

8 Channel DSI3 Sensor Emulation Board

AL-5010 for SLSC

This document describes how to get started with the SLSC AL-5010 DSI3 Sensor Emulator for National Instruments (NI) SLSC-12001 chassis.

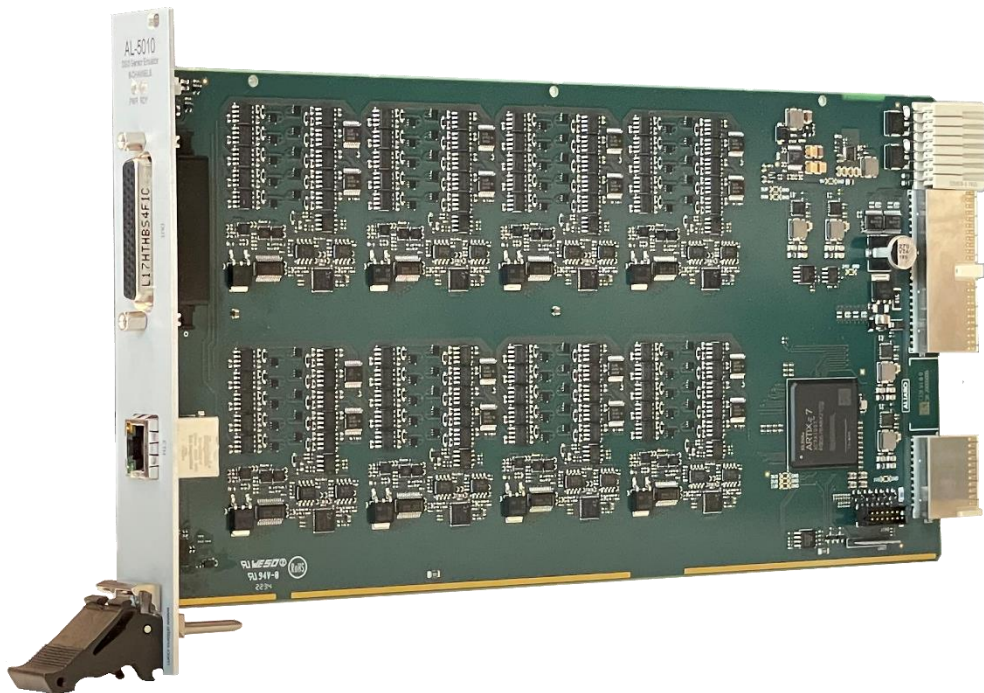


Figure 1 - ALIARO AL-5010 SLSC Board

Definitions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

The following characteristic specifications describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- Typical specifications describe the performance met by most models.
- Nominal specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are *Typical* unless otherwise noted.

Conditions

Specifications are valid under the following conditions unless otherwise noted.

The AL-5010 board is mounted in an SLSC chassis with the recommended cooling clearances and using a power supply that meets the specifications provided in the chassis user guide. For the entire temperature range of the chassis.



NOTE - These specifications only apply to the product as provided by ALIARO. Modifications to the module may invalidate these. Be certain to verify the performance of modified modules.



CAUTION - Observe all instructions and cautions in the user documentation. Using the model in a manner not specified can damage the model and compromise the built-in safety protection. Return damaged models to ALIARO for repair.

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Electromagnetic Compatibility

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install, and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any modifications to the product not expressly approved by ALIARO could void your authority to operate it under your local regulatory rules.



CAUTION - To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

Safety



CAUTION - Observe all instructions and cautions in the user documentation. Using the model in a manner not specified can damage the model and compromise the built-in safety protection. Return damaged models to ALIARO for repair.

Environmental Characteristics

Temperature and Humidity

Operating temperature:	0 °C to 40 °C
Storage temperature range:	-40 °C to 85 °C
Operating relative humidity range:	10% to 90%, noncondensing
Storage relative humidity range:	5% to 95%, noncondensing
Pollution degree:	2
Maximum altitude:	2,000 m (800 mbar at 25 °C ambient)
Note: Indoor use only	

Unpacking the module

Carefully inspect the shipping box / container and the module for damage. If damage appears to have been caused during shipment file a claim with the carrier. Retain the packing material for inspection and/or reshipment. If the module is damaged, do not install it and contact ALIARO.

