# CAN COMMUNICATION SYSTEM

## CAN(CONTROLLER AREA NETWORK)

- The CAN (Controller Area Network)* [ISO 11898] communication system, which uses a pair of communication wires (twisted pair wiring) to transmit multiple pieces of information or data that have been converted into digital signals via a communication circuit, is used. Compared to a system that connects the input devices (sensors, switches, etc.), control units, and output devices (motors, etc.), this network uses a fewer number of wiring harnesses and makes for a leaner electronic control system.

❖REFERENCE❖

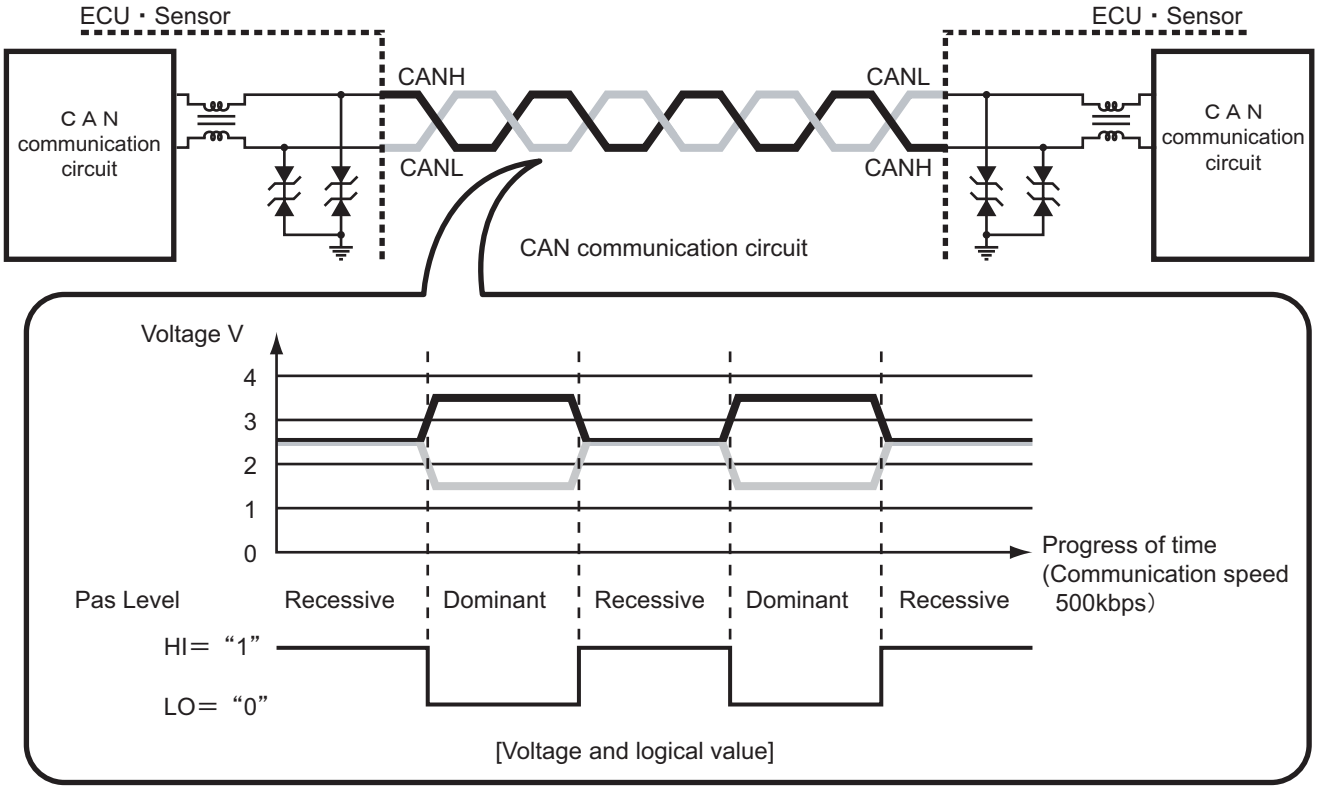
* : CAN is an abbreviation for Controller Area Network, a serial communication network that complies with the ISO (International Organization for Standardization) standards.

- In the CAN communication system, two communication wires (buses), the CAN High, and CAN low, form a pair. The level*1 of a bus is determined by its differential voltage. The system converts this voltage into a digital signal that complies with a dedicated communication protocol and transmits it at a speed of 500 kbps*2.

