INPRONIC USA
REVOLUTIONIZING AUTOMOTIVE CONTROL

J1939 250KBPS TO 500KBPS BIDIRECTIONAL CONVERTER

USER GUIDE

PREFACE

As the complexity of heavy-duty electronic systems continues to grow, modern J1939 networks have transitioned to higher communication speeds to support increasingly data intensive vehicle systems. However, a large portion of engines, transmissions, ABS modules, body controllers, and auxiliary ECUs still operate at the traditional 250 kbps, while newer platforms utilize 500 kbps for faster refresh rates and higher bandwidth.

When components from different generations must work together, such as installing a modern engine in an older chassis, replacing modules with newer versions, or integrating mixed J1939 systems, a major communication conflict arises: 250 kbps and 500 kbps networks cannot communicate directly.

The INPRONIC J1939 250kbps to 500kbps Bidirectional Converter was engineered to solve this exact problem. Acting as an intelligent translator between networks of different speeds, it ensures transparent communication, minimal latency, and complete preservation of PGN and SPN integrity according to SAE J1939 standards.

1. Introduction

In modern heavy-duty vehicles, the J1939 CAN network speed determines how efficiently ECUs exchange information. While most pre-2015 platforms operate at 250 kbps, newer systems transmit at 500 kbps to support advanced sensors, emissions systems, and real-time engine control.

This dual-generation ecosystem creates critical incompatibility issues, including:

- ECUs failing to identify each other
- Missing engine RPM, torque, or temperature data
- Transmission modules not receiving required information
- ABS or braking systems losing synchronization
- Dashboards or displays with no valid readings
- Diagnostic tools unable to communicate
- PGNs not being broadcast or acknowledged

The J1939 250kbps to 500kbps Bidirectional Converter eliminates these issues by automatically translating and synchronizing messages between both speeds.

Key Benefits

- Connects old J1939 networks to new ones
- Enables engine or ECU retrofits without reprogramming
- Restores full diagnostic capability on mixed-speed networks
- Ideal for fleet modernization and component upgrades
- Suitable for simulators, training environments, and R&D
- Ensures all PGNs, SPNs, priorities, and timing remain intact
- Works fully automatically — no configuration required

This device enables components from different eras to communicate as if they were designed for the same system.

2. Product Overview

The INPRONIC J1939 Converter is a rugged, automotive-grade module that translates CAN J1939 communication between 250 kbps and 500 kbps in both directions. No switches, calibrations, or parameters need to be configured.

It automatically detects the speed of the bus, validates each incoming frame, and retransmits the message at the opposite speed while keeping the original data untouched.

Its compact ABS enclosure, rated up to 270°C, ensures durability in harsh heavy-duty environments with vibration, dust, and temperature fluctuations.

3. Applications

Heavy-Duty Vehicles

- Trucks
- Buses
- Agricultural machinery
- Construction equipment
- Industrial engines

Electronic Integration

- Engine replacements between different generations
- Transmission module compatibility
- Connecting old ECUs to new dashboards or vice versa
- Retrofitting mixed J1939 systems

Diagnostics & Testing

- Enabling diagnostic scanners on networks of another speed
- Laboratory J1939 simulations
- Training environments requiring mixed-speed interaction

Fleet Modernization

- Updating older vehicles with newer electronic systems
- Reconfiguring multi-vendor ECU environments

4. Operating principle

The converter performs high-precision processing to guarantee compatibility and data integrity within dual-speed J1939 networks.

4.1 Conversion Workflow

Step	Description
1. Speed Detection	Detects whether the input CAN network runs at 250 kbps or 500 kbps.
2. Frame Validation	Verifies CRC, structure, ID, PGN, SPN, priority, bit stuffing, and ACK.
3. Frame Reconstruction	Rebuilds the message internally without changing the content.
4. Speed Conversion	Re-transmits at the opposite speed while preserving all J1939 fields.
5. Bidirectional Communication	Processes simultaneous traffic from both sides with zero collisions.

