

1. OBD Connector and CAN Pinouts

- The On-Board Diagnostics (OBD) connector, commonly found under the dashboard of vehicles, is a standardized interface that allows technicians to access various on-board vehicle systems for diagnostics and data retrieval.
- The **Controller Area Network (CAN)** is a crucial communication protocol that connects multiple microcontrollers or Electronic Control Units (ECUs) in modern vehicles, enabling real-time data sharing.
- In the standard 16-pin OBD-II connector, **CAN High** and **CAN Low** are specifically assigned to **pin 6** and **pin 14** respectively.
- Knowing which pins correspond to CAN on the OBD connector is vital for accurate diagnostics, troubleshooting, and connecting external tools like scan tools or oscilloscopes.

2. Types of CAN (Controller Area Network) in Vehicles

- There are different subtypes of CAN networks based on application:
 - **P CAN (Powertrain CAN):** Used for engine, transmission, emission, and other powertrain controllers—critical for vehicle operation and emissions.
 - Other types include **E CAN** (Exterior), **I CAN** (Interior), and **C CAN** (Chassis), using separate networks for non-powertrain communications.
- For a 5L RDE (Real Driving Emission) vehicle, **P CAN** is typically used, as it supports fast and reliable communication required by modern, emission-controlled powertrains.
- Understanding CAN network segmentation helps in isolating issues and ensures targeted diagnostics and repairs.

3. Recognizing Symbols in Wiring Diagrams

- Automotive wiring diagrams use standardized symbols to represent components and wiring features.
- A **terminating resistor** symbol is important in CAN network schematics. Terminating resistors (usually 120 ohms) are required at both physical ends of the CAN bus to prevent signal reflection which could cause communication errors.
- Recognizing this symbol helps quickly identify the CAN bus topology and to troubleshoot communication faults by verifying resistor presence and location.

4. Diagnostics Using a Multimeter on CAN Wiring

- Proper diagnosis of CAN wiring health often involves measuring resistance across CAN High and CAN Low (pins 6 and 14).
- With vehicle power off, a resistance reading of **around 60 ohms** typically confirms that both 120-ohm terminating resistors are properly installed (in parallel, as required by the CAN standard).
- Divergence from this reading may indicate:

- **Open Circuit (Infinite resistance):** One or both resistors are missing/disconnected; CAN bus may not function.
- **Short Circuit (Near zero resistance):** Wires are shorted; communication is impossible.
- **Ground Fault (Very low reading):** Either wire is grounded; can severely disrupt/disable the bus.
- Mastering these measurements and their implications improves diagnostic accuracy and repair efficiency.

5. Location of Terminating Resistors in CAN Networks

- Ideal CAN network design places a terminating resistor at each end of the main bus.
- Frequently, one resistor will be shown in the wiring schematic, within a secure location such as a control module or a specific wiring harness location.
- The *other* terminating resistor could be:
 - Located in another module at the opposite end,
 - Integrated into the wiring harness,
 - Or present as an inline resistor.
- Understanding that terminating resistors can have varied locations is important to avoid misdiagnoses such as suspecting missing components when they are simply not shown in the visible part of the wiring diagram.

Key Learning Outcomes

- **OBD-II connector pinouts (especially 6 & 14 for CAN) are essential knowledge for communication diagnostics.**
- **Powertrain-centric CAN networks (P CAN) are the backbone for engine and emission-related controls.**
- **Symbols in wiring diagrams—especially for terminating resistors—provide crucial information about CAN network design and potential points of failure.**
- **Resistance measurements across CAN lines are a primary diagnostic tool, and their interpretation directly informs you about wiring and resistor integrity.**
- **Terminating resistor locations may vary; thorough knowledge of their possible placements prevents unnecessary part replacements and streamlines fault finding.**