❖REFERENCE❖

*1 : Bus levels are either dominant or recessive. Theoretically, the CAN communication system determines the dominant level as "0" and the recessive level as "1".

*2 : A unit that indicates the transmission speed of signals. The "500 kbps" indicates that 500,000 bits of data are transmitted per second.

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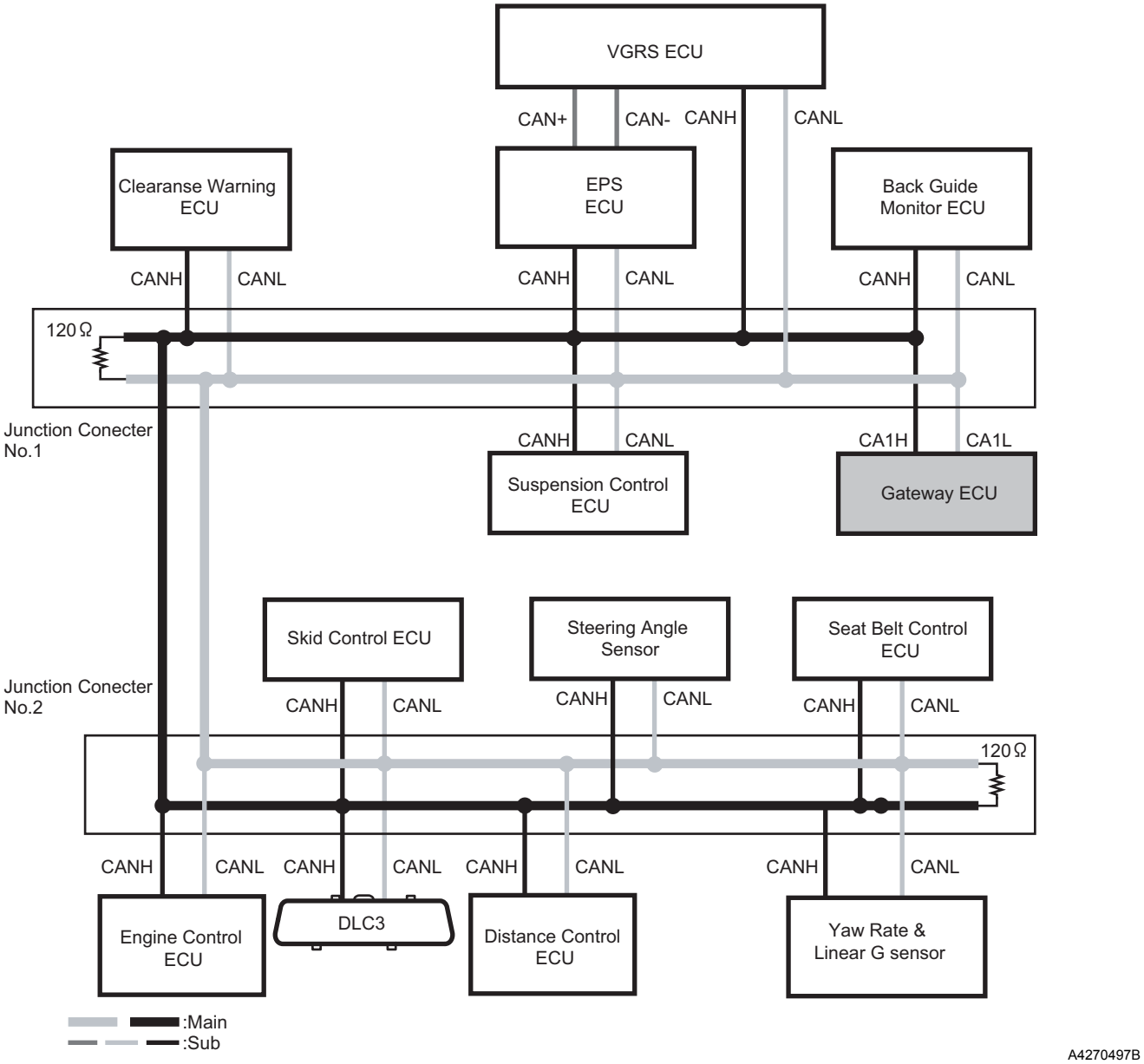
## CAN Communication Network

- The CAN communication system consists of a bus type network configuration in which multiple ECUs are connected to a single, common communication line. The CAN communication line is the main line (common communication line) that connects junction connectors No. 1 and No. 2.
- A termination resistor (120Ω) is provided on the bus main line, enabling the differential voltage to be determined from the network that is wired into a loop.