Overview

The AL-5010 is an 8-channel DSI3 sensor emulation board for applications requiring simulation of sensors over the DSI3 protocol.

The AL-5010 is designed for the National Instruments (NI) Switch Load Signal Conditioning (SLSC) system, to be used in Hardware-In-the-Loop (HIL) simulators.

The board interfaces with NI PXI and/or Compact-RIO instrumentation devices for the purposes of developing, verifying, and validating electronic control unit software and hardware.

The module supports the following communication modes defined in the DSI3 specification:

- Command and Response Mode
- Periodic Data Collection Mode

The AL-5010 supports the following bus topologies: point-to-point, daisy-chain, and parallel.

Topology	Bus In	Bus Out
Isolated	Front Connector	Front Connector
Serial Start	Front Connector	Next Channel
Serial Middle	Last Channel	Next Channel
Serial End	Last Channel	None
Parallel From Master	Front Connector	Internal Bus
Parallel From Bus	Internal Bus	Internal Bus

Table 1 - ALIARO AL-5010 SLSC board, Supported bus topologies

Fault insertion (FIU) is available on each channel providing options for short to AUX1/F+, short to AUX2/F-, Pin to Pin Short, and Open Fault.

The reference (REF) of each channel can be Disabled (for fault insertion) or wired to DUT_GND.