4.2 What the Converter Preserves

Preserved Element	Description
29-bit Identifier	Exact J1939 arbitration ID.
PGN	Parameter Group Number remains unchanged.
SPNs	Suspect Parameter Numbers kept intact.
Priority Bits	Original message priority preserved.
Data Payload	No modification of measurement or status bytes.
Timing Structure	Broadcast behavior remains stable.
Diagnostic Frames (DTCs)	Passed through without alteration.

5. Main Connector DTF13-6P 90°

The converter uses a DTF13-6P 90° receptacle, designed for harsh environments.
This connector provides the interface for:

- 250 kbps CAN network
- 500 kbps CAN network
- Power input
- Common ground

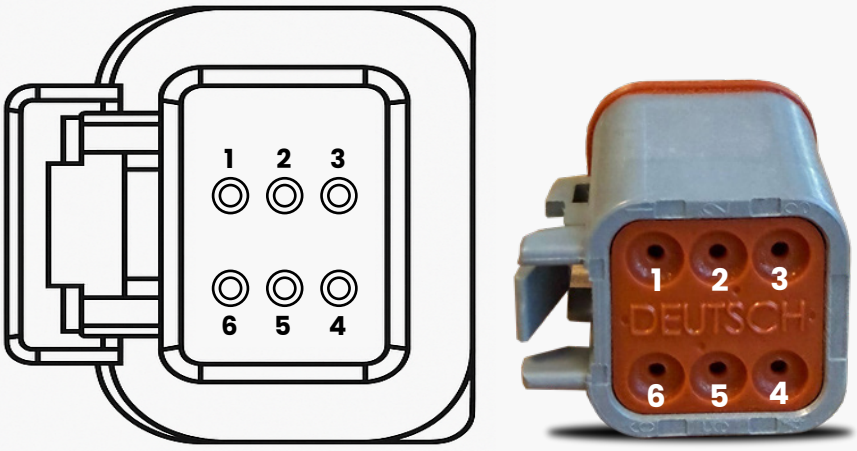
Connector must be used with a matching DT06-6S plug and wedge-lock.

5.1 Pin Description

Pin	Function	Matting Connector
J2-1	CAN_H (500 kbps)	DT06-6S
J2-2	GND Negative	DT06-6S
J2-3	12 v Positive	DT06-6S
J2-4	CAN_L (250 kbps)	DT06-6S
J2-5	CAN_H (250 kbps)	DT06-6S
J2-6	CAN_L (500 kbps)	DT06-6S

Note:
Deutsch DT series contacts are size 16.
Deutsch DTP series contacts are size 12.
DTF13-6P uses size 16 solid contacts.

BACK VIEW CONNECTOR



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J2-5	CAN_H (250 kbps)	DT06-6S
J2-6	CAN_L (500 kbps)	DT06-6S

6. Connection Overview

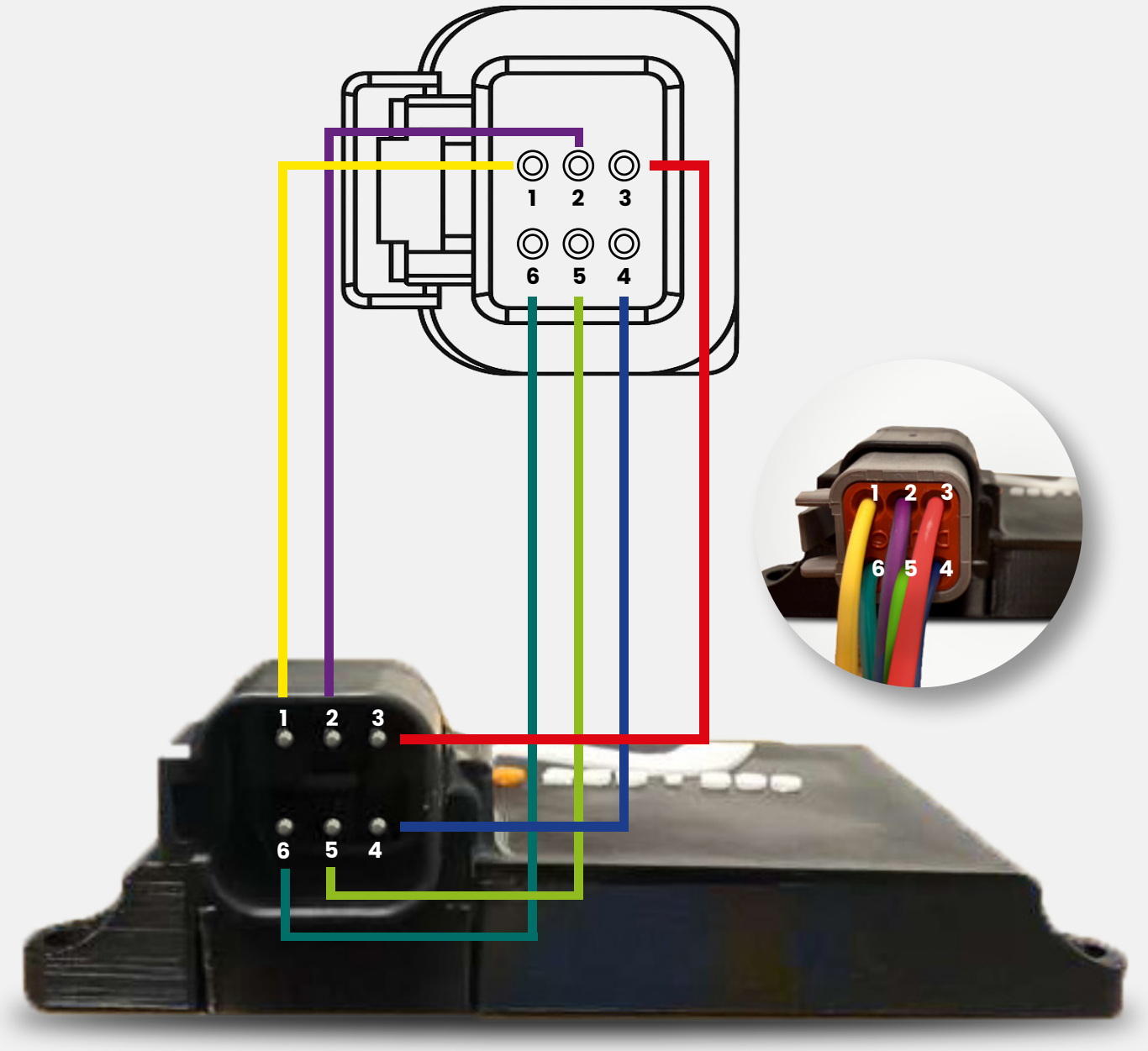
The DTF13-6P main connector provides all electrical interfaces required for the operation of the J1939 250–500 kbps Bidirectional Converter.
This connector routes the two CAN networks (250 kbps and 500 kbps) and supplies power to the module.

