

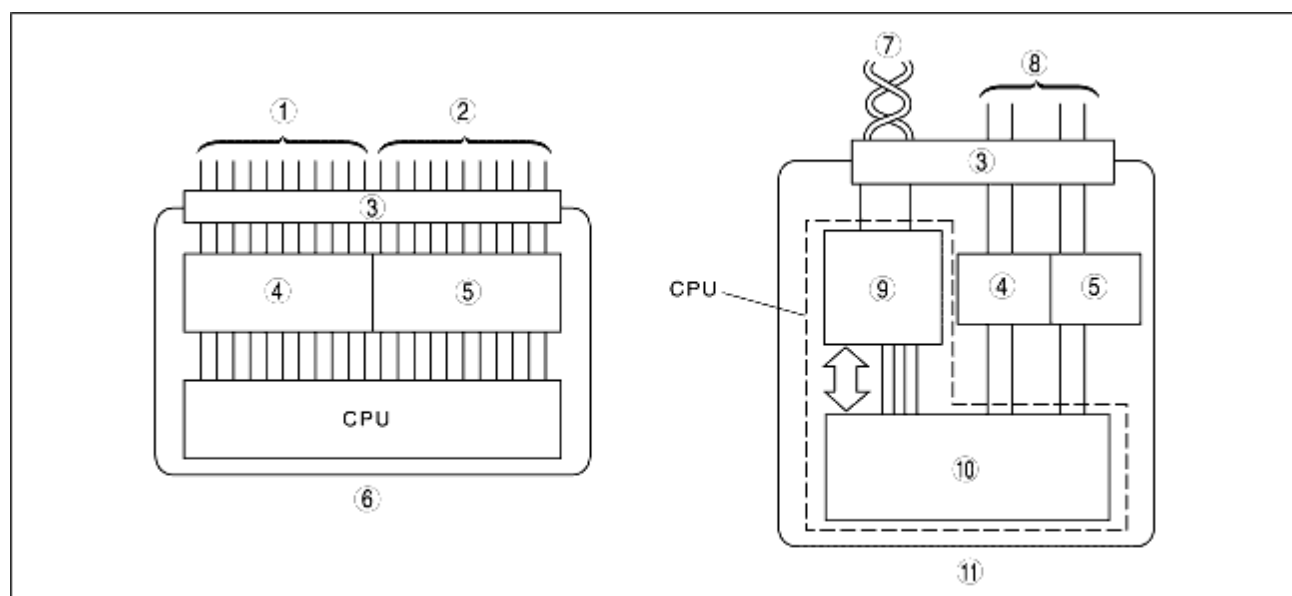
CAN SYSTEM DESCRIPTION

B3E094055430T04

Mechanism of CAN System-Related Module

- A CAN system-related module is composed of an electrical circuit, CPU, and input/output interface.
- The size of the module has been reduced due to the elimination of the bulky, superfluous, input/output interface in the conventional type of electrical module.
- The CPU (multiplex block) controls all signals exchanged on the CAN harness.
- Communication with non-multiplex parts is carried out by conventional input/output interface.
- The functions of each component are shown below.

Component		Function
Electrical circuit		Supplies power to CPU and vicinity, and to input/output interface.
CPU	Computation processing block	Control function has been expanded, and when transmission is necessary, transmitted data is stored in a multiplex block. If a multiplex block receives a request to read stored data, transmitted data is read from the multiplex block.
	Multiplex block	Transmits data received from bus line to computation processing block. In addition, sends transmitted data stored from computation processing block to bus line.
Input/Output interface		Electrically converts information signals from switches to, be input to CPU, and signals output from CPU for operating actuator or indicator lights.