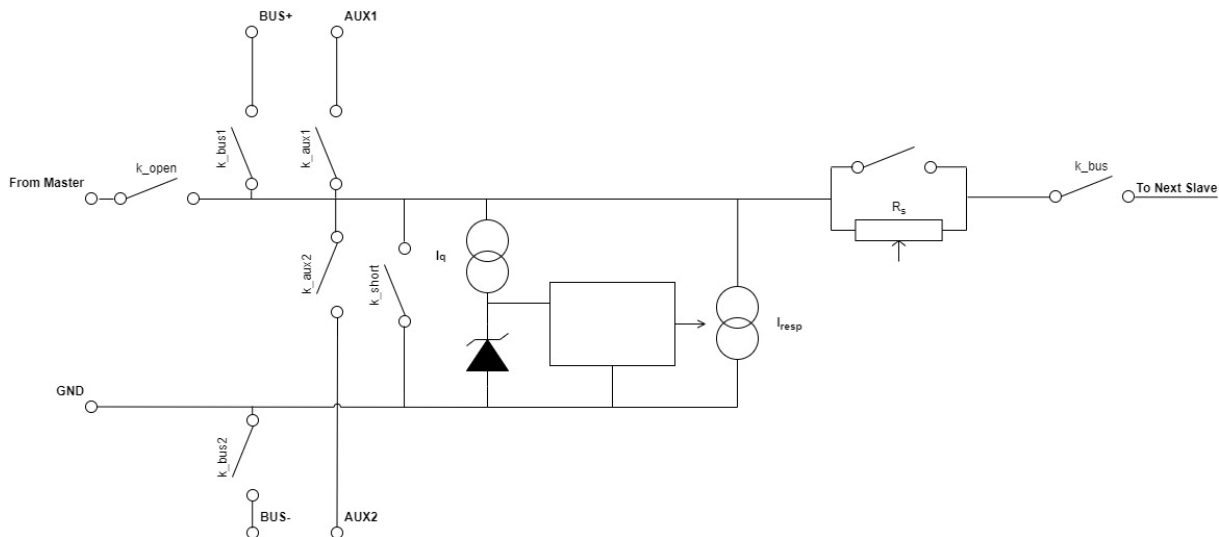


Figure 2 – ALIARO AL-5010, FIU on single channel

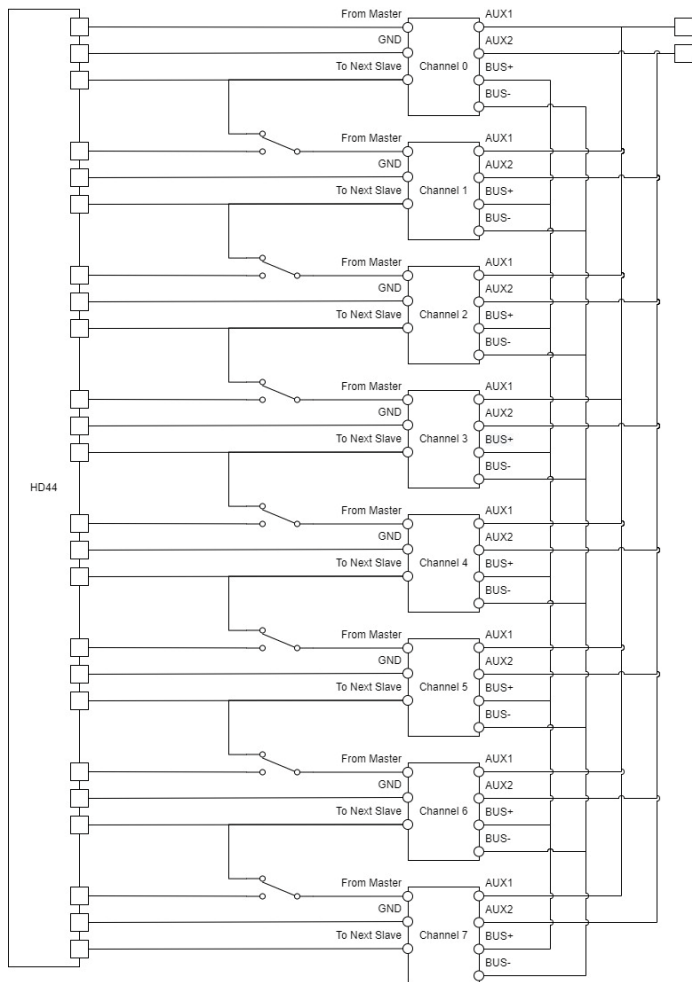


Figure 3 - ALIARO AL-5010, Overview of channel connectivity.

ALIARO reserve the right to vary from the description given in this data sheet and shall not be liable for any errors.

Application

- ✓ Sensor emulation such as ultrasonic distance sensors, airbag crash sensors.
- ✓ Fault insertion i.e., validation of faulty wiring or corrupt sensors.

Features

- ✓ 8 independent channels.
- ✓ Two common reference buses.
- ✓ Short to AUX1/F+, short to AUX2/F-, Pin to Pin, and Open faults for each channel.
- ✓ Supports the NI SLSC driver for easy integration with NI systems.

What You Need to Get Started

To set up and use the module you need the following items:

Hardware

- SLSC-12001 chassis
- SLSC module(s)
- NI RTI backplane
- Power cable
- Power input connector
- Grounding wire
- Grounding lug
- Ethernet connection to a computer or controller.

Tools

- Screwdriver as needed for your application
- Wire stripper

Documentation

- SLSC-12001 Chassis Getting Started Guide and Specifications

Installing the AL-5010

1. **CAUTION** - Do not touch the contacts or remove the I/O boards or cables while the system is energized.
2. Power off the main DC power source or disconnect the power source from the chassis before installing any modules or RTIs.
3. Ensure that the chassis is powered off. The POWER LED should be off. If the POWER LED is not off, do not proceed until it is off.



NOTICE - SLSC chassis and AL-5010 board do not support hot plug-in. The entire chassis must be powered off when a module is inserted or removed.

4. Loosen the screws on the upper rear panel of the chassis.
5. Position the RTI backplane at the desired slot and insert the securing screws, but do not fully tighten them.
6. Insert the AL-5010 module into the same slot as its corresponding RTI while firmly holding the RTI in place until the RTI is firmly connected to the module.
7. Repeat steps 4 and 5 for all required RTIs.
8. Fully tighten the screws for all RTIs and the upper rear panel of the chassis. Note Waiting until all RTIs and modules are installed to fully tighten the screws ensures proper alignment for future connections between modules and RTIs.
9. Fully tighten the two module mounting screws on each newly installed module.

