

User Manual

LCU1S/LCU2 Open

Release 1.00





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1 – Introduction

LCU1S/LCU2 Open are the new small, light and fast AiM Lambda Controller open expansions that can be connected to non AiM CAN network. They are of course supported by AiM devices too. **Please note:** the only AiM systems that does not support LCU1S/LCU2 Open are MXL, MXL2 and MyChron.

LCU1S/LCU2 Open allow you to perfectly tune the carburation of the engine as well as to improve the engine performances.

Both expansions 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

Available LCU1S Open kits are:

LCU1S Open complete kit; part number: **X08LCU1SAC090**

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

LCU1S Open kit without Lambda probe; part number: **X08LCU1SAC0**

- LCU1S Open

Available LCU2 open kit are:

LCU2 Open complete kit; part number: **X08LCU2AC090**

- LCU2 Open
- Bosch LSU 4.9 Lambda probe
- 2 Thread iron rings for installation

LCU2 Open kit without Lambda probe; part number: **X08LCU2AC0**

- LCU2 Open

Optional and spare parts:

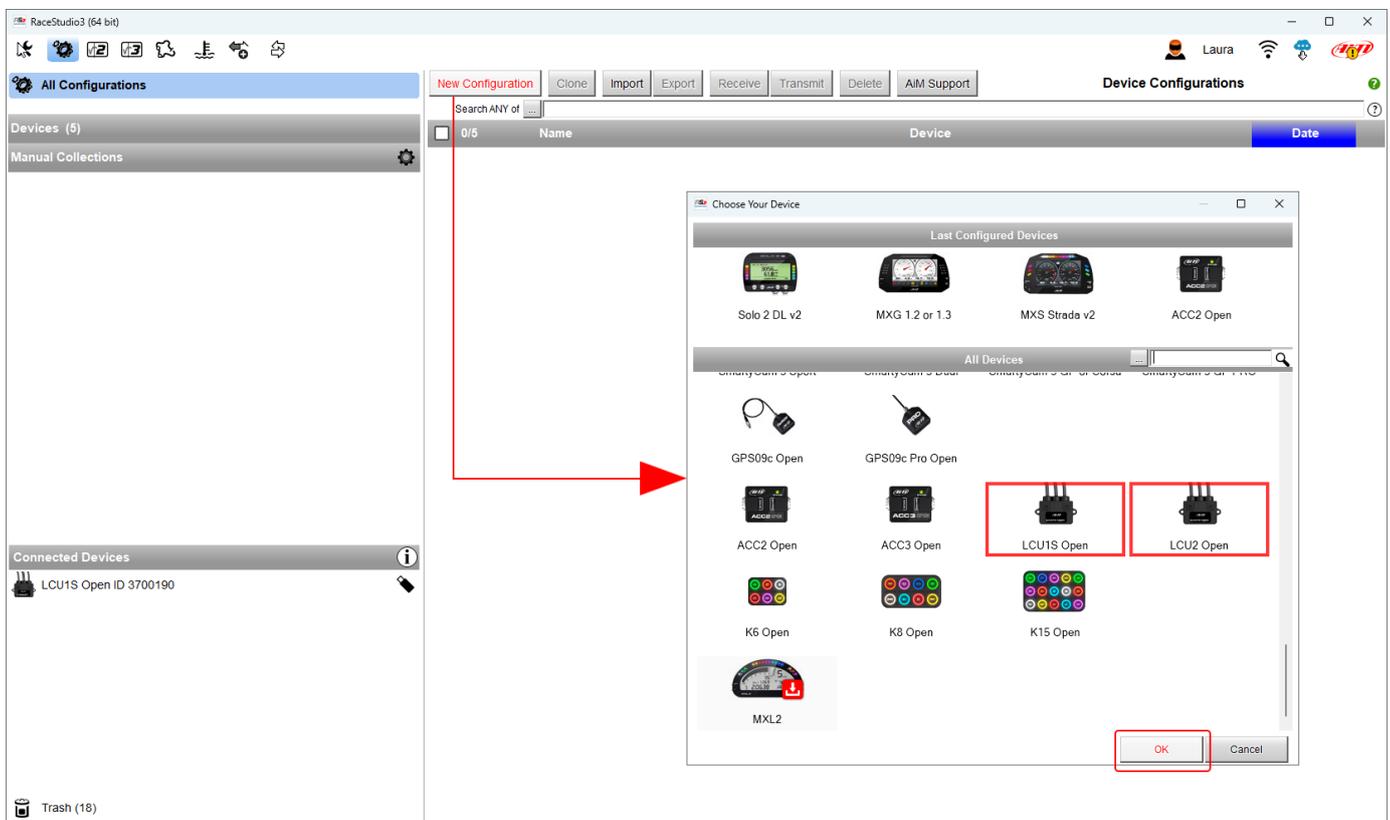
- Bosch LSU 4.9 Lambda probe **X05LSU490**
- Thread iron ring for installation **LBS552680**
- 50cm AiM CAN cable **V02552690**
- 100cm AiM CAN cable **V02552700**
- 200cm AiM CAN cable **V02552720**
- 400cm AiM CAN cable **V02551070**

3 – Configuring LCU1S/LCU2 Open channels

LCU1S/LCU2 Open can only be configured using AiM RaceStudio 3 software you can freely download from AiM website at www.aim-sportline.com download software/firmware area.

