GROUP 54B

# LOCAL INTERCONNECT NETWORK (LIN)

CONTENTS

GENERAL INFORMATION

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LIN refers to "Local Interconnect Network," which is a serial multiplex communication protocol[*] administrated by LIN consortium. A communication circuit employing the LIN protocol connects each ECU, and switch and sensor data can be shared among ECUs, which enables more reduction in wiring.

NOTE: [*]: The regulations that have been decided in detail, from software matters such as the necessary transmission rate for communication, the system, data format, and communication timing control method to hardware matters such as the harness type and length and the resistance values.

STRUCTURE

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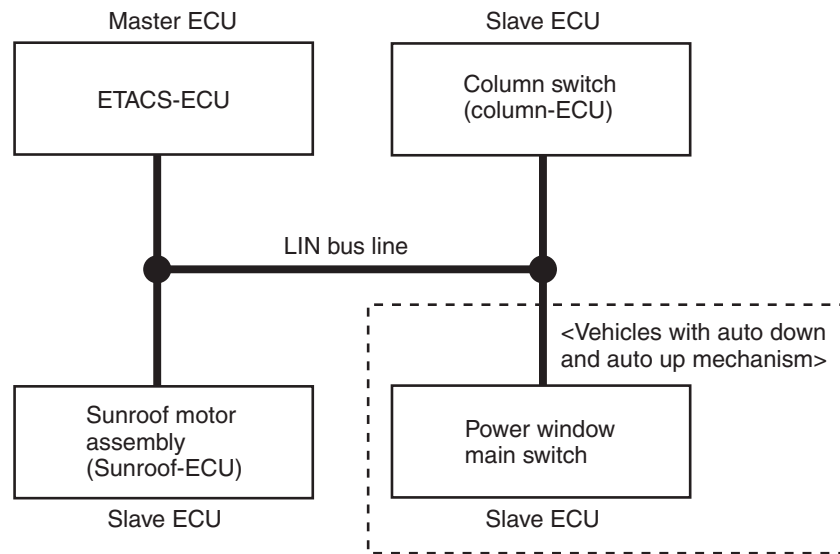
Master and slave ECUs are connected to the LIN bus lines. The master ECU is the ETACS[*1]-ECU, and the slave ECUs are the column switch (column-ECU), the sunroof-ECU and the power window main switch[*2]. The master ECU requests these slave ECUs to communicate each other via communication lines.
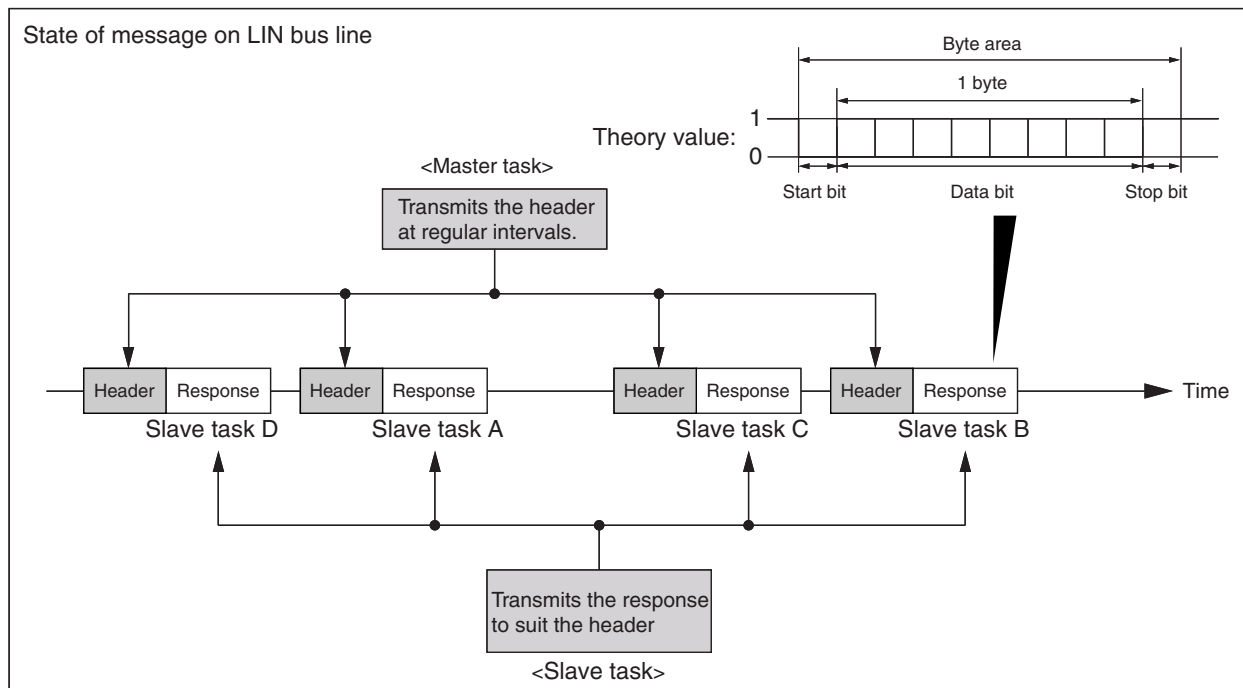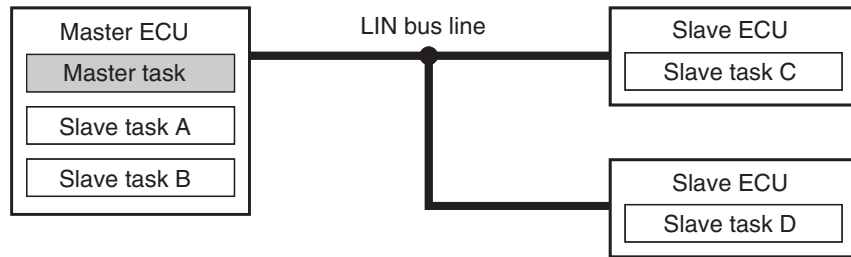
NOTE: [*1]: ETACS (Electronic Time and Alarm Control System)

NOTE: [*2]: Vehicles with auto down and auto up mechanism.

SYSTEM OPERATION

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LIN communication system is described below:
- The master ECU performs the master tasks and slave tasks, and the slave ECUs perform the slave tasks.
- When the master ECU performs a master task, the header frame which stores information to call certain slave tasks (ECU) is transmitted at regular intervals.
- When the master ECU and slave ECU perform a slave task, the ECU called by the header frame transmits the response frame which stores data used for control.

- A header and response collectively are called as a message frame, and the communication method that uses the message frame is called as the frame communication.
- Basically, the communication data is used with some blocks of 10-bit data group which includes one start bit and one stop bit (byte region) arranged in order.

VOLTAGE VARIATION OF LIN BUS LINE
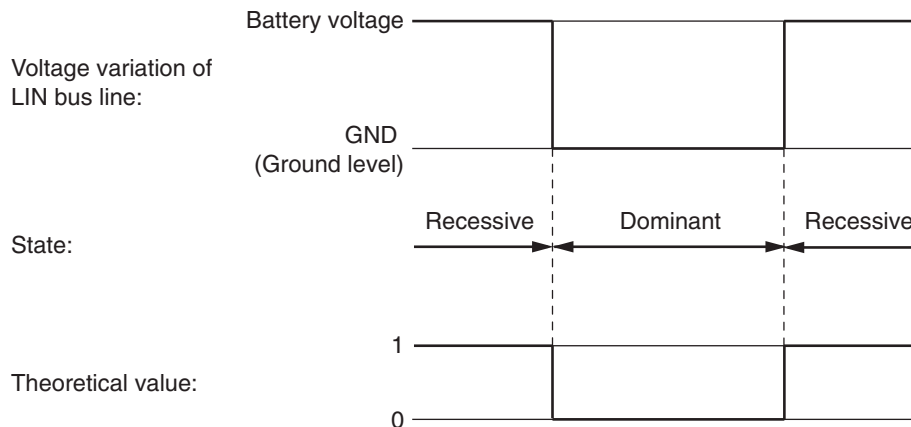
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When each ECU sends or receives signals, LIN bus line voltage varies as follows:
- The voltage variation of LIN bus line (0 and 1 combination as a theoretical value) ranging between battery voltage (recessive) and 0 V (dominant) is output (transmitted) as a control signal.

- When no communication is established, the LIN bus line remains recessive (battery voltage).

MESSAGE FRAME
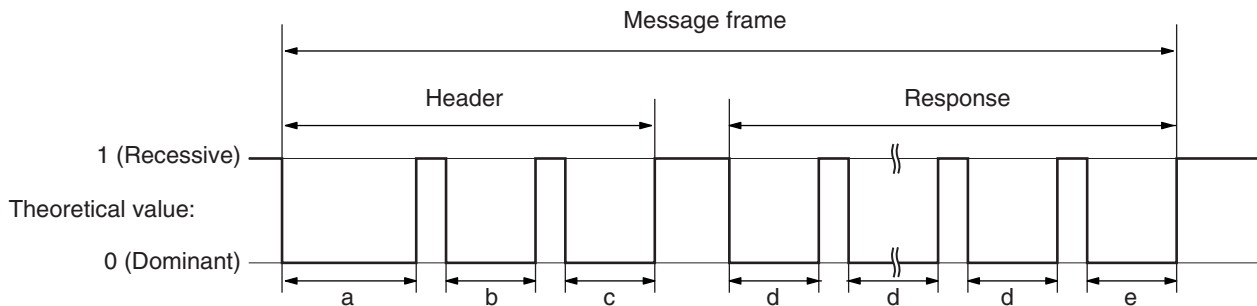
a: Synchronization start region   c: Identifier region   e: Checksum region
b: Synchronization region   d: Data region

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A message frame consists of regions that include a synchronization start region, identifier region, data region, and checksum region. A few bits of recessive data is used to separate the frame from each region.

Frame	Region name	Description
Header	Synchronization start region	A region that informs each ECU of the starting of header transmission by sending dominant signals for a given period of time.
	Synchronization region	A region that synchronizes the transmission cycle of each ECU connected to the LIN bus line (the slave ECU matches its communication speed to that of the master ECU).
	Identifier region	A region that stores an ID to call the slave ECU defined by the LIN protocol. The number of bytes for the data region is also defined in this region.
Response	Data region	A region to store the control data used by ECU that is called by the header
	Checksum region	A region for checking errors in data content The sending-end ECU calculates data region value according to the specified computing equation, and the result is stored in this filed. The receiving-end ECU detects the transmission error based on the checksum filed value.

NOTES