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10. Power on the SLSC chassis

Getting Started with Software

Install the following applications to get full device functionality:

- National Instrument software
 - SLSC Driver
 - SLSC EDS Custom Device for VeriStand & HW
 - LabVIEW 2020 or higher

Connector locations

AL-5010 has multiple connectors, see illustration below.

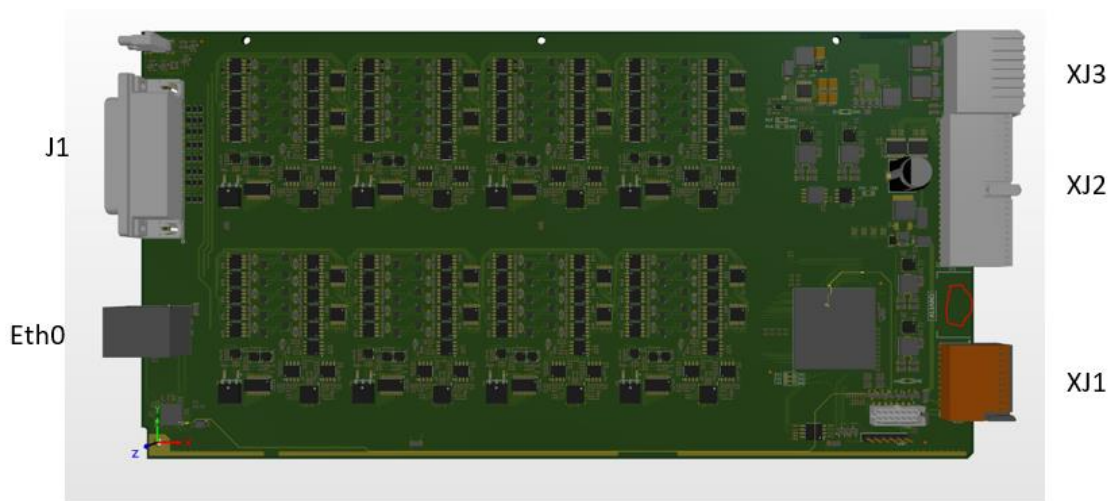


Figure 4 - ALIARO AL-5010, Connectors

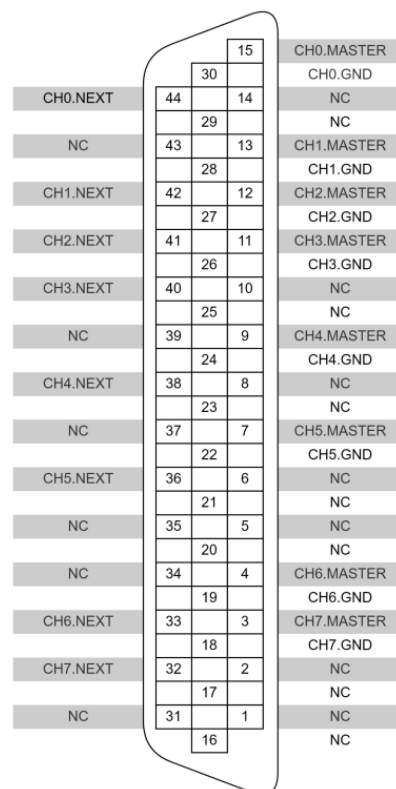
ALIARO reserve the right to vary from the description given in this data sheet and shall not be liable for any errors.

Connector pinout - Connector J1

Connector type: High density (44 pin) Female D-Sub connector

This connector is used for interfacing with the DSI3 network.

Depending on your desired network topology anywhere between 1 and 8 channels may be externally connected.



Connector pinout - Connector Eth0

Connector type: Standard RJ45 Ethernet Connector.

Figure 5 – ALIARO AL-5010, J1 Connector Pinout

Connector pinout - Connector XJ2

The pinout for the XJ2 connector can be found in the table below.