With LCU1S/LCU2 Open powered and connected to the PC, run the software and create a new configuration. If, on the contrary, you want to use it as slave connected to an AiM device select the configuration to load it on and use it as LCU1S/LCU2 non open version (in this case we would suggest you to refer to LCU1S/LCUS user manual for further information). **To create a new configuration:**

- Press “New Configuration”
- Scroll the menu in the panel that is prompted and select LCU1S/LCU2 Open
- Press “OK”





The software enters “Channels” tab.

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	Parameters
Lmd	<input checked="" type="checkbox"/>	Lambda	Lambda	Lambda	# 0.01	
AFR	<input checked="" type="checkbox"/>	AFR	AFR	AFR	# 0.01	
Ltm	<input checked="" type="checkbox"/>	LmdTmp	Lambda Temperature	LmdTmp	# 0.1	
LDg	<input checked="" type="checkbox"/>	Diagn	Lambda Diagnosis	LCU-One Diagn	#	

Once LCU1S/LCU2 Open configuration created, the software enters the expansion channel configuration tab (0LC1S Open here below) where they can be configured. Specifically:

- According to the fuel used select the related multiplier to calculate AFR from lambda (1)
- Manage Lambda multiplier through the related button (2) or add a custom value (3)

Set channel table (4) clicking on each channel and setting sampling frequency, Unit of measure and display precision.

The screenshot shows the 'RaceStudio3 (64 bit) 3.81.07' interface. The main window is titled 'LCU1S Open' and shows a configuration for 'Open' mode, connected to an 'AIM master'. The 'Channels' tab is active, showing a table of channels:

ID	Name	Function	Sensor	Unit	Parameters
Lmd	Lambda	Lambda	Lambda	# 0.01	
AFR	AFR	AFR	AFR	# 0.01	
LmTmp	LmdTmp	Lambda Temperature	LmdTmp	# 0.1	
LDg	Diagn	Lambda Diagnosis	LCU-One Diagn	#	

Below the table is a 'Lambda Multiplier Manager' dialog box. It contains a table of multiplier values:

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

The dialog box also includes buttons for 'Change value above and click here to add it', 'Remove Current Item', and 'Restore Default Values'. The 'OK' and 'Cancel' buttons are at the bottom.

Red circles and lines in the image indicate the following steps:

- (1) Selecting the fuel type from the dropdown menu.
- (2) Clicking the 'Manage Custom Values' button.
- (3) Clicking the 'Change value above and click here to add it' button in the dialog box.
- (4) Clicking on the 'AFR' channel in the table.



LCU1S and LCU2 channels configuration procedure is the same except for the fact that configuration table is doubled in LCU2 as shown here below and so you need to set bot LCUs channels.

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

14.57 - Gasoline Manage Custom Values

ID	<input checked="" type="checkbox"/>	Name	Function	Sensor	Unit	Parameters
Lmd1	<input checked="" type="checkbox"/>	Lambda1	Lambda	Lambda1	# 0.01	
AFR1	<input checked="" type="checkbox"/>	AFR1	AFR	AFR1	# 0.01	
LTm1	<input checked="" type="checkbox"/>	LmdTmp1	Lambda Temperature	LmdTmp1	# 0.1	
LDg1	<input checked="" type="checkbox"/>	Diagn1	Lambda Diagnosis	LCU-One Diagn	#	

Lmd2	<input checked="" type="checkbox"/>	Lambda2	Lambda	Lambda2	# 0.01	
AFR2	<input checked="" type="checkbox"/>	AFR2	AFR	AFR2	# 0.01	
LTm2	<input checked="" type="checkbox"/>	LmdTmp2	Lambda Temperature	LmdTmp2	# 0.1	
LDg2	<input checked="" type="checkbox"/>	Diagn2	Lambda Diagnosis	LCU-One Diagn	#	

4 – Configuring LCU1S/LCU2 Open CAN Output

To configure CAN Output enter the related tab and ensure that the tab is set on “Open” (1).

The software offers a default example of configuration you can set according to the CAN network you are going to connect your LCU1S Open to.

Once CAN Header details set (2) configure all bytes (3) according to the frame of the vehicle protocol.

In case more devices of the network can receive the information supplied by LCU1S/LCU2 Open you can add and configure more payloads pressing the related button so to satisfy the network parameters.

The screenshot displays the RaceStudio3 interface for configuring CAN output. The 'CAN Output' tab is active, and the 'Open' button is highlighted with a red box and the number 1. Below the bit rate protocol dropdown, the 'CAN ID (hex)' is set to 0x0, and the 'Add New Payload' button is highlighted with a red box and the number 2. The CAN frame configuration table is shown with the following data:

Byte	Content
Byte 0	Lambda [LCU1S Open-AC]
Byte 1	AFR [LCU1S Open-AC]
Byte 2	LmdTmp [LCU1S Open-AC]
Byte 3	Diagn [LCU1S Open-AC]

Four 'Set CAN Payload Details' dialog boxes are shown, each corresponding to a channel in the table. Each dialog includes fields for Channel, Unit of measure, Multiplier (a), Offset (b), Num Bytes, and Data Format. A 'Select Channel' dialog is also shown, listing the available channels: Main Device - LCU1S Open, A/D Channels, Lambda, AFR, LmdTmp, and Diagn. The 'Select Channel' dialog is highlighted with a red box and the number 3.



