CAN-ISO-2500 Galvanic CAN Bus Isolation Device - User Manual

Figure 1: CAN-ISO-2500

Overview

The Perspic CAN-ISO-2500 is a galvanic isolation device for use on CAN Bus networks in mobile or stationary applications. The device features 2500 V isolation between the HV (High Voltage) and LV (Low Voltage) sides and supports CAN baud rates of up to 1 Mbit/s.

The CAN-ISO-2500 is available with M12 5-pin connector pigtails or loose, field-wireable pigtails and features flange-style holes for mounting to a surface. Two case options are available: the ABS case is rated IP54 (protection against dust and splashing water) while the Polycarbonate option is rated IP68 (protection against dust and long-term submersion in water) and features an extended temperature range.

Key Features

- Up to 2500 V galvanic isolation between HV and LV sides
- Up to 1 Mbit/s data rate
- Automatic baud rate detection (no configuration required)
- Standard 120 Ohm termination resistors with cuttable solder jumpers
- Optional silent mode allows data in one direction (LV to HV only)
- Wide input voltage range of 5-28 V DC with reverse polarity protection
- ESD protected inputs
- IP54 rating (splash-resistant); IP68 (submersion-resistant) optional

Applications

CAN Bus data transmission is ubiquitous on vehicles and mobile equipment and is a popular protocol for industrial communications applications. Many CAN data busses are powered by a single power supply; however, on busses with different power supplies, voltage transients can travel across the data bus causing signal integrity problems and possibly destroying CAN-connected devices. Alternatively, high-precision data acquisition systems may require isolation from the main power supply to ensure measurement accuracy. Either of these scenarios will require high-quality galvanic isolation for proper operation.

Multiple Power Supplies on Single CAN Network

For scenarios where CAN devices are connected to different power supplies, voltage differences on the CAN network can cause data transmission issues and even damage components. The CAN-ISO-2500 can be used to isolate different components on the bus and eliminate the possibility of damage caused by voltage differences.
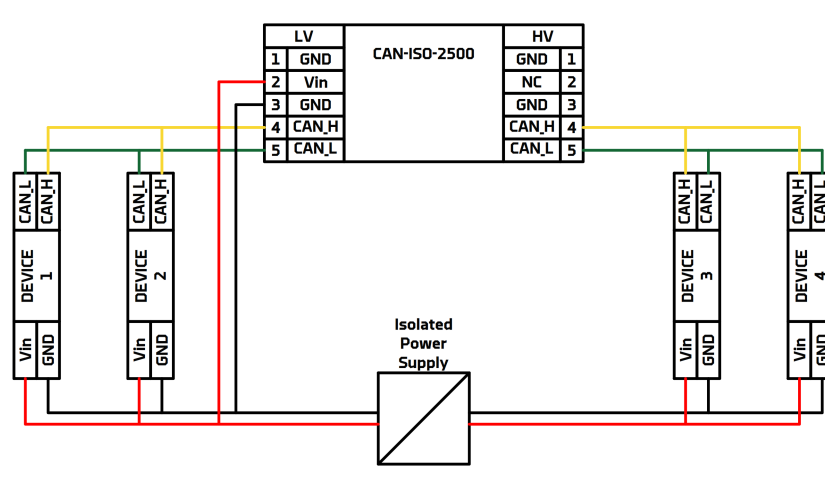

Figure 2: CAN Circuit with Galvanic Isolation

Device Specifications

Electrical

Specification	Min	Max	Notes
Input Voltage	5 V	28 V	
Current Draw (5V input)	40 mA	40 mA	Idle and Active
Current Draw (28V input)	30 mA	30 mA	Idle and Active
CAN Baud Rate	5 Kbit/s	1 Mbit/s	
Isolation Between HV and LV		2.5 kV	Tested 1 second
Propagation Delay		150 ns	

Protections

- Reverse polarity protected on LV power input
- ESD protected inputs on all CAN pins

Pin Functions

LV Side (M12 Male)

Figure 3: M12 Male Plug

Pin Number	Function
1	GND (Optional)
2	V+ (Power In)
3	GND
4	CAN_H
5	CAN_L

HV Side (M12 Female)

Figure 4: M12 Female Socket

(Image shows mating male connector for reference)

Pin Number	Function
1	NC
2	NC
3	NC
4	CAN_H
5	CAN_L

Note: HV side is isolated and requires no power connection

Mechanical Specifications

Mechanical - IP54 ABS Enclosure (Standard)