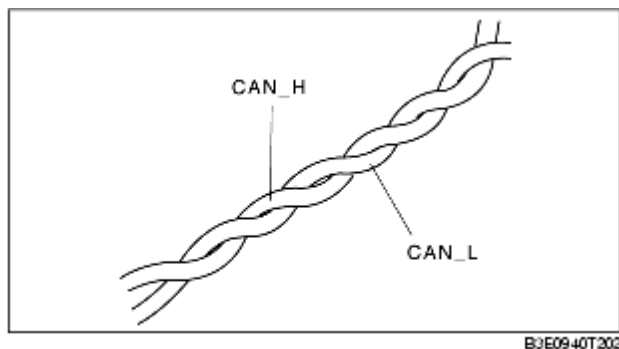
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1	Input signal
2	Output signal
3	Connector
4	Input interface

5	Output interface
6	Conventional module
7	CAN harness (twisted pair)
8	Conventional wiring harness
9	Multiplex block
10	Computation processing block
11	CAN system-related module

Twisted Pair

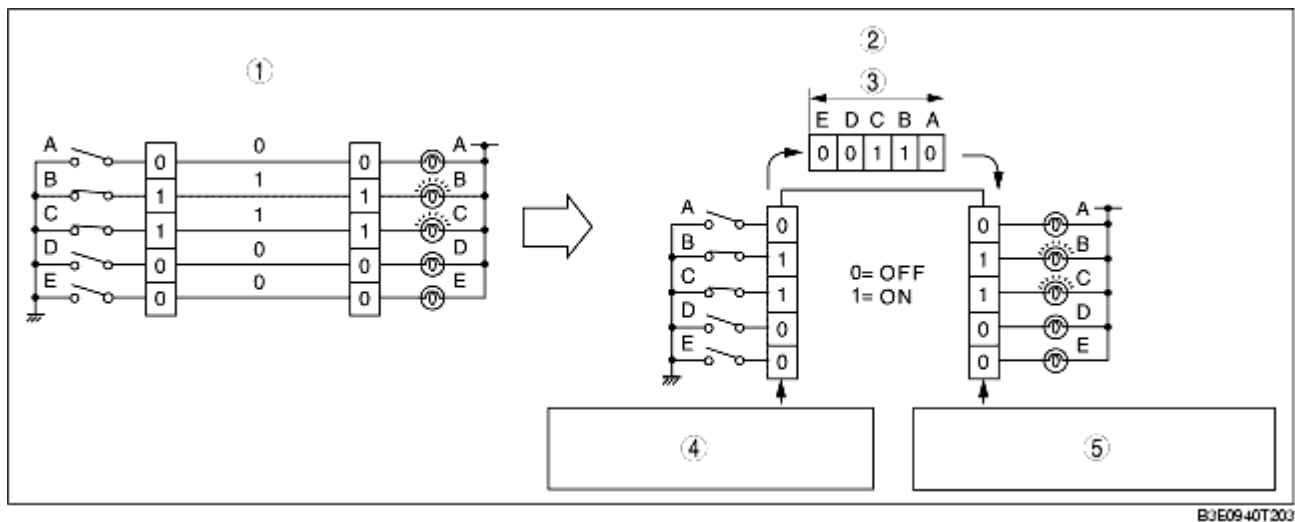
- The multichannel use two spirally twisted wires called a twisted pair, and each wire, CAN_L and CAN_H, has its own special function.



- Both bus lines are opposite phase voltage. This allows for minimal noise being emitted and makes it difficult for noise interference to be received.

