

Different Types of CAN Protocol:

The CAN Protocol finds applications across various fields due to its unique and comprehensive features. Unlike protocols such as Ethernet, it stands out of its cost-effectiveness. Therefore, it is classified into distinct types, includes;

1. CAN Protocol categorized based on "As per ISO standard":

ISO-11898 standard:	Road Vehicles	CAN for high-speed communication
ISO-11519 standard:	Road Vehicles	Low-Speed serial data communication
ISO-11992 standard:	Road Vehicles	Electrical connections between towing and towed vehicle
ISO-11783 standard:	ISO-BUS is for "Tractors and machinery for agriculture and forestry - Serial control and communication data network"	
EIA RS-485 standard	Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems (formerly used for CAN Physical Layer).	

2. CAN Protocol categorized based on the "number of wires used on Physical Layers" as:

SW CAN (Single Wire):

- Single Wire CAN used for low speed and less risk data transmission CAN network.
- Single Wire CAN interface has a lower data rate of up to 33.3 Kbits/s and also named SAE-J2411.
- The devices that do not require high performance like seat and mirror adjuster use a Single wire CAN interface.

DW CAN (Double Wire):

- Double Wire CAN used for High speed and fault-tolerant CAN network.

3. CAN Protocol categorized based on "Physical Layer Speed"

Low-Speed CAN Physical Layer:

- The Low-speed CAN basically be used for 40 kbps to 125 kbps CAN bus.
- This is called as Fault-Tolerant CAN bus.
- This kind of CAN bus also can run without termination resistor.
- The Low-Speed CAN bus voltage levels are:
 - **Dominate Voltage Level:** CAN-L is **1.4v** and CAN-H is **3.6v**.
 - **Recessive Voltage Level:** CAN-L is **0v** and CAN-H is **5v**.

High-Speed CAN Physical Layer:

- The High-Speed CAN basically be used for 40Kbps to 1 Mbps data rate.
- This kind of bus must be terminated with a termination resistor from 108 Ohm to 132 Ohm as per bus system specific.
- The High-Speed CAN bus voltage levels are:
 - **Dominate Voltage Level:** **CAN-L is 1.5v and CAN-H is 3.5v.**
 - **Recessive Voltage Level:** **CAN-L is 2.5v and CAN-H is 2.5v.**

4. CAN Protocol categorized based on CAN Generation Improvement

Classical CAN:	Normal CAN Protocol having speed up to 1 Mbps with a maximum of 8-bytes of Payload in a single data packet
CAN-FD:	CAN-FD (Flexible Data Rate) having speed up to 2 Mbps with a maximum of 64-bytes of payload in a single data packet. (CAN FD-Sic up to 5-8Mbit/s).
CAN-XL:	CAN-XL (Extra/Extended Length) having speed up to 20 Mbps with a maximum of 2048-bytes of payload in a single data packet.

5. CAN Protocol categorized based on DATA RATE

- Low-Speed CAN:** Speed between 1 kbps - 125 kbps.
- Medium-Speed CAN:** Speed between 125 kbps - 500 kbps.
- High-Speed CAN:** Speed between 500 kbps - 1 Mbps.
- Ultra High-Speed CAN (CAN-FD):** Speed between 1 Mbps - 2 Mbps.
- Extended Ultra High-Speed CAN (CAN-XL):** Speed between 2 Mbps - 20 Mbps.

6. CAN Protocol categorized based on Length

- Class A:** 50 Kbps speed at 1 Kilo Meter (1000 Meter) of CAN Bus length.
- Class B:** 125 Kbps speed at 500 Meters of CAN BUS length.
- Class C:** 1 Mbps speed at 40 Meter of CAN Bus length.

As per Identifier, CAN is categorized as:

Basic / Standard CAN: Message Identifier is 11-bit ($2^{11} = 2048$) which helps to create limited unique messages or message identifiers for the lowest number of ECU with lowest data communication in simple CAN network.

Extended CAN: Message Identifier is 29-bit ($2^{29} = 536,870,912$) which helps to create millions of unique messages for data communication in complex CAN networks.