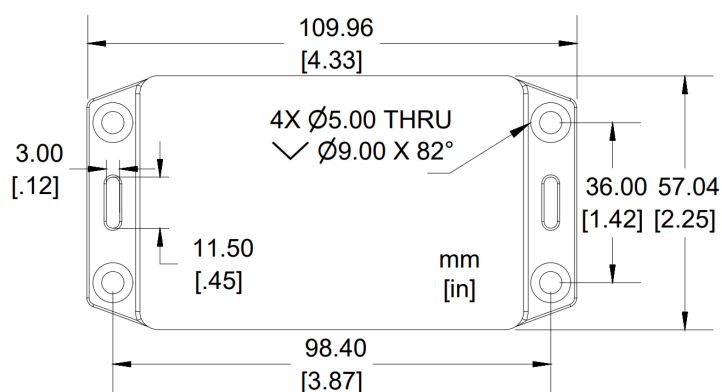| Dimension	Measure (Pigtail)
Width	5.8 cm
Length	13 cm (from strain reliefs)
Height	3 cm
Weight	110 g
Cable Length	15 cm
IP Rating	IP54
Hole Pattern	Rectangular 4x 5mm countersunk through holes
Temperature	-20 to 80 C
Humidity	0 to 95% (Non-Condensing)

Figure 5: Pigtail Option

Figure 6: IP54 Flange Mounting Pattern

Mechanical - IP68 Polycarbonate Enclosure

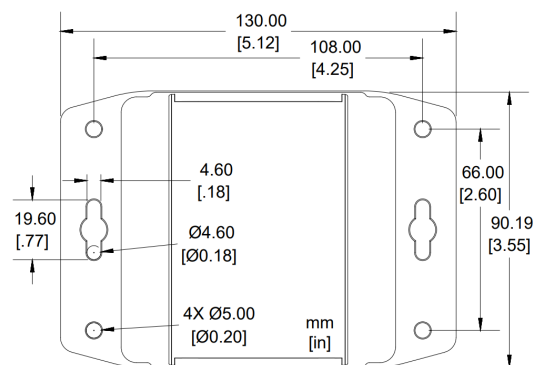| Dimension	Measure (Pigtail)
Width	9 cm
Length	13 cm (from flanges)9 cm (case only)
Height	3.4 cm
Weight	200 g
Cable Length	15 cm
IP Rating	IP68
Hole Pattern	Rectangular 4x 5mm countersunk through holes
Temperature	-40 to 105 C
Humidity	0 to 100%

Figure 7: IP68 Enclosure

Figure 8: IP68 Flange Mounting Pattern

Device Configuration

CAN Bus Termination Resistor

Devices with board version V3.1 or later have optional termination resistor cut traces to remove termination resistance from either the LV and/or HV sides. See the figures below for traces to cut (highlighted in red). Ensure you cut traces to both 60 Ohm resistors and verify the cut with a multimeter to confirm continuity has been lost. To re-connect the termination resistor, solder between the pad and resistor.

> **WARNING:** Cut only the traces indicated. Cutting other traces will cause the device to malfunction.
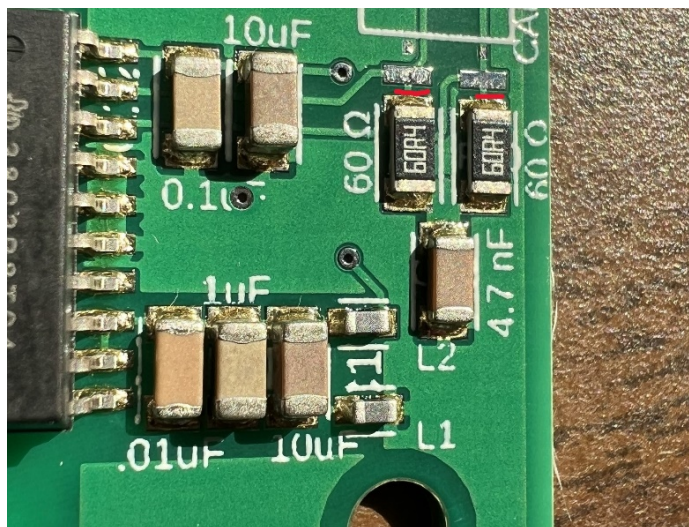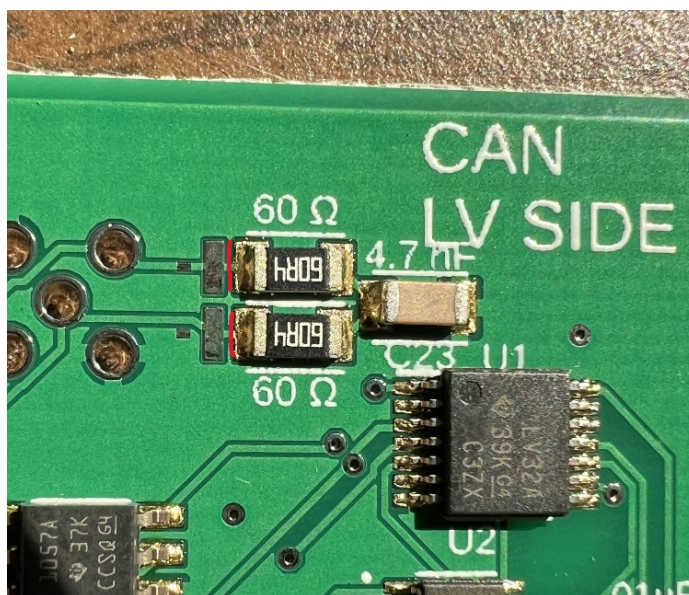