Time Division Multiplex

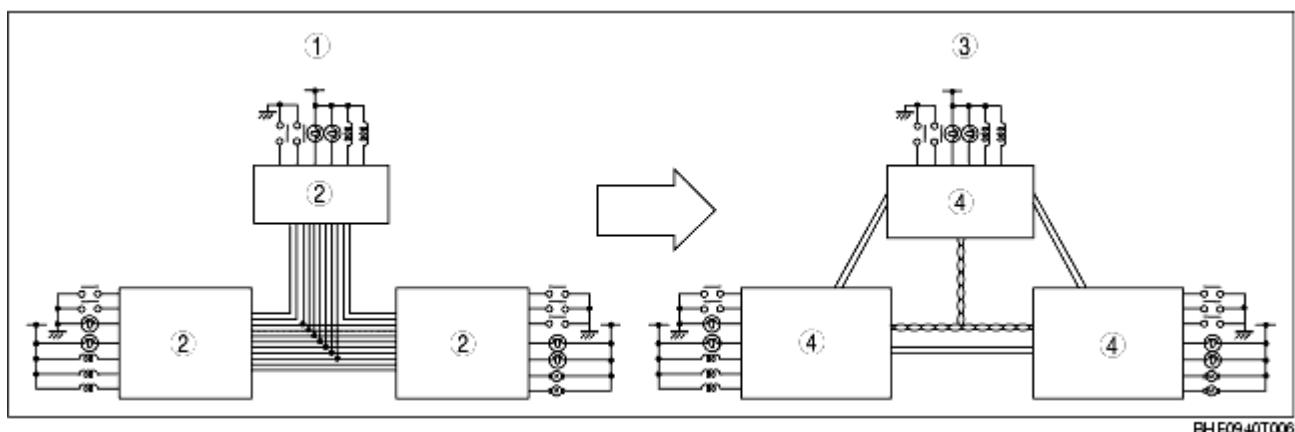
- For information exchange between electrical modules in a conventional system, a wire connection was necessary for each information signal. However, by sending the different signal at varying times over one channel, it is possible to send a large amount of information via a small harness.
- In the conventional, non-multiplex system, in order to control the illumination of the five bulbs, one switch and one channel was necessary for each bulb. For bulbs B and C to illuminate, switches B and C must be ON and electricity must flow through the channel. With the time multiplex system, this can be done through one channel. The channel is comprised of five data signal transmitters which transmit either a "0" or "1" signal to indicate whether a bulb turns ON or OFF. For example, to illuminate bulbs B and C, transmitters B and C transmit a "1" and transmitters A, D, and E transmit a "0". When the receiver receives these signal, bulbs B and C illuminate.



1	Non-multiplex system
2	Time division multiplex system
3	Data
4	Each signal is transmitted one by one through the channel as it is received.
5	Each signal is output one by one as it is received from the channel.

Vehicle CAN System

- By rearranging the multiple signal, common information between the CAN system-related modules is transmitted and received through the multichannel.
- The signal transmitted by one CAN system-related module is sent through the multichannel to all the CAN system-related modules, but only the concerned module (s) receives the signal and performs the appropriate operation (ex. light illumination, fan operation).



1	Conventional system
2	Electrical module
3	CAN system
4	CAN system-related module

CAN Signal-Chart (HS-CAN)

OUT: Output (sends signal)

IN: Input (receives signal)

Signal	Multiplex module			
	PCM	EHPAS control module	DSC HU/CM	Instrument cluster
			ABS HU/CM	
Engine speed	OUT	IN	IN	IN
Vehicle speed	OUT	IN	-	IN
ATX gear position/selector lever position (ATX)	OUT	IN	IN -	IN
Neutral switch position (MTX)	OUT	IN	-	-
CPP switch position (MTX)	OUT	IN	-	-
Engine torque	OUT	-	IN -	-
Throttle valve opening angle	OUT	-	IN -	-
Brake pedal position	OUT	-	IN	-
Transaxle specifications	OUT	-	IN -	-
TCC status (ATX)	OUT	-	IN -	-
Engine specifications	OUT	-	IN -	-
Immobilizer-related information	OUT	-	-	IN
	IN			OUT
AT warning light on request (ATX)	OUT	-	-	IN
Engine coolant temperature	OUT	-	-	IN
Travelled distance	OUT	-	-	IN
Fuel injection amount	OUT	-	-	IN
MIL on request	OUT	-	-	IN
Generator warning light on request	OUT	-	-	IN
EHPAS control module malfunction	-	OUT	-	IN
Brake system status (EBD/ABS/DSC)	IN	-	OUT	-
Wheel speed (LF, RF, LR, RR)	IN	-	OUT	-
Brake system warning light on request	-	-	OUT	IN
ABS warning light on request	-	-	OUT	IN
DSC indicator light on request	-	-	OUT -	IN
			-	
DSC OFF light on request	-	-	OUT -	IN
			-	
Fuel tank level	IN	-	-	OUT
A/C on request	IN	-	-	OUT
Transaxle in reverse position	IN	-	-	OUT
Parking brake position	-	IN	-	OUT