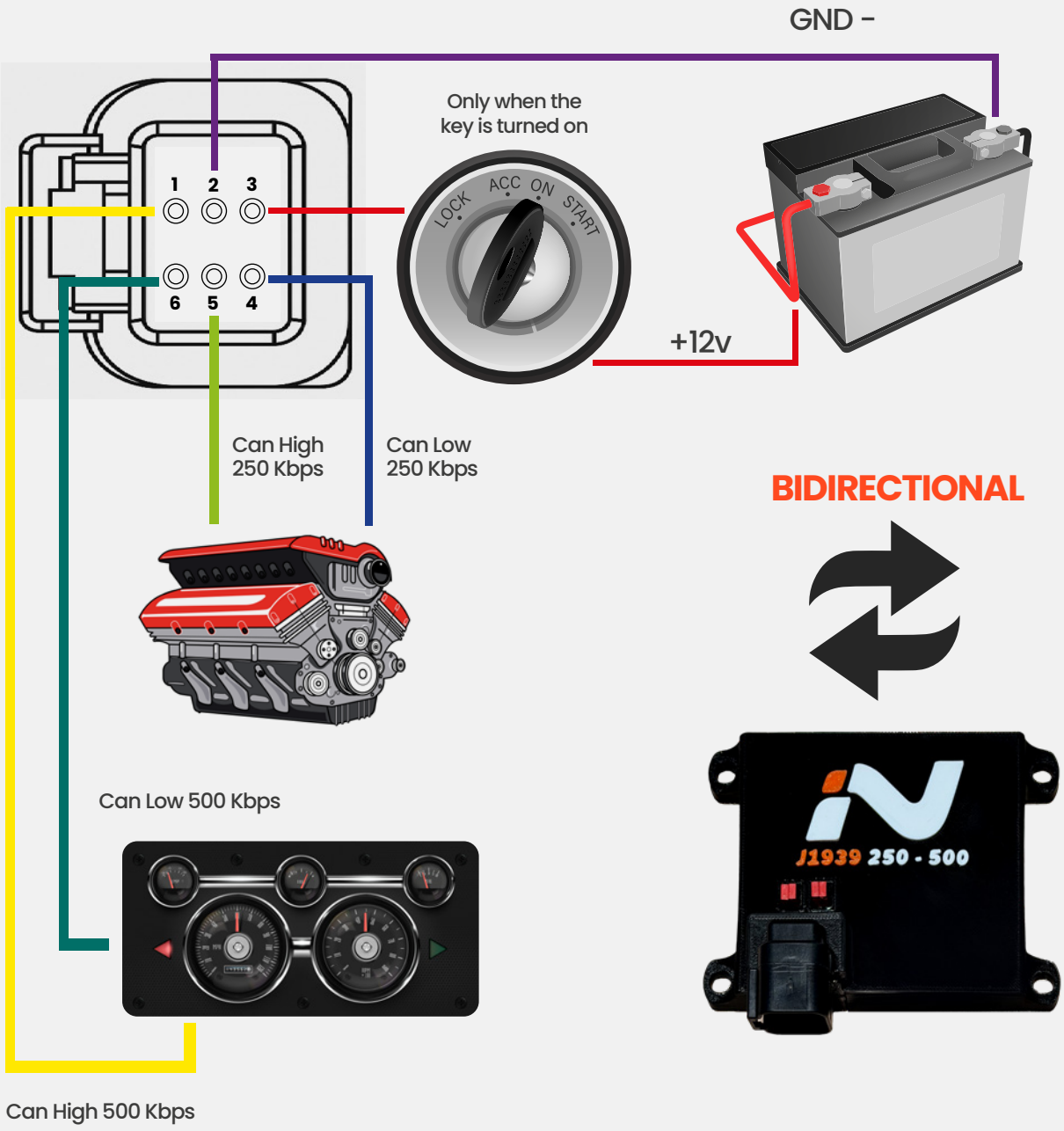
The diagram illustrates the front view (pin side) of the connector along with the corresponding wiring paths to the converter enclosure. Each circuit must be connected according to the pin assignment table to ensure proper J1939 communication.

6.1 Wiring connections

Pin	Function	Limit	Matting Connector
1	CAN_H (500 kbps)	High line for 500 kbps J1939 network	
2	GND Negative	Chassis / system ground	
3	12 v Positive	Vehicle power supply (12 v)	
4	CAN_L (250 kbps)	Low line for 250 kbps J1939 network	
5	CAN_H (250 kbps)	High line for 250 kbps J1939 network	
6	CAN_L (500 kbps)	Low line for 500 kbps J1939 network	

BACK VIEW CONNECTOR




GND -
Only when the key is turned on
1 2 3
6 5 4
LOCK ACC ON START
+12v
Can High 250 Kbps
Can Low 250 Kbps
BIDIRECTIONAL
Can Low 500 Kbps
J1939 250 - 500
Can High 500 Kbps

7. Termination & Jumper configuration table

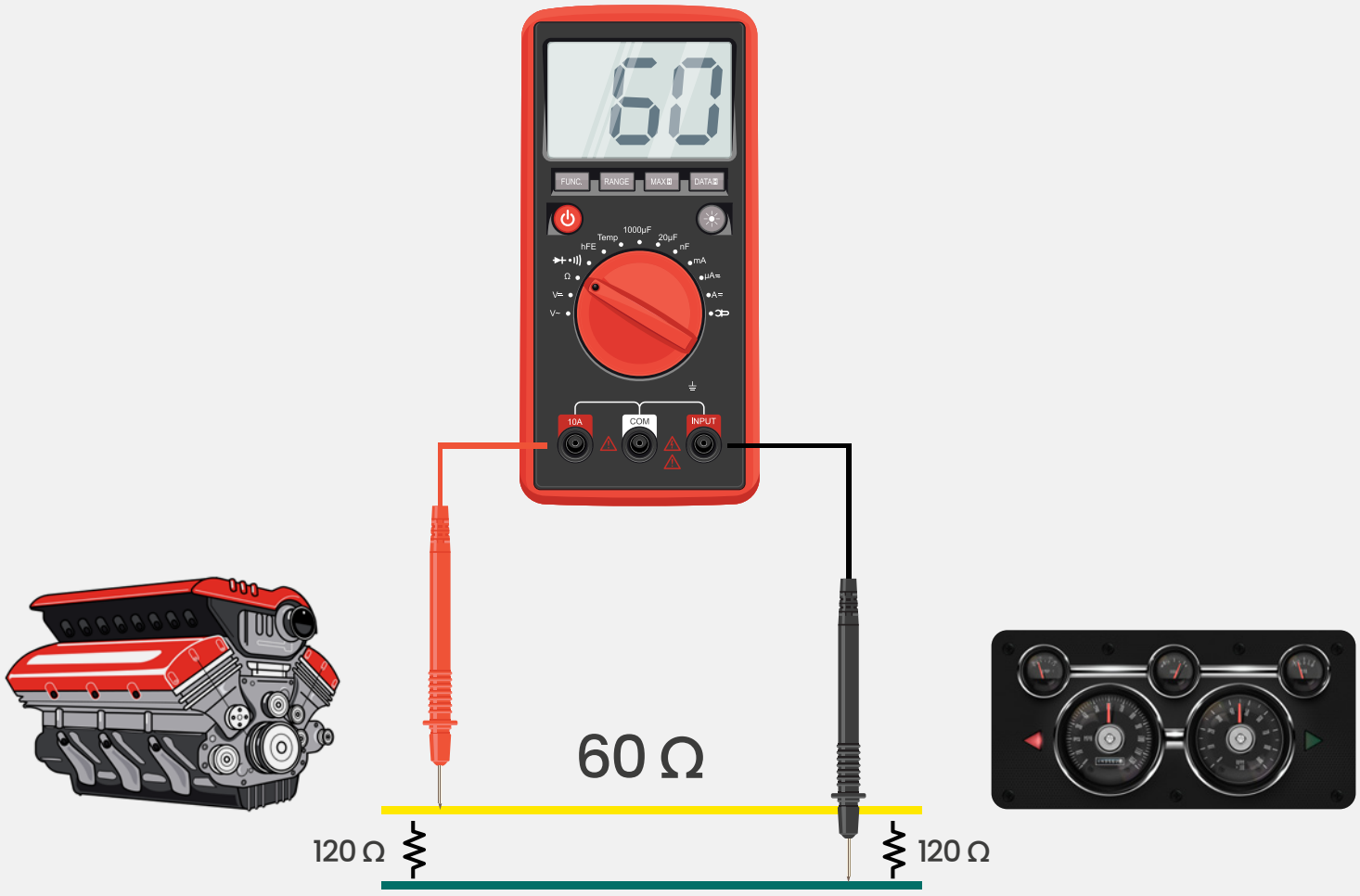
Use this table to determine the correct termination settings for each CAN network.
The converter includes internal selectable 120 Ω resistors that can be enabled or disabled depending on the vehicle's existing termination.

Jumper Configuration Table

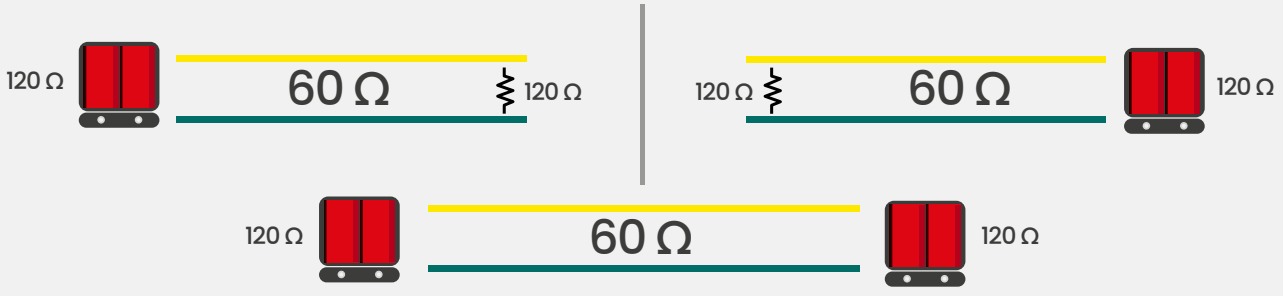
Jumper	Position	Network Slide	Adds 120 Ω Termination?	When to use
JP1	ON	250 kbps side (Engine)	YES	When the engine-side CAN bus does not have a termination resistor.
JP1	OFF	250 kbps side (Engine)	NO	When the engine already has a 120 Ω termination at the end of the bus.
JP2	ON	500 kbps side (Instrument Cluster / Dash)	YES	When the instrument network lacks a termination resistor.
JP2	OFF	500 kbps side (Instrument Cluster / Dash)	NO	When the instrument network already includes proper termination.

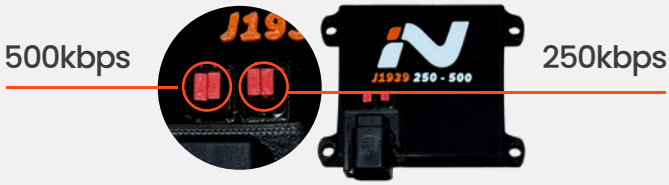
Important notes

- A CAN network must always have two termination resistors (one at each end).
- The converter should not add termination if the network is already properly terminated.
- Improper termination can cause: dropped frames, noise, incorrect PGNs, or complete loss of communication.



Guarantee proper 60Ω impedance in the network





8. Speed conversion considerations (250 kbps & 500 kbps)

The J1939 converter must be installed between two networks operating at different baud rates.
Use the following operational notes to ensure correct functionality.

Engine (250 kbps) Instrument Cluster (500 kbps)

- Connect the engine CAN wires to the 250k pins (CAN_H_250 / CAN_L_250).
- Connect the dashboard or cluster to the 500k pins (CAN_H_500 / CAN_L_500).
- The converter will automatically:
    - Detect baud rate
    - Validate J1939 extended ID messages
    - Convert communication speed
    - Preserve PGNs, SPNs, priorities, and timing

General Considerations

- The converter does not modify message content.
- PGNs and SPNs are forwarded exactly as received.
- The device must not bridge two networks of the same speed—it is designed specifically for mixed-speed systems.
- Each network must remain electrically isolated except through the converter.
- Never connect 250k and 500k CAN wires directly.
- Both sides must have proper CAN termination (see jumper table).

Diagnostic Considerations

- Diagnostic readers will always receive data at the speed of the network they are connected to.
- The device does not buffer or delay diagnostic PGNs; latency remains <2 ms

9. Technical Specification

9.1 Electrical Specifications

Parameter	Value	Notes
Operating Voltage	12 VDC	Compatible with 12 V and 24 V systems.
Current Consumption	< 80 mA	Low-power design.
Transient Protection	ISO 7637-2	Automotive surge protection.
Reverse Polarity	Supported	Protected input stage.
ESD Protection	Integrated	For CAN and power lines.

10. Mechanical Specifications

Feature	Description
Enclosure Material	ABS automotive-grade
Temperature Resistance	Up to 270°C
Connector	DEUTSCH DT04-6P
Environmental Resistance	High vibration, dust protection

11. Safety Guidelines

- Do not connect CAN lines to power lines.
- Verify polarity before powering the module.
- Avoid exposure to excessive moisture without additional sealing.
- Route cables away from ignition coils or high-voltage sources.
- Designed for automotive, industrial, and educational applications.

12. Legal Notice

INPRONIC USA certifies that every unit is tested before shipment.
The warranty does not cover damage caused by incorrect installation, modifications, or operation outside the specified electrical range.