As for channels configuration procedure, CAN Output LCU1S/LCU2 configuration procedure is the same for both controllers except for the fact that the payload table of LCU2 is doubled as shown here below.

Bit Rate Protocol (bits) 1 Mbit/s

<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"/>	0x0	[20 Hz] LRP	Lambda1 [LCU2 Open-AC]	LRP	AFR1 [LCU2 Open-AC]	LRP	LmdTmp1 [LCU2 Open-AC]	LRP	Diagn1 [LCU2 Open-AC]	
<input checked="" type="checkbox"/>	0x1	[20 Hz] LRP	Lambda2 [LCU2 Open-AC]	LRP	AFR2 [LCU2 Open-AC]	LRP	LmdTmp2 [LCU2 Open-AC]	LRP	Diagn2 [LCU2 Open-AC]	

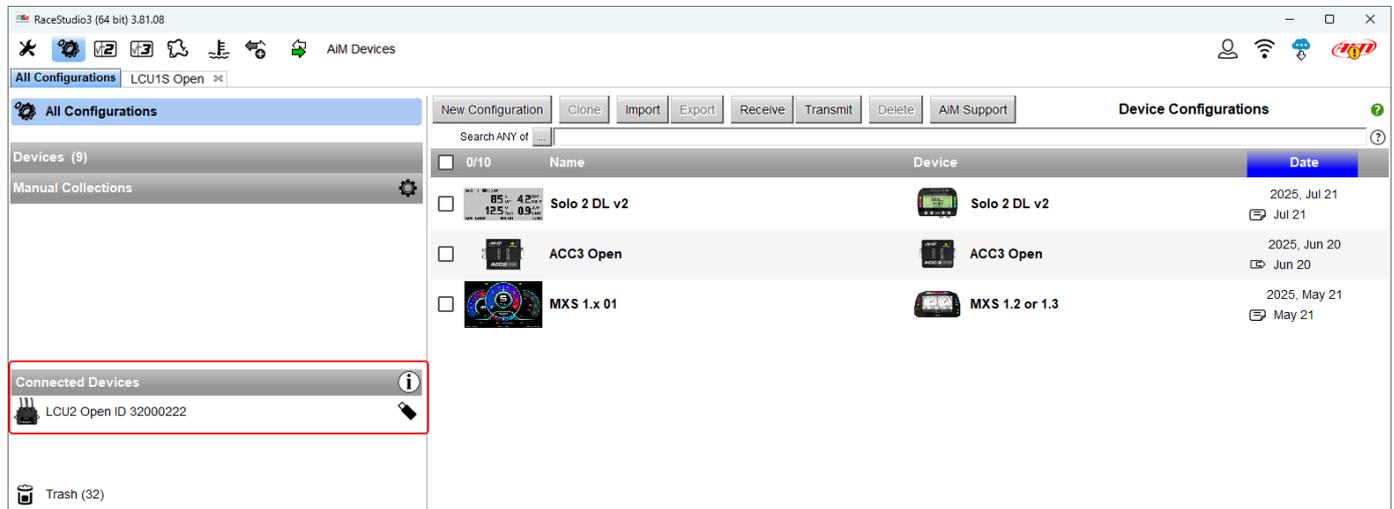
Add New Payload Create CAN Input Protocol Export Import

5 – Online view and firmware update

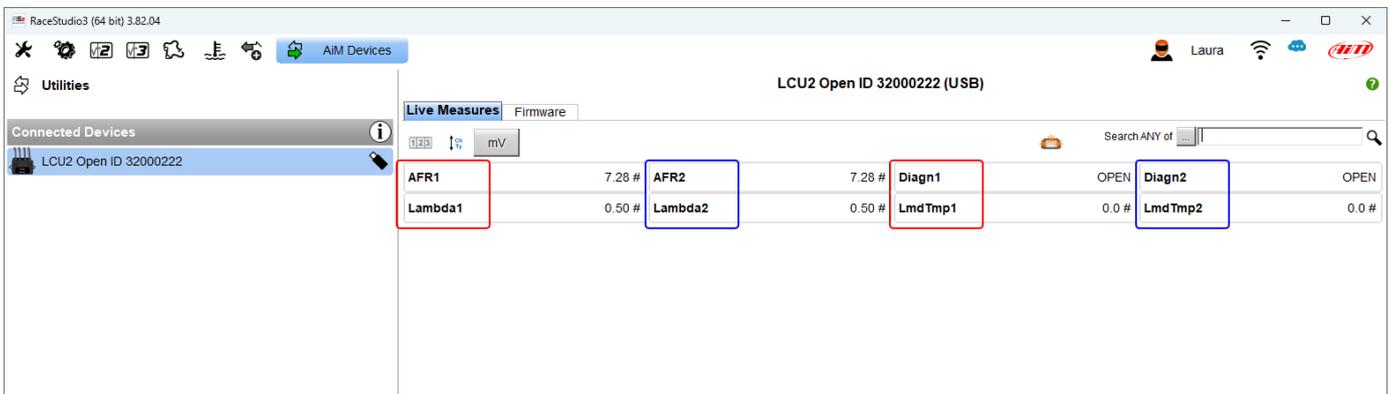
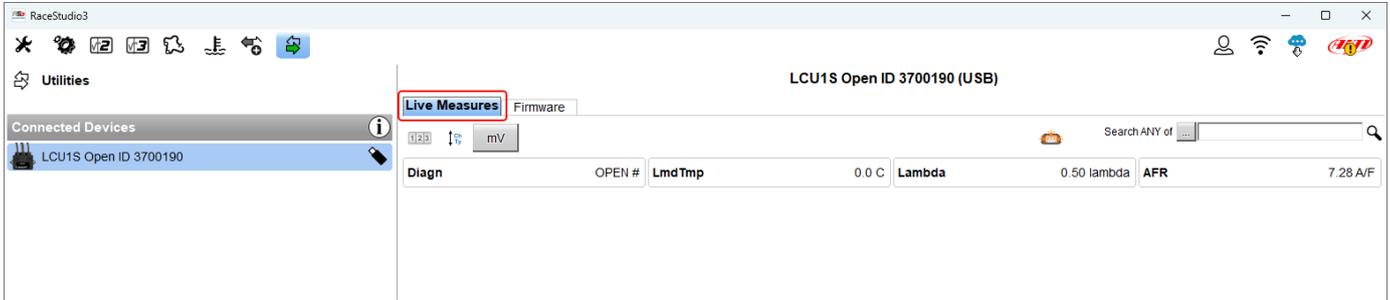
Once LCU1S/LCU2 Open connected, identified and correctly configured it is suggested to save and transmit the configuration to LCU1S/LCU2.