Brake fluid level	-	-	-	OUT
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CAN Signal-Chart (MS-CAN)

OUT: Output (sends signal)

IN: Input (receives signal)

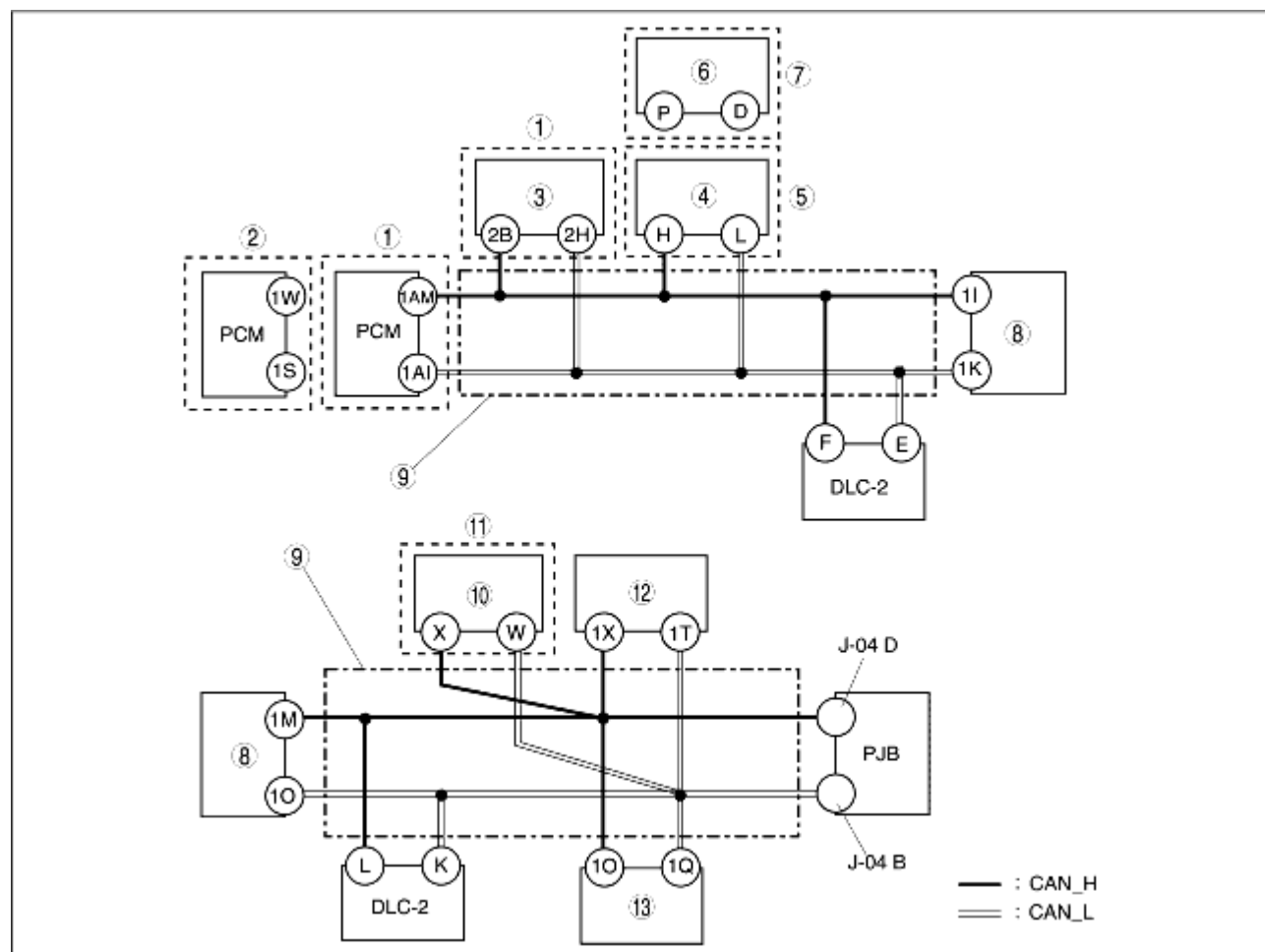
Signal	Multiplex module				
	Passenger junction box (PJB)	Climate control unit	SAS control module	Audio unit (base module)	Instrument cluster
Ambient temperature	OUT	IN	-	-	IN
		-		IN	-
Front wiper status	OUT	IN	-	-	-
Turn indicator light on request	OUT	-	-	-	IN
Security light on request	OUT	-	-	-	IN
Alarm on request	OUT	-	-	-	IN
Each door status	OUT	-	-	-	IN
Brake fluid level	OUT	-	-	-	IN
High-beam indicator light on request	OUT	-	-	-	IN
Transaxle in reverse position	OUT	-	-	-	IN
Parking brake position	OUT	-	-	-	IN
Rear window defroster on request	IN	OUT	-	-	-
	OUT	IN			
A/C on request	IN	OUT	-	-	-
	OUT	IN			
A/C status display request	-	OUT	-	IN	-
Buckle switch status	-	-	OUT	-	IN
Air bag system warning light on request	-	-	OUT	-	IN
Seat belt warning light on request	-	-	OUT	-	IN
Seat belt warning alarm on request	-	-	OUT	-	IN
Air bag system warning alarm on request	-	-	OUT	-	IN
Temperature unit	-	IN	-	OUT	-
	OUT	-		IN	
INFO switch status	-	-	-	OUT	IN
Engine speed	IN	-	-	-	OUT
Vehicle speed	IN	IN	IN	IN	OUT
Engine coolant temperature	IN	IN	-	-	OUT
Key reminder switch position	IN	-	IN	-	OUT
Ignition key position	-	-	-	IN	OUT
Air bag system warning light status	-	-	IN	-	OUT