Figure 9: HV Side Termination Resistor Cut Trace

Figure 10: LV Side Termination Resistor Cut Trace

Silent Mode

An optional "LV silent mode" jumper is included on board revision V3 or later, indicated as "JP1" on the board. Soldering this jumper together will allow data from LV to HV but block data from HV to LV.

Silent mode refers to silence on the LV bus: the device will not transmit data on the LV bus, it will only transmit on the HV bus. This is useful when connecting a monitoring device to an isolated bus segment where you want to observe traffic without affecting the bus.

Installation Considerations

The CAN-ISO-2500 adds 150 ns of propagation delay to the CAN data signals. For proper operation, ensure maximum CAN bus length does not exceed the following values with one CAN-ISO-2500 installed:

Bit Rate	Typical Max Bus Length	Recommended Max Bus Length with CAN-ISO-2500
1 Mbit/s	40 m	10 m
500 kbit/s	110 m	80 m
250 kbit/s	240 m	210 m
125 kbit/s	500 m	470 m
50 kbit/s	1300 m	1270 m

Note: For bitrates below 50 kbit/s, the propagation delay is negligible.

Wiring Best Practices

- Use twisted pair cable for CAN_H and CAN_L connections
- Keep stub lengths short (< 30 cm typical)
- Ensure 120 Ohm termination at both physical ends of each CAN bus segment
- The CAN-ISO-2500 includes termination resistors on both sides; if placed mid-bus, consider disabling internal termination

Wiring and Connections

The CAN-ISO-2500 comes standard with two waterproof M12 A-Code barrel type connectors. The device contains a 120 Ohm termination resistor on both the input and output and can be placed anywhere in the middle of an existing CAN data bus.

Pigtail Option

The pigtail option has a Male M12 connector on the LV side and Female M12 connector on the HV side. The wires are each 15 cm long.

M12 Connector Part Numbers

Use the following parts or equivalents to connect to the CAN-ISO-2500. Any M12 A-keyed connector will connect properly.

Part Number	Style	Supplier
61-25001	M12 Female, straight, 4-6mm cable	Perspic
61-25002	M12 Female, straight, 6-8mm cable	Perspic
61-25003	M12 Male, straight, 4-6mm cable	Perspic
61-25004	M12 Male, straight, 6-8mm cable	Perspic

Note: Standard wiring harness limited to -20 to 80 C ambient temperatures. Contact us for extended temperature range wiring harness.

Wiring Option: Unterminated Pigtails

Unterminated pigtail option includes 4-conductor cables on each end.

Wire Color	LV Side	HV Side
Red	V+ (Power In)	
Black	GND	HV GND (Optional)
Yellow	CAN_H	CAN_H
White	CAN_L	CAN_L

Troubleshooting

No CAN data transmission:

- Check input voltage (5-28 V DC)
- Confirm CAN HV/LV wiring pinout
- Check power status LED inside cover
- Check CAN termination resistor configuration
- Check silent mode solder-jumper "JP1"

Intermittent communication:

- Verify proper bus termination (120 Ohm at each end)
- Check for excessive bus length (see Installation Considerations)
- Ensure proper shielding and grounding

Power LED not illuminated:

- Verify power supply voltage (5-28 V DC)
- Check for reverse polarity (device is protected but will not operate)
- Inspect wiring connections

Tests and Certifications

RF Emissions: Tested per CISPR22 Edition 5.2 2006-03 Class A EMC: Tested per IEC 61000-4-2 Edition 3.2 2010-04 Level 2 ESD Immunity: Tested per IEC 61000-4-2 Edition 2.0 2008-12 Class 2 Galvanic Isolation: Tested 2.5 kV between HV and LV connector pins

Produced in an ISO-9001 certified facility.