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

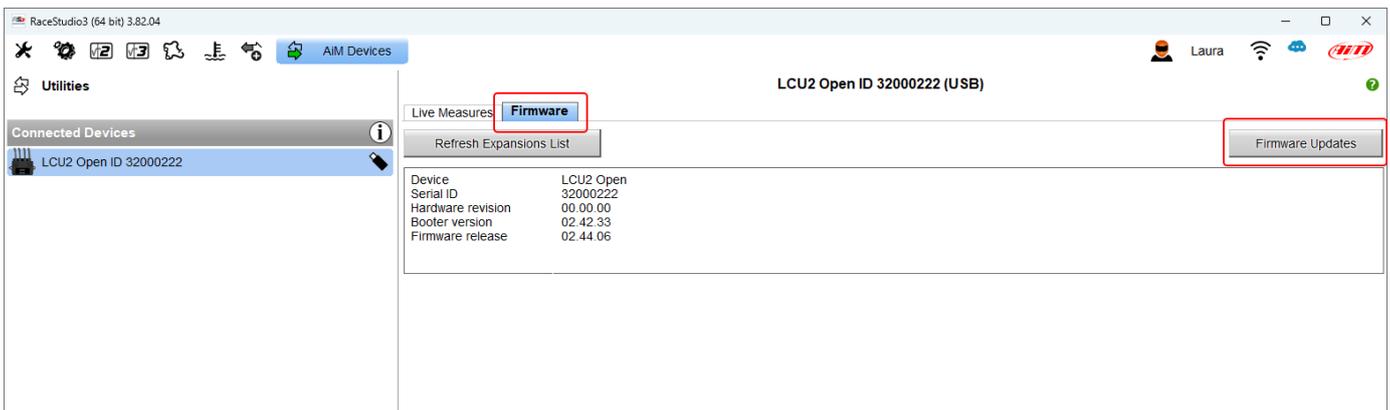
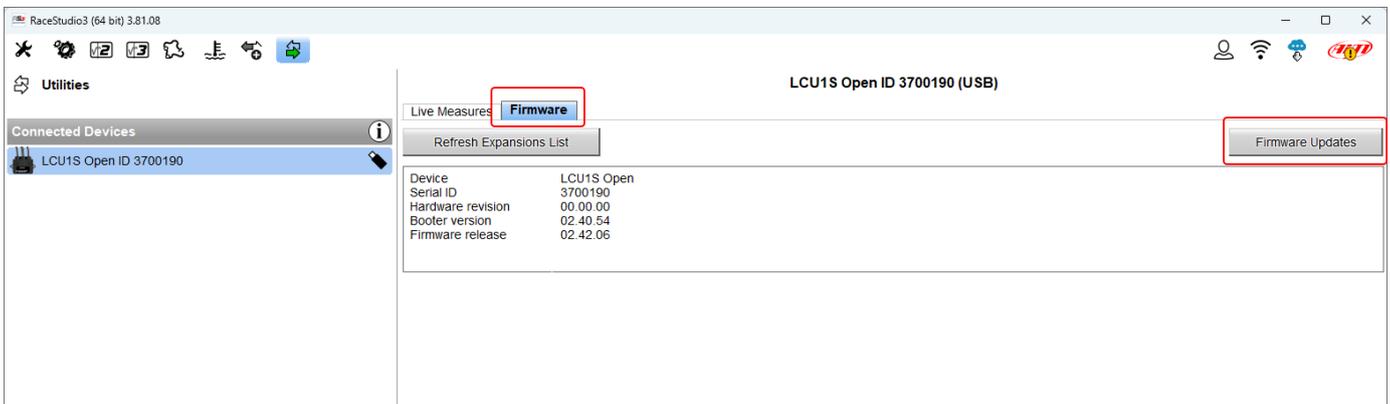
- enter “Configurations” view
- Press LCU1S/LCU2 Open connected.