Drive information system data	-	-	-	IN	OUT
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On-Board Diagnostic Function

- The on-board diagnostic function is incorporated into the following module:
 - PCM
 - ABS HU/CM (with ABS) or DSC HU/CM (with DSC)
 - EHPAS control module
 - Passenger junction box (PJB)
 - Climate control unit
 - SAS control module
 - Audio unit (base module)
 - Instrument cluster
- This function can narrow down CAN system malfunction locations.
- The on-board diagnostic function consists of the following functions.
 - Failure detection function, which detects DTCs malfunctions in CAN system-related parts.
 - Memory function, which stores detected.
 - Self-malfunction diagnostic function, which indicates system malfunctions using DTCs and warning lights.
 - PID/DATA monitoring function, which verifies the input/output condition of specific input/output signals being read out.
- Using the WDS or equivalent, DTCs can be read out and deleted, and the PID/DATA monitoring function can be activated.
- The CAN system has a fail-safe function. When a malfunction occurs in CAN system, the transmission module sends a warning signal and the receiving module illuminates the warning light.

Block diagram



B3E0940T001

1	LF engine model
2	Z6, ZJ engine model
3	EHPAS control module
4	ABS HU/CM
5	With ABS
6	DSC HU/CM
7	With DSC
8	Instrument cluster
9	Twisted pair
10	Climate control unit
11	With full-auto air conditioner system
12	SAS control module
13	Audio unit (base module)

Failure detection function

- The failure detection function in each CAN system-related module detects malfunctions in input/output signals.
- This function outputs the DTC for the detected malfunction to the DLC-2, and also sends the detected result to the memory function and fail-safe function.

Fail-safe function

- When the failure detection function determines that there is a malfunction, the fail-safe function illuminates a warning light to inform the driver of the malfunction.

Memory function

- The memory function stores the DTC for the malfunction of input/output signals for related parts, as determined by the failure detection function.

Self-malfunction diagnostic function

- The self-malfunction diagnostic function determines that there is a malfunction, and outputs a signal, as a DTC, to the DLC-2. The DTC can be read out using the WDS or equivalent.