Row	E	D	C	B	A
1	RTI_IO4	RTI_IO3		RTI_IO2	RTI_IO1
2	RTI_IO8	RTI_IO7		RTI_IO6	RTI_IO5
3	GND	GND	GND	GND	GND
4	RTI_IO12	RTI_IO11		RTI_IO10	RTI_IO9
5	RTI_IO16	RTI_IO15		RTI_IO14	RTI_IO13
6	GND	GND	GND	GND	GND
7					
8					
9	GND	GND	GND	GND	GND
10					
11					
15					
16					
17	GND	GND	GND	GND	GND
18					
19					
20	GND	GND	GND	GND	GND

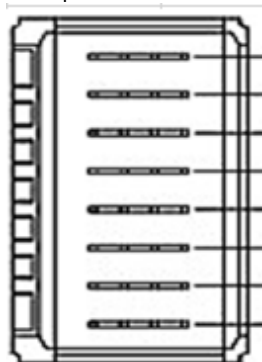
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21					
22					
23	GND	GND	GND	GND	GND
24					
25					

Table 2 - ALIARO AL-5010, XJ2 Connector Pinout

Connector pinout - Connector XJ3

The pinout for the XJ3 connector can be found in the picture below.



Signal	XP3 Pin	Pin Number
AUX1 (F+)	H	1
AUX1 (F+)	G	2
AUX2 (F-)	F	3
AUX2 (F-)	E	4
GND	D	5
GND	C	6
BUS POS	B	7
BUS NEG	A	8

Figure 6 - ALIARO AL-5010, XJ3 Connector Pinout

Design Standards and Compatibility

Switch Load and Signal Conditioning Module Design Specifications Version	1.2
SLSC Compliance Level	1
Rear I/O Compatibility Category	1
Required RTI	Any Compliance Level 1
Earliest driver version	NI-SLSC 20.0

Power consumption (SLSC backplane)

3.3V	< 100mA
24V	< 500mA

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Accessories

Visit ALIARO.com for more information about AL-5010 accessories. You must install mating connectors according to local safety codes and standards and according to the specifications provided by the manufacturer.

You are responsible for verifying the safety compliance of third-party connectors and their usage according to the relevant standard(s).

Calibration

Recommended warm-up time	1 hour
Calibration interval	2 years

Physical Characteristics

SLSC slots	1
Dimensions	144.32mm x 30.48mm x 281 mm (H x W x D)
Weight	560 grams
Front I/O Connector	1 x DSUB44, 1 x RJ45
Rear I/O Connectors	1x 110-pin Hard Metric Type A, 1x 8-blade Universal Power Module (UPM), capable of implementing Fully Compatible Rear I/O

Safety Guidelines

Cautions

Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.



Do not mix hazardous voltage circuits and human-accessible circuits on the same module

When device terminals are hazardous voltage LIVE, you must ensure that devices and circuits connected to the device are properly insulated from human contact.

All wiring must be insulated for the highest voltage used.

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information.

To obtain product certifications and the DoC for ALIARO products, visit ALIARO.com/certification.

CE Compliance

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2011/65/EU; Restriction of Hazardous Substances (RoHS)

Electromagnetic Compatibility Standards

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

EN 61326-1-2013 Electrical equipment for measurement, control, and laboratory use - EMC requirements - Part 1: General requirements IEC 61326-1:2012

FCC Regulations Title 47 Chapter 1, Part 15, Subpart B, Class B.
§15.107: Conducted Emission, AC power line, §15.109: Radiated Emission

Environmental Management

ALIARO is committed to designing and manufacturing products in an environmentally responsible manner. ALIARO recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to ALIARO customers. For additional environmental information, refer to the Minimize Our Environmental Impact web page at ALIARO.com/environment.

This page contains the environmental regulations and directives with which ALIARO complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all ALIARO products must be disposed of according to local laws and regulations.

For more information about how to recycle ALIARO products in your region, visit ALIARO.com/environment/weee