The software enters “Live measures” view and shows the expansion live measures as shown below.



From this page it is also possible to update LCU1S/LCU2 Open firmware activating the related tab. To update the firmware press the related button.





The software enters Firmware update view.

To update LCU1S/LCU2 Open firmware scroll the list of available updates select, download and install LCU1S/LCU2 Open firmware as for any AiM device.

Connected Devices: LCU1S Open ID 3700190

Download Updates | Install SW | Export | Import | Update Device

Search ANY of [...]

<input type="checkbox"/>	Name	On the web	Downloaded	Info
Software - Installed version: 'RaceStudio3 (64 bit) 3.81.08'				
<input type="checkbox"/>	RaceStudio3 (64 bit)	3.81.08	3.72.22	[Info]
Firmware				
<input type="checkbox"/>	ACC2 Open	02.42.36	02.42.36	[Info]
<input type="checkbox"/>	ACC3 Open	02.42.36	02.42.36	[Info]
<input type="checkbox"/>	ECULog	02.42.68	02.42.68	[Info]
<input type="checkbox"/>	EVO4S	01.32.40	01.32.40	[Info]
<input type="checkbox"/>	EVO5	01.32.40	01.32.40	[Info]
<input type="checkbox"/>	GPS09c Open	02.42.33	02.42.33	[Info]
<input type="checkbox"/>	GPS09c Pro Open	02.42.33	02.42.33	[Info]
<input type="checkbox"/>	GT Standalone	02.42.30	02.42.30	[Info]
<input type="checkbox"/>	K15 Open	02.42.34	02.42.34	[Info]
<input type="checkbox"/>	K8 Open	02.42.34	02.42.34	[Info]
<input type="checkbox"/>	MX UTV	02.40.40	02.40.40	[Info]
<input checked="" type="checkbox"/>	LCU1 S Open	02.42.01	02.42.06	[Info]
<input type="checkbox"/>	MX UTVw2	02.42.64	02.42.64	[Info]
<input type="checkbox"/>	MX2E	02.42.35	02.42.35	[Info]
<input type="checkbox"/>	MXG	01.32.34	01.32.34	[Info]
<input checked="" type="checkbox"/>	MXG 1.2	02.44.01	02.44.00	[Info]
<input checked="" type="checkbox"/>	MXG 1.2 Strada	02.44.01	02.44.00	[Info]
<input checked="" type="checkbox"/>	MXG 1.3	02.44.01	02.44.00	[Info]
<input checked="" type="checkbox"/>	MXG 1.3 Strada	02.44.01	02.44.00	[Info]
<input type="checkbox"/>	MXK10	02.28.79	02.28.79	[Info]



6 – Diagnostic codes in Race Studio Analysis

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

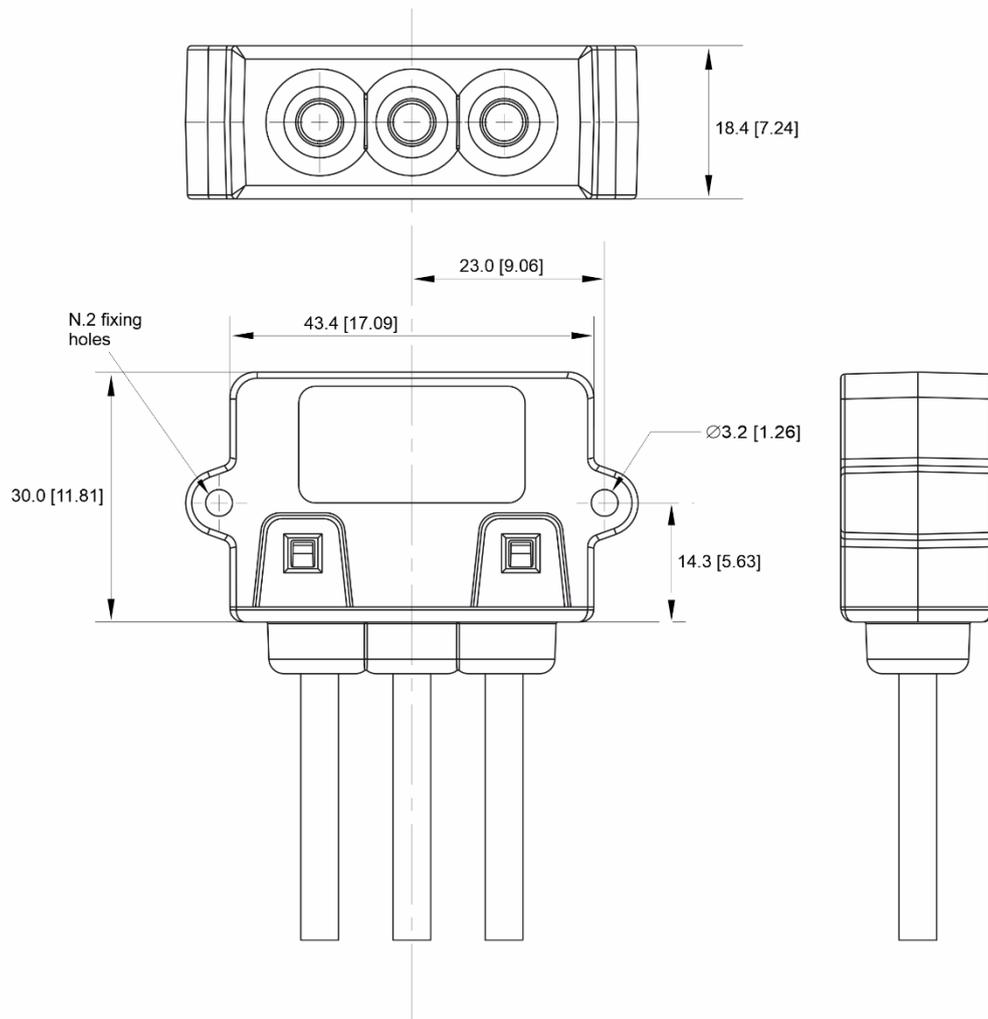
- 0 = Unknown [--]
- 1 = OK [OK]
- 2 = WarmUp [WUP]
- 3 = Probe disconnected from controller and circuit open [OPEN]
- 4 = 12V short circuit [SC+12]
- 5 = GND short circuit [SCgnd]
- 6 = Low Voltage on (LCU1S) [LowV]

7 – Technical specifications and drawings

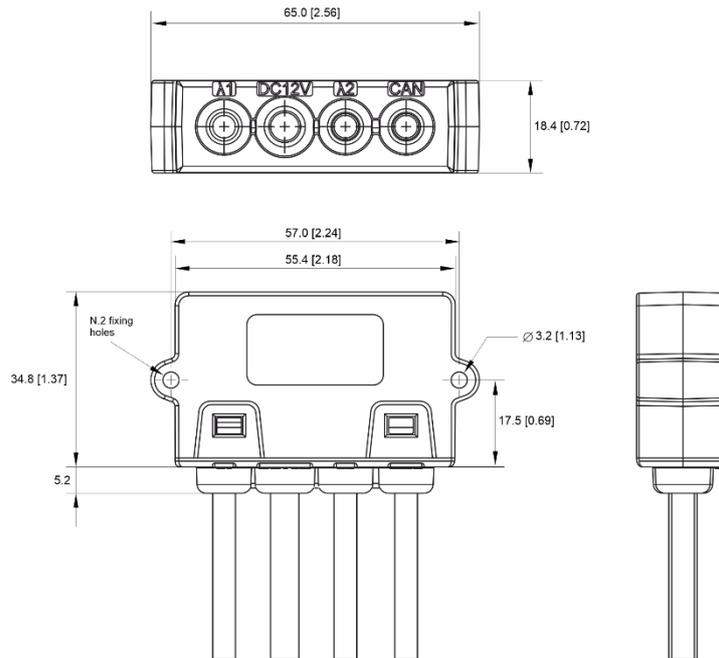
LCU1S/LCU2 Open technical specifications are:

- Sensor compatibility Bosch LSU4.9
- 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 65.0x34.8x18.4 mm
- Weight 70g
- Waterproof IP67

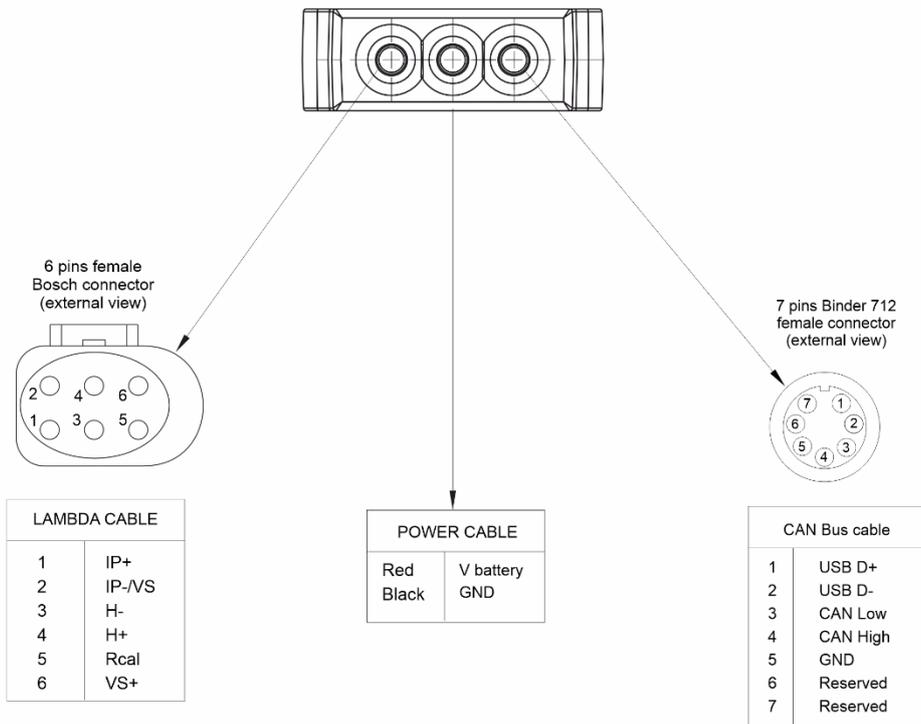
LCU1S Open Dimensions in mm [inches]



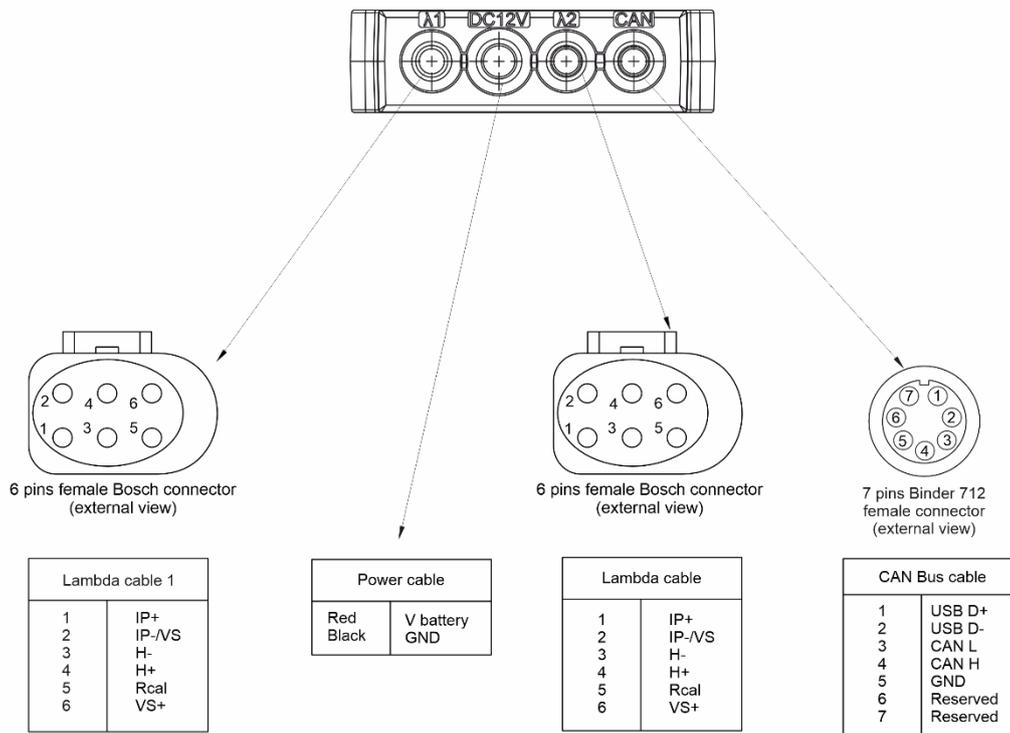
LCU2 Open Dimensions in mm [inches]



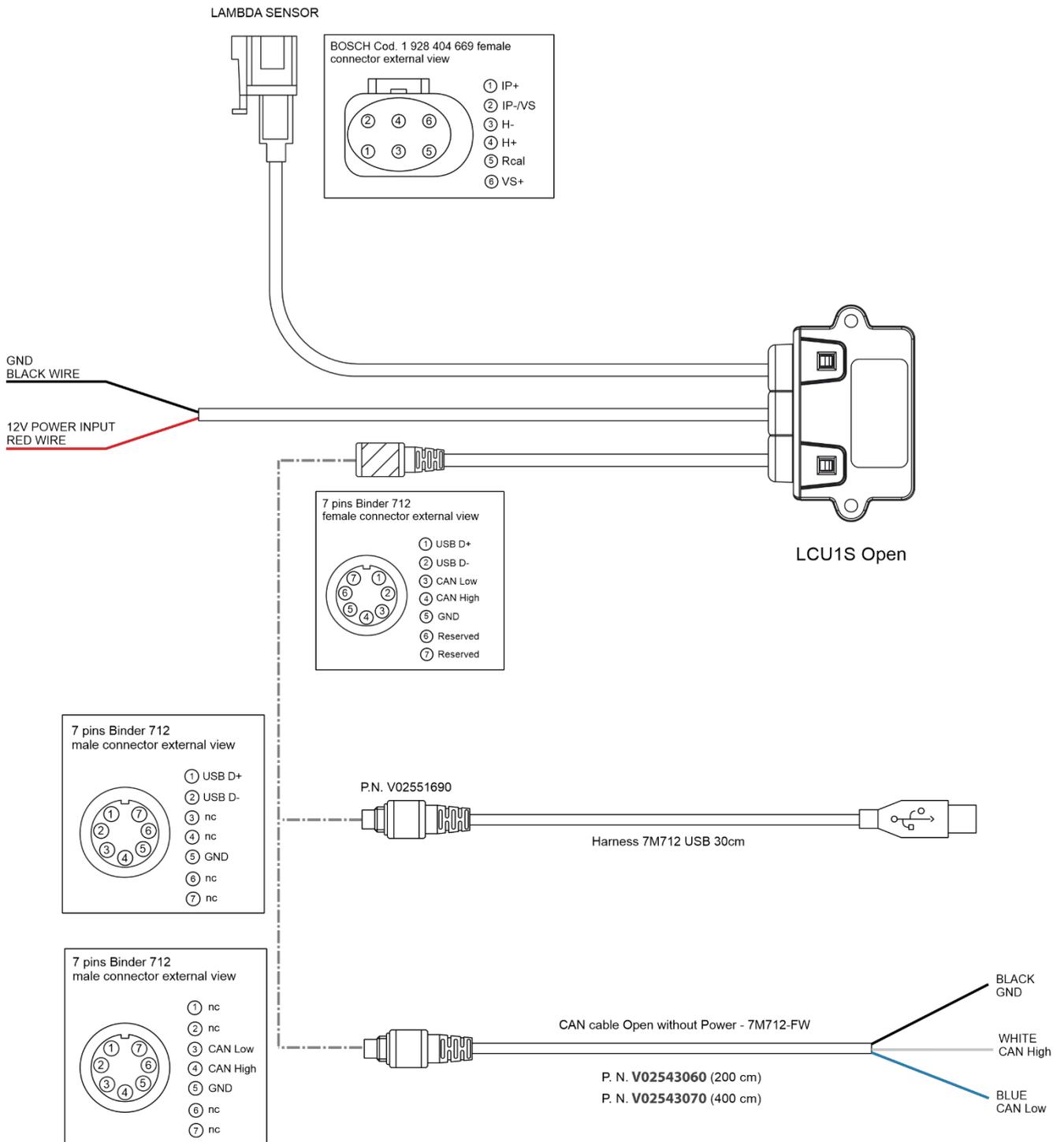
LCU1S Open Pinout



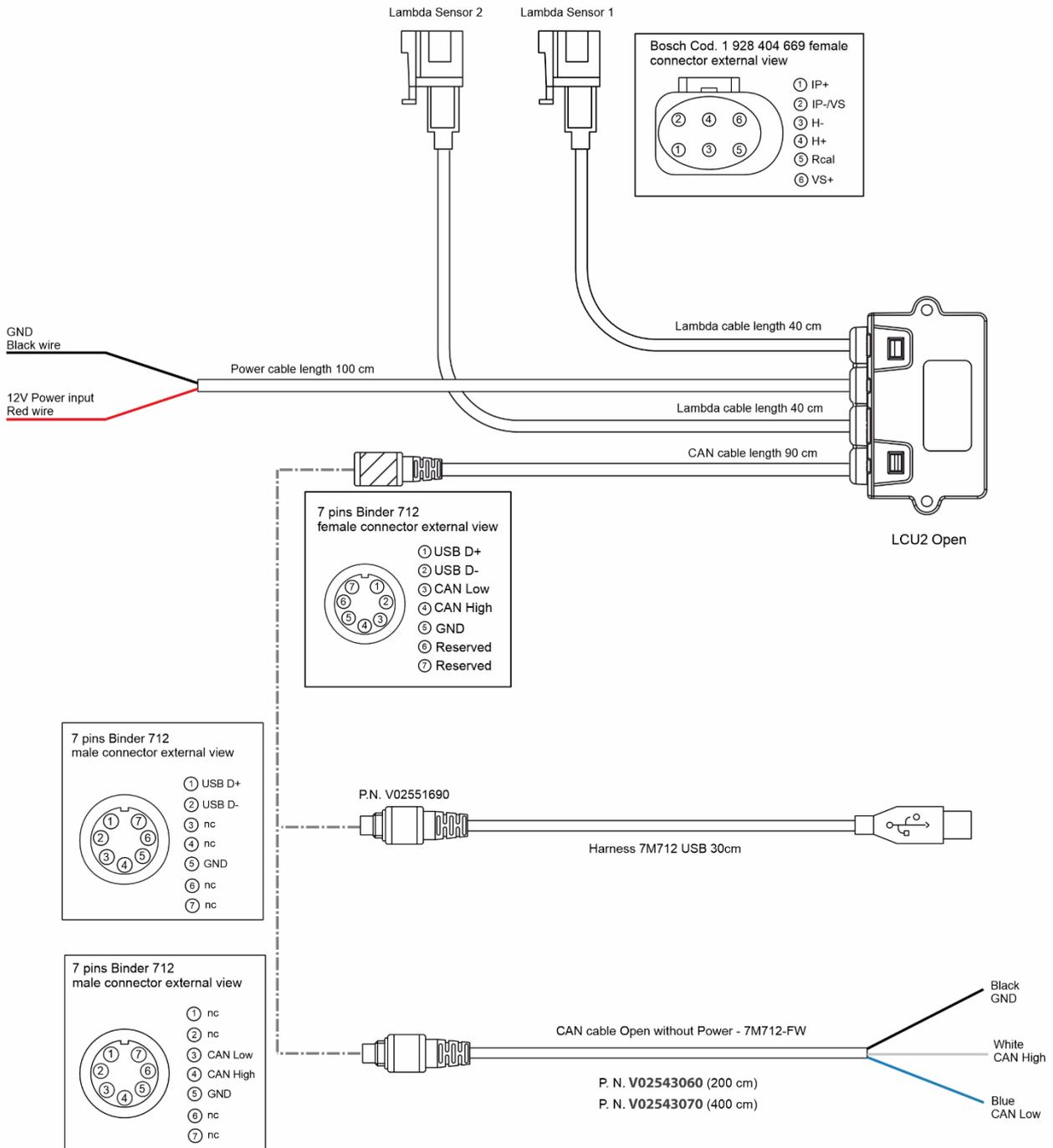
LCU2 Open pinout



LCU1S Open cables



LCU2 Open cables



EXTERNAL POWER SUPPLY IS ALWAYS REQUIRED