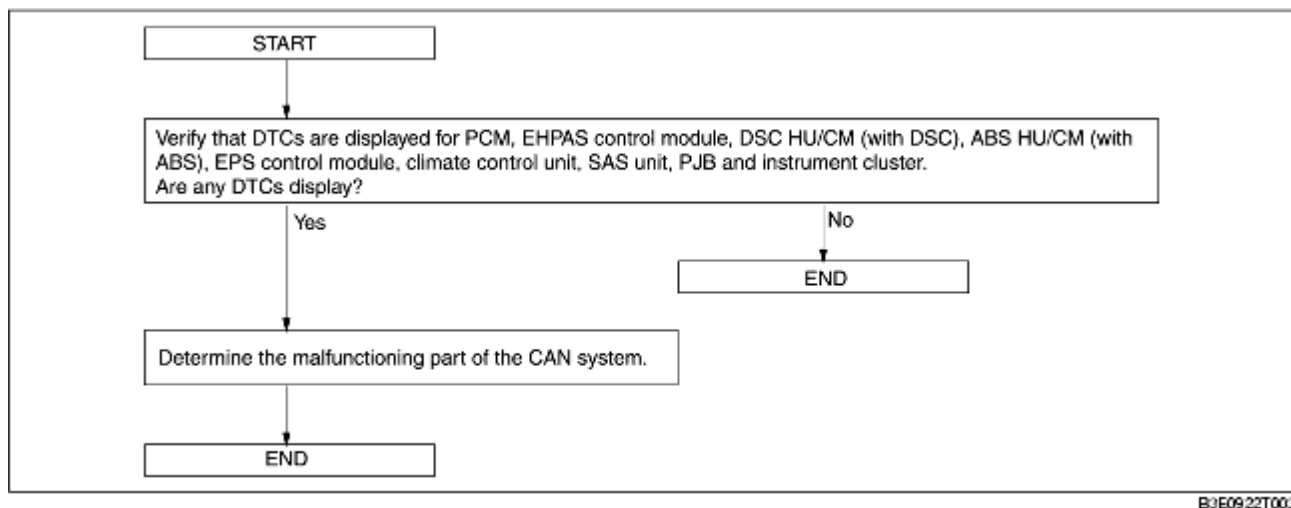
DTC table

DTC	Malfunction location	DTC output module
U0073	CAN system communication error	<ul style="list-style-type: none"> • PCM • EHPAS control module • Instrument cluster • SAS control module
U0100	Communication error to PCM	<ul style="list-style-type: none"> • EHPAS control module • Instrument cluster
U0121	Communication error to DSC HU/CM or ABS HU/CM	<ul style="list-style-type: none"> • PCM • Instrument cluster
U0131	Communication error to EHPAS control module	Instrument cluster
U0140	Communication error to PJB	<ul style="list-style-type: none"> • Instrument cluster • Climate control unit
U0151	Communication error to SAS control module	Instrument cluster
U0155	Communication error to instrument cluster	<ul style="list-style-type: none"> • PCM • Climate control unit
U0184	Communication error to audio unit (base module)	<ul style="list-style-type: none"> • Instrument cluster • Climate control unit
U0516	CAN system communication error	Climate control unit
U1900	Communication error to instrument cluster	<ul style="list-style-type: none"> • ABS HU/CM (with ABS) • DSC HU/CM (with DSC) • SAS control module
	CAN system communication error Abnormal message	PJB
U2012	CAN system communication error	<ul style="list-style-type: none"> • ABS HU/CM (with ABS) • DSC HU/CM (with DSC)
U2023	Abnormal message from PCM	EHPAS control module
U2516	CAN system communication error	Instrument cluster
U2523	Communication error to PCM	<ul style="list-style-type: none"> • ABS HU/CM (with ABS) • DSC HU/CM (with DSC)

Narrowing down malfunction locations

- The on-board diagnostic function, by verifying the detected DTC information from each module, can narrow down a CAN system malfunction location. Refer to the Self-malