S.N. )' field contains '9601315'. Below this, there is a section for 'Multiplier to calculate AFR (AF) from lambda (AFR = Air Fuel Ratio - pounds of air / pound of fuel)' with a dropdown menu set to '14.57 - Gasoline'. At the bottom, a table lists the configured expansions:

ID	Name	Function	Sensor	Unit	Freq	Parameters
Lmd	0LC1S Lambda	Lambda	Lambda	# 0.01	10 Hz	
AFR	0LC1S AFR	AFR	AFR	# 0.01	10 Hz	
LTm	0LC1S LmdTmp	Lambda Temperature	LmdTmp	# 0.1	10 Hz	
LDg	0LC1S Diagn	Lambda Diagnosis	LCU-One Diagn	#	1 Hz	

## 5 – Online view and firmware update

Once LCU1S/LCU2 is connected and identified it is suggested to complete, save and transmit the configuration to the logger. This procedure changes according to the logger that is being configured.

Now it is possible to enter online view and check LCU1S/LCU2 values. To do so:

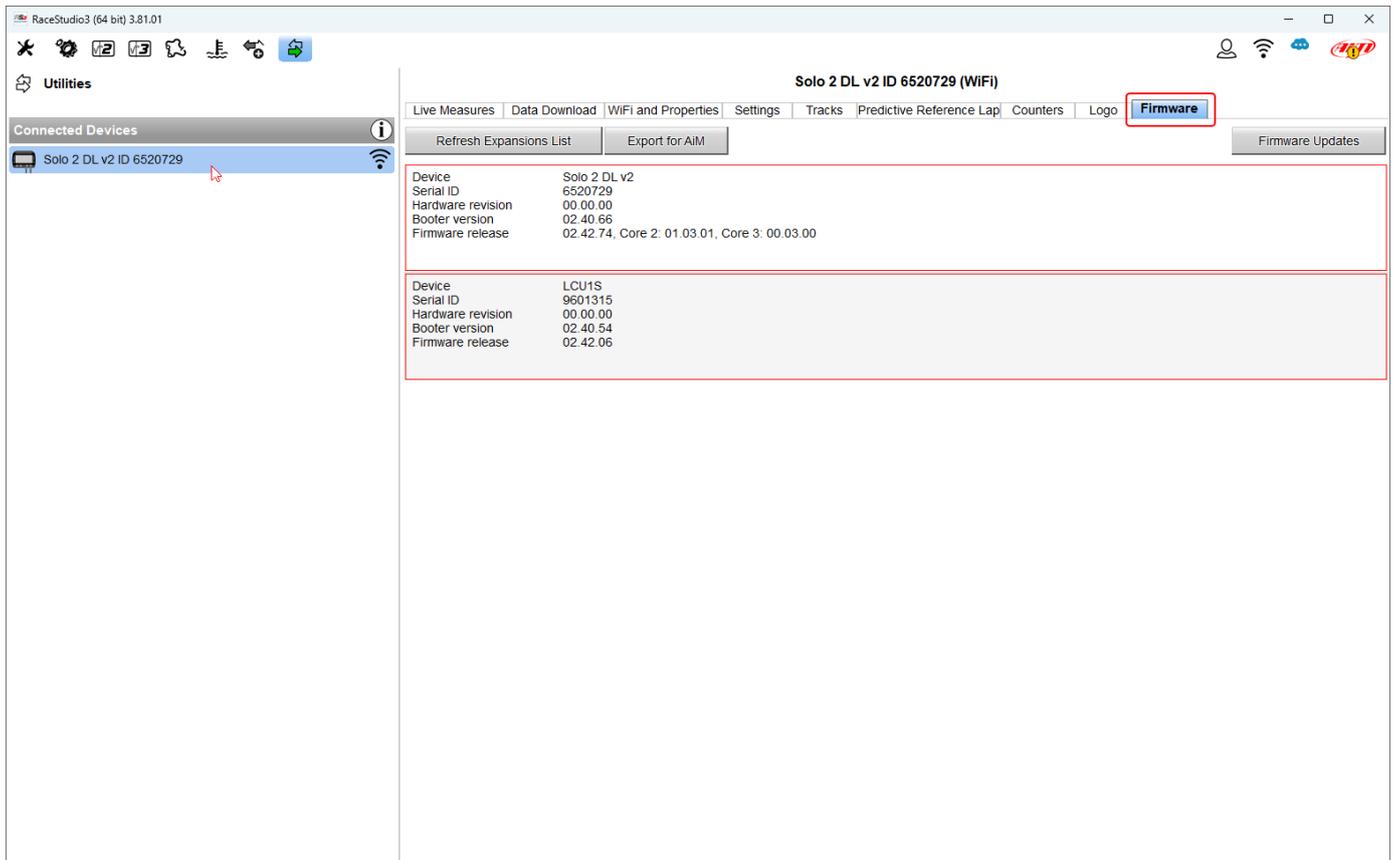
- enter “Configurations” view
- Press the logger you are configuring as shown here below.

The screenshot displays the RaceStudio3 (64 bit) 3.81.01 interface. The main window is titled "All Configurations" and shows a list of device configurations. The "Connected Devices" section on the left is highlighted with a red box, showing a "Solo 2 DL v2 ID 6520729" with a wireless signal icon. The main table lists various devices with their names, device types, and dates.

Name	Device	Date
Solo 2 DL v2	Solo 2 DL v2	11:14 AM 9:57 AM
MXS 1.x 01	MXS 1.2 or 1.3	2025, May 21 May 21
XLog	XLog	2025, Apr 30 May 05
MXS 1.x	MXS 1.2 or 1.3	2024, Dec 09 Monday, Dec...
PDM32	PDM32	2024, Oct 04 Friday, Octo...
K8 Open	K8 Open	2024, Sep 16 Monday, Sep...
SmartyCam 3 Sport	SmartyCam 3 Sport	2024, Aug 01 Thursday, Au...
SmartyCam 3 Dual	SmartyCam 3 Dual	2024, Aug 01 Thursday, Au...
SmartyCam 3 GP or Corsa	SmartyCam 3 GP or Corsa	2024, Aug 01 Thursday, Au...

The software enters Online view:

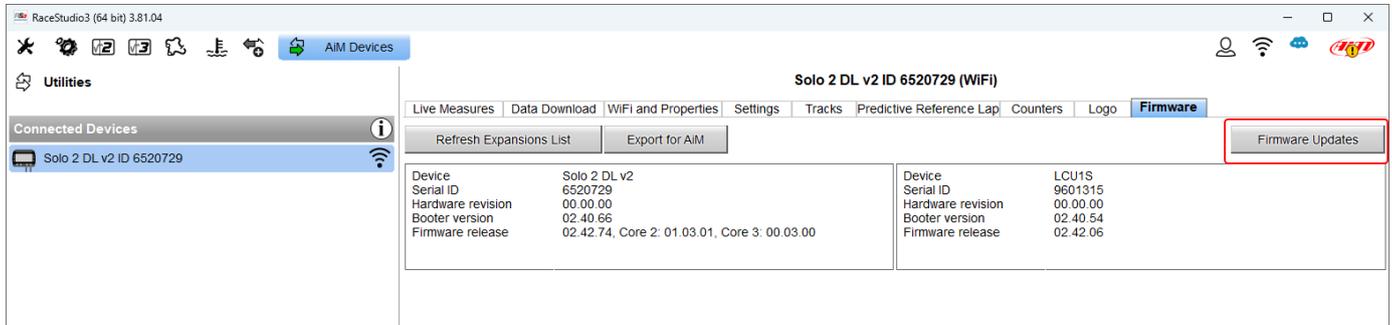
- Activate “Firmware” tab
- The view shows the logger and its expansions on the right part of the view as shown below.



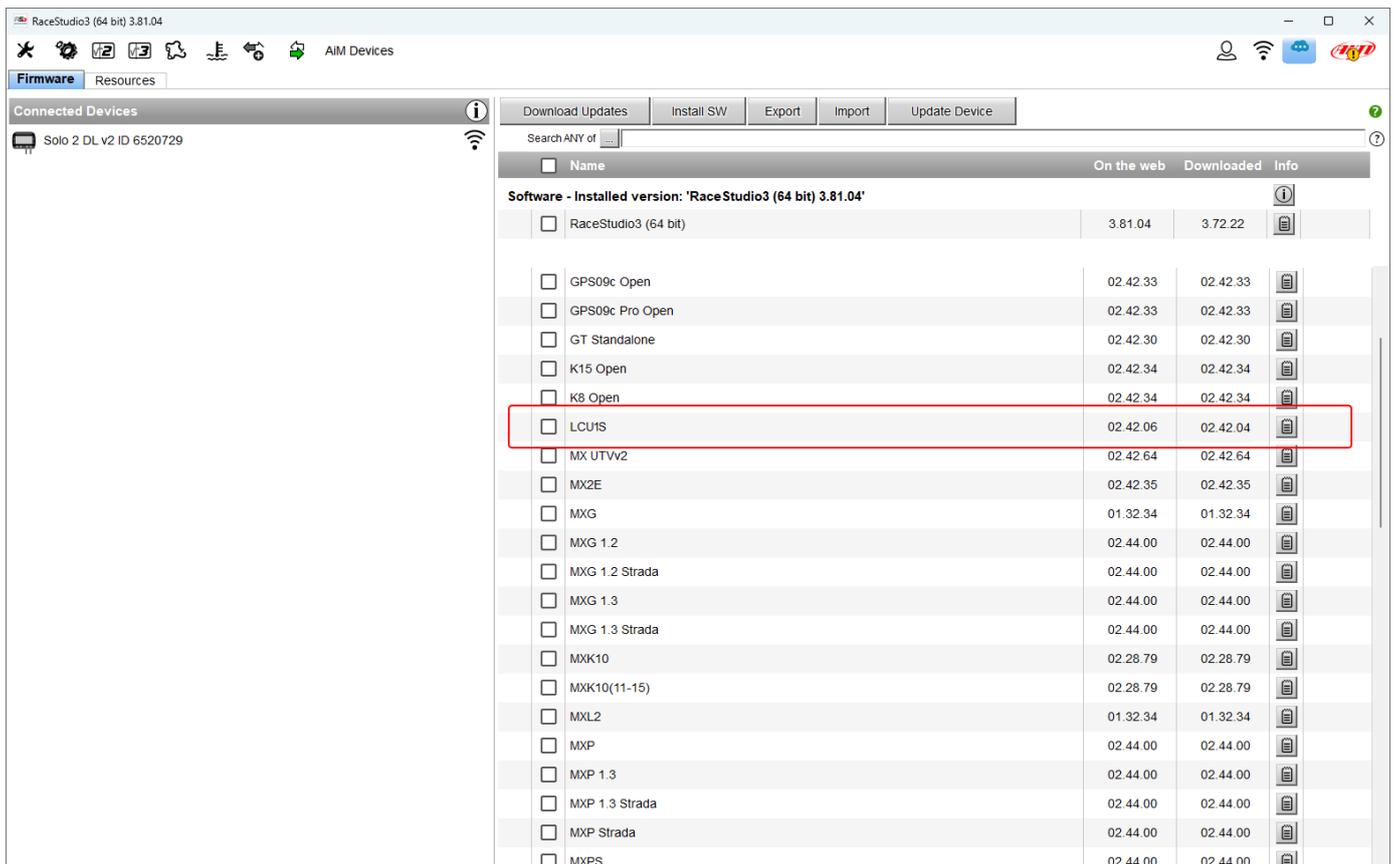


To update both logger and expansions firmware:

- click the related button top right of the view



- the software enters firmware update view where it is possible to download and install the firmware as for any AiM device.





## 6 – Diagnostic codes in Race Studio Analysis

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When LCU1S/LCU2 are connected to any AiM logger, sampled data can be downloaded and analysed. According to LCU1S/LCU2 status Race Studio Analysis will show some diagnostic codes. Here below their meaning are explained.

- 0 = Unknown [--]
- 1 = OK [OK]
- 2 = WarmUp [WUP]
- 3 = Probe disconnected from controller and circuit open [OPEN]
- 4 = 12V short circuit [SC+12]
- 5 = GND short circuit [SCgnd]
- 6 = Low Voltage on (LCU1S) [LowV]

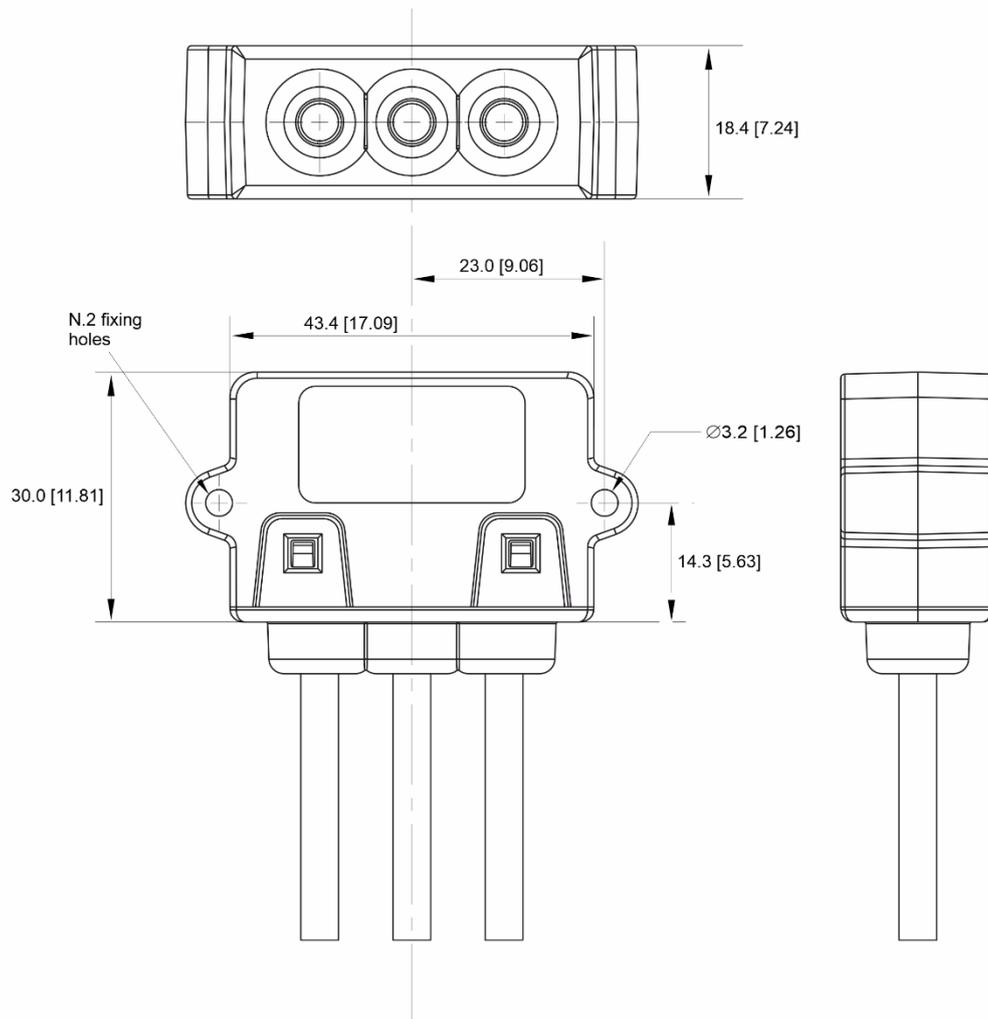
## 7 – Technical specifications and drawings

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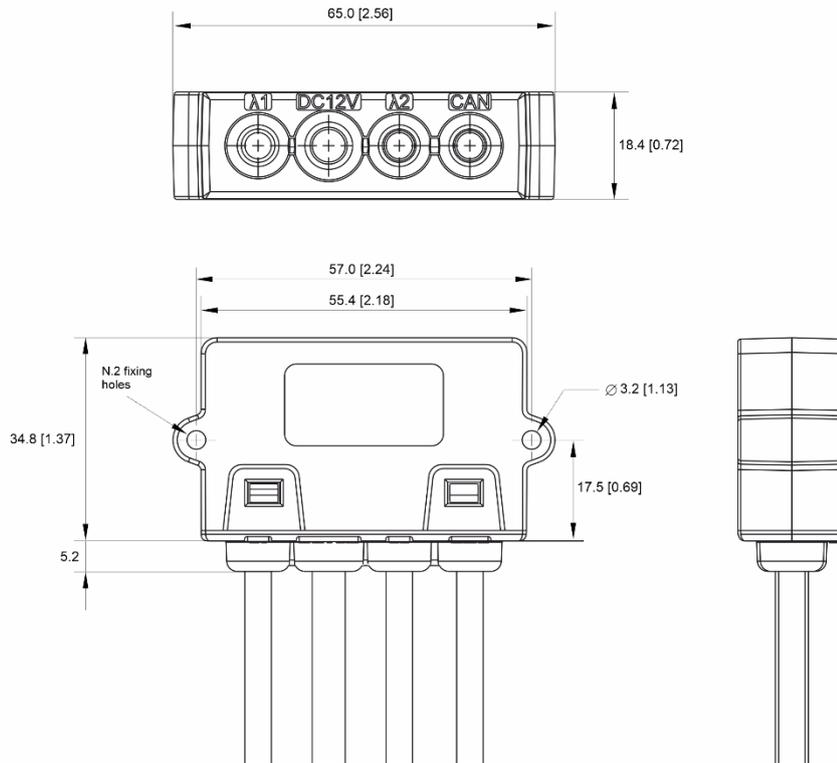
LCU1S/LCU2 technical specifications are:

- Sensor compatibility Bosch LSU4.
- Power supply voltage 9-15V
- Power supply current 50mA ÷ sensor heater typical current 750 mA up to 2A on cold sensor
- Reaction time Less than 10msec
- Material Latigloss 57
- LCU1S Dimensions 43.4x30x18.4 mm
- LCU2 Dimensions 65.0x34.8x18.4mm
- Weight 70g
- Waterproof IP67

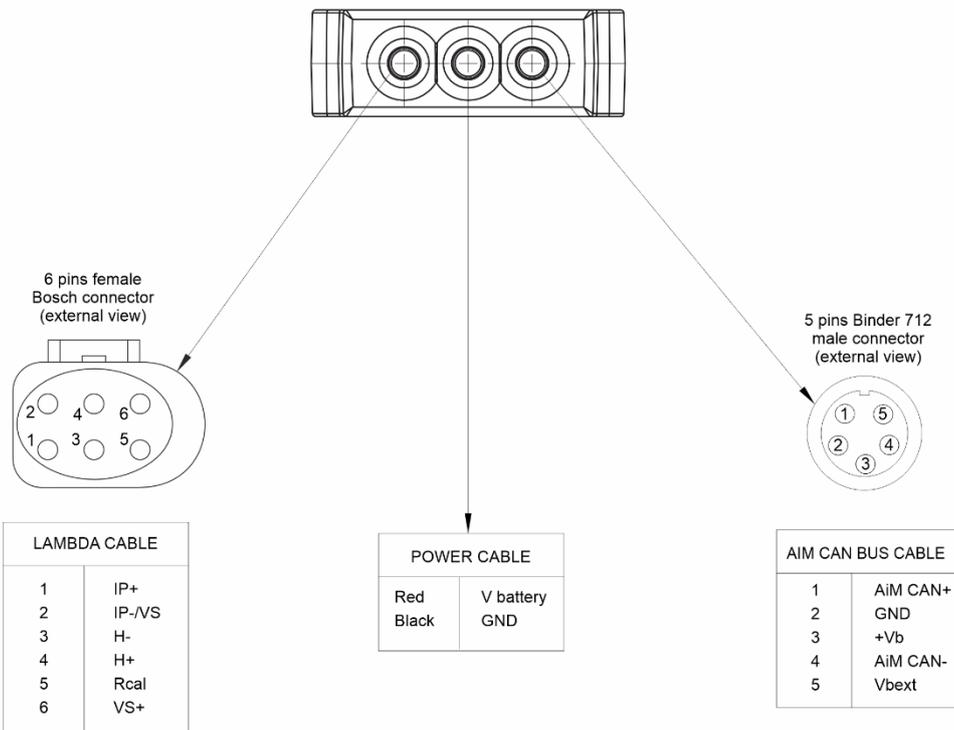
LCU1S Dimensions in mm [inches]



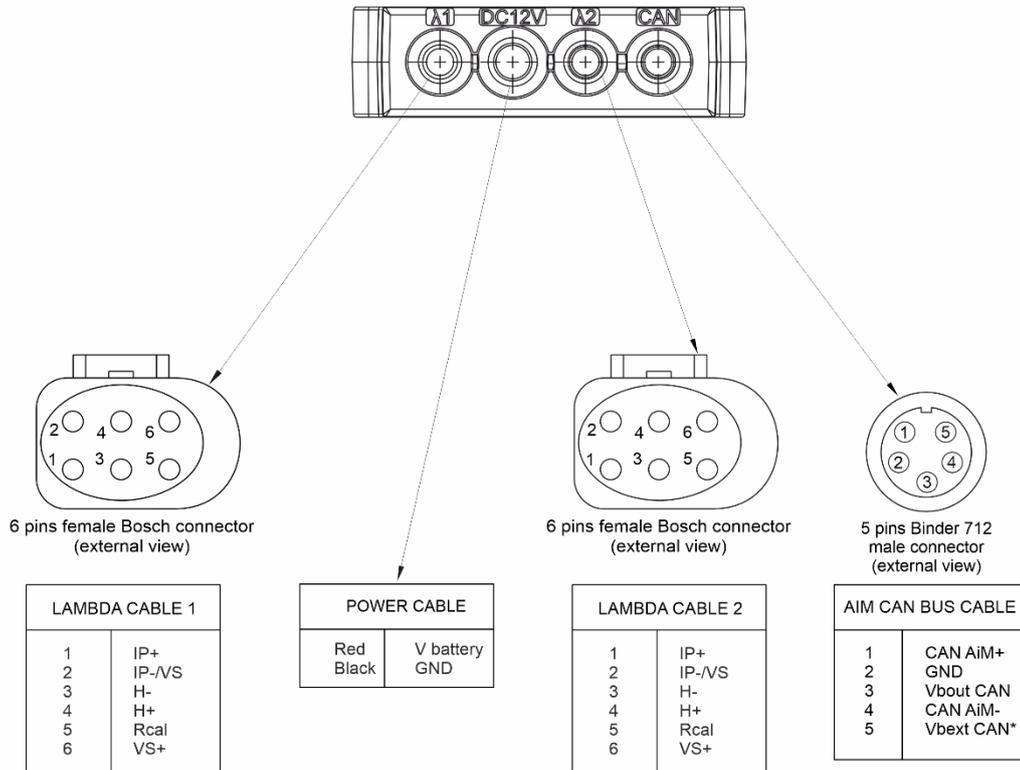
LCU2 dimensions in mm [inches]



LCU1S Pinout

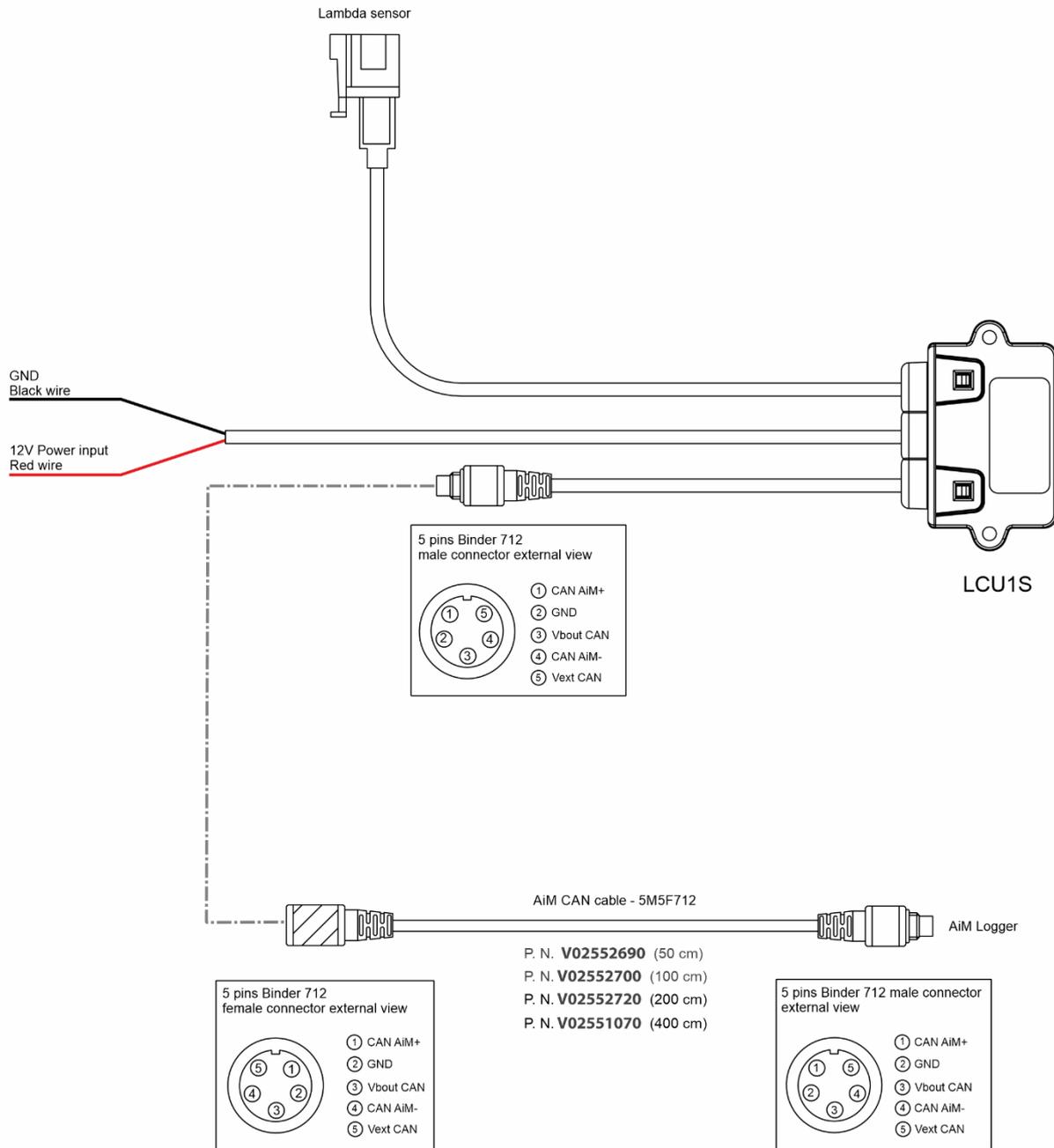


LCU2 Pinout



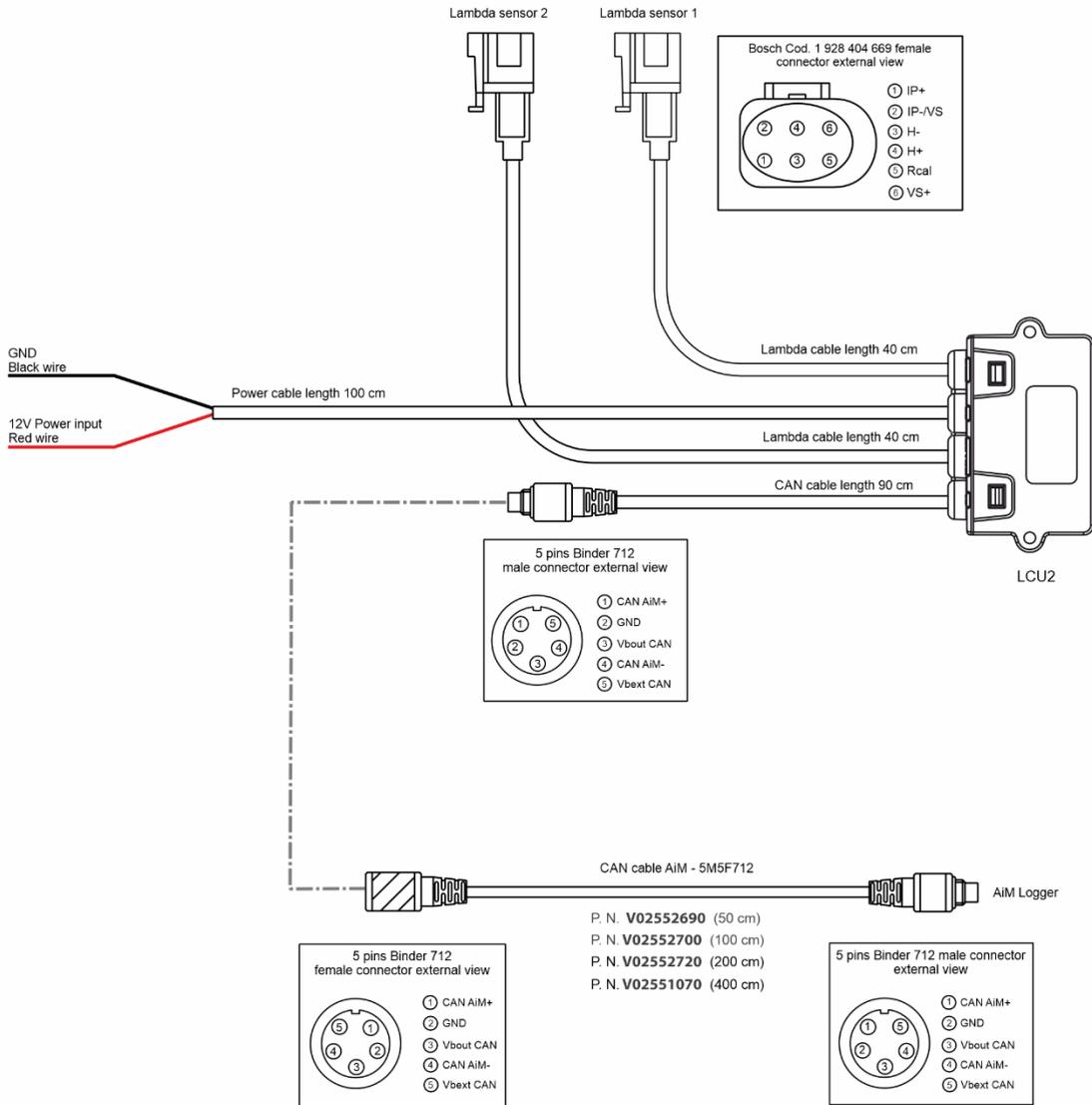
\*Internally enabled or disabled by configuration.

LCU1S Connections



EXTERNAL POWER SUPPLY IS ALWAYS REQUIRED

LCU2 Connections



EXTERNAL POWER SUPPLY IS ALWAYS REQUIRED