Part Numbers

Part Number	IP Rating	Wiring Option	Temperature Range	Connector
10-21001	IP54	15 cm pigtail	-20 to 80 C	M12 Male/Female
10-21031	IP54	15 cm pigtail	-20 to 80 C	Unterminated Pigtails
10-21022	IP68	15 cm pigtail	-40 to 105 C	M12 Male/Female

Visit our website at perspic.ca for the latest part numbers and configurations.

Don't see the configuration you need? Contact Us for specialty configurations and custom connectors

Warranty and Returns

1-Year Limited Warranty

Perspic Inc warrants that this product will be free from defects in materials and workmanship under normal use for one (1) year from the date of delivery to the original purchaser. This warranty is non-transferable.

What's Covered:

- Manufacturing defects in material or assembly
- Defects resulting from improper workmanship under normal usage conditions

What's Not Covered:

- Damage due to misuse, abuse, mishandling, or improper installation
- Normal wear and tear, cosmetic blemishes, or environmental damage (e.g., corrosion, humidity, extreme temperatures beyond rated specifications)
- Modifications or repairs not authorized by Perspic Inc
- Damage resulting from accidents, neglect, or force majeure events
- Third-party components not manufactured by Perspic Inc

Warranty Claims

To make a warranty claim:

1. Contact Perspic Inc in writing or via email within the warranty period
2. Provide proof of purchase (e.g., invoice or order confirmation)
3. Return the product for evaluation if requested (shipping at client's expense)

Perspic Inc will, at its discretion, repair, replace, or issue a credit for any product found defective under this warranty. Replacement parts or products are warranted only for the remainder of the original warranty period.

Returns

If you are not satisfied with your purchase, you may request a return within 30 days of delivery. Items must be unused, in original condition, and in original packaging. Contact support@perspic.ca with your order number and reason for return.

Non-returnable items: Customized or special-order items, final sale or clearance items.

Return shipping: Customers are responsible for return shipping costs unless the item was damaged or incorrect. Use a trackable shipping service; Perspic Inc is not responsible for items lost in return transit.

Limitation of Liability

Perspic Inc shall not be liable for incidental, indirect, or consequential damages, including loss of profit, downtime, or damage to other equipment. This warranty is the sole remedy and replaces all other warranties, express or implied, including implied warranties of merchantability or fitness for a particular purpose.

This warranty is governed by the laws of the Province of Ontario, Canada.

Definitions

- **CAN (Controller Area Network)** - A robust vehicle bus standard designed to allow microcontrollers and devices to communicate without a host computer.
- **Baud Rate** - The speed at which data is transmitted over the CAN network, measured in Kbit/s (e.g., 250 Kbit/s, 500 Kbit/s).
- **Galvanic Isolation** - Electrical separation between two circuits that prevents direct current flow while allowing signal transmission, typically through magnetic or optical coupling.
- **HV (High Voltage) Side** - The isolated output side of the CAN-ISO-2500, designed to connect to equipment that may have different ground potential or voltage transients. No power connection required.
- **LV (Low Voltage) Side** - The powered input side of the CAN-ISO-2500 that receives device power (5-28 V DC). Connects to the "known good" or reference side of the network.
- **CAN Frame** - A single message sent on the CAN bus, containing an ID, data length, and data payload.
- **Termination Resistor** - A 120 Ohm resistor placed at both ends of a CAN bus to prevent signal reflections.
- **Propagation Delay** - The time required for a signal to travel through the isolation device, measured in nanoseconds.
- **Silent Mode** - A mode where the device only transmits in one direction (LV to HV), useful for monitoring without affecting the source bus.
- **IP54 Rating** - Indicates the device is protected against limited dust ingress and splashing water.
- **IP68 Rating** - Indicates the device is fully protected against dust ingress and long-term water submersion.
- **M12 Connector** - A circular, threaded connector commonly used in industrial and automotive applications, available in various keying configurations.
- **A-Code** - A specific keying configuration for M12 connectors, commonly used for sensor and CAN bus applications.

Version Changelog

V1.0

Initial Release Version

V1.1

- Add polycarbonate IP68 enclosure option
- Add extended temperature range for IP68 option

V1.2

- Update IP68 enclosure image
- Add CAN Termination resistor cut trace information and images

V1.3

- Add silent mode jumper information
- Add unterminated pigtail wiring option

V1.4

- Converted documentation to new format
- Added installation considerations for bus length
- Added wiring best practices
- Added expanded troubleshooting section