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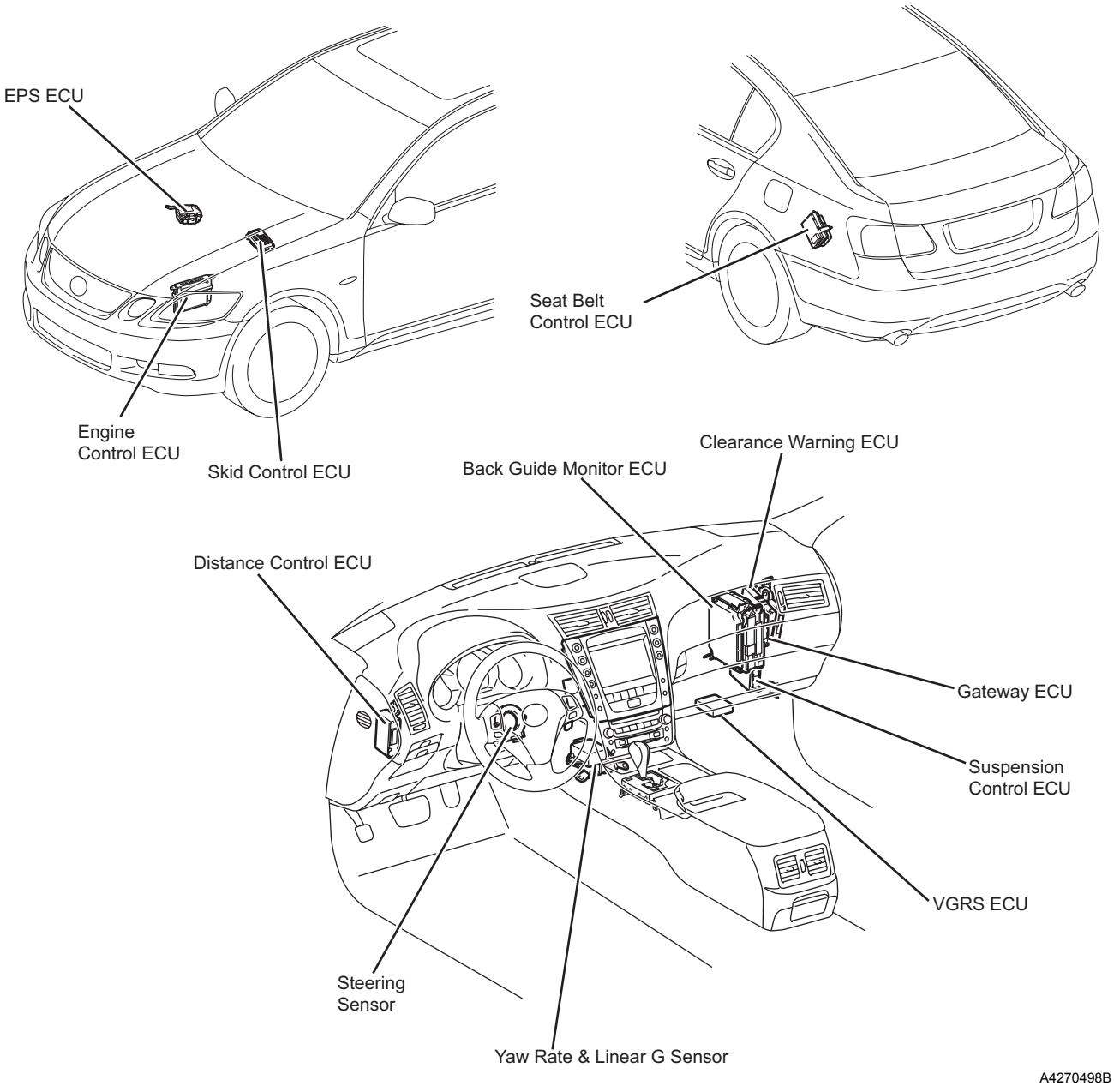
**Computer & Sensor corresponding to CAN communication system**

| Computer & Sensor | Function |
|---|---|
| Skid Control ECU | • Controls the ABS, brake assist, etc. |
| Traction Control ECU | • Controls the torque distribution for the front and rear wheels. |
| Yaw Rate & Linear G sensor | • Detects the deceleration speed of the vehicle proper in the fore-aft and side-to-side directions. |
| Distance Control ECU | • Effects vehicle-to-vehicle control in the Dynamic radar cruise control system. |
| Gateway ECU | • Relays data between the CAN communication and various types of onboard multiples communication. |
| Seat Belt Control ECU | • Controls the pre-crash seat belt. |
| EPS ECU | • Controls the electric power steering system. |
| VGRS ECU | • Controls the Variable gear ratio steering system. |
| Steering Angle sensor | • Detects the steering angle and direction of the steering wheel. |
| Engine ECU | • Provides data such as engine speed. |
| Back Guide Monitor ECU | • Controls the back guide monitor system. |
| Clearanse Warning ECU | • Controls the clearance sonar system . |
| Suspension Control ECU | • Controls the electronically controlled air suspension. |
| DLC3(Data link connector No.3) | • Inspection of the CAN communication with the diagnosis tool (Intelligent tester II).<br>• Enables the continuity inspection of the CAN communication bus through the use of a Toyota electrical tester. |

## Layout of Component



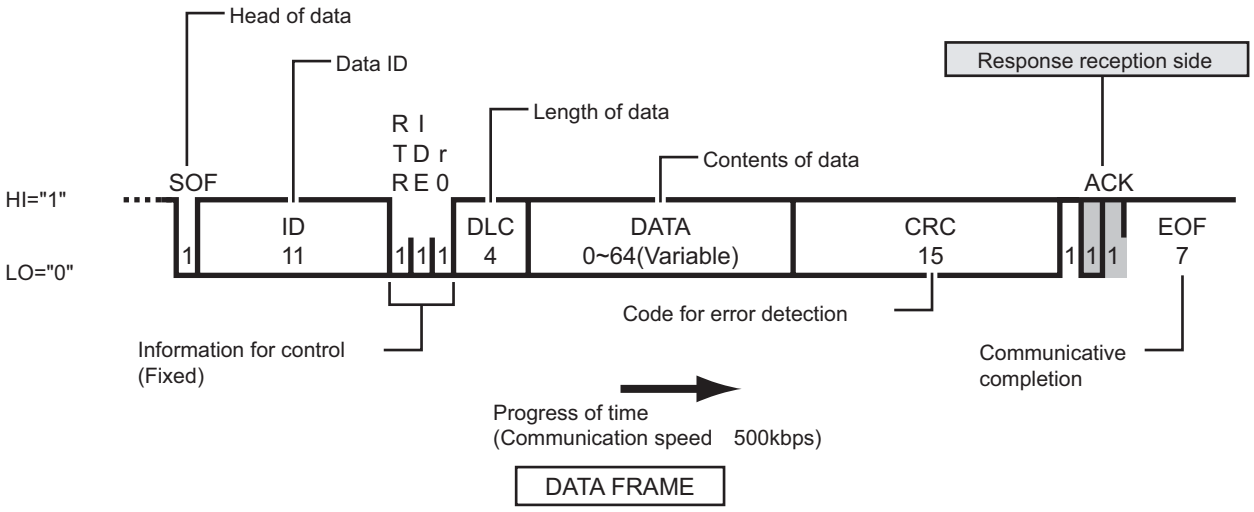
## Communication Frame

- The CAN communication system is a time division multiplex bi-directional communication system that also enables all the computers (ECUs) and sensors that comprise the network to transmit data by staggering their time, using a pair of communication lines (bus). Therefore, the ECUs and sensors operate in accordance with a common communication protocol to ensure smooth and reliable communication.
- The CAN communication uses the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) communication protocol*. This protocol enables all ECUs and sensors to share a pair of communication lines while granting them the right to start transmitting data.

❖REFERENCE❖

*Carrier Sense Multiple Access with Collision Detection - Controls communication access by allowing the ECUs to constantly monitor the state (carrier waves) of the communication line, and start data transmission only when there is no other data present on the communication line. In addition, if an ECU detects a data collision (because another ECU has transmitted data simultaneously), this control allows the ECU to stand by for a predetermined length of time, and transmit the data again.

- Each ECU or sensor starts transmitting data when there is no other data present on the CAN bus. If two or more ECUs or sensors start transmitting simultaneously, this system determines their transmission priority in accordance with the ID information contained in the respective transmitted data.
- The pieces of data used in the CAN communication system comprise a single frame, each containing the following: ID, DLC, DATA, CRC, and ACK.




Note: he numbers in the frame indicate the number of bits that are used for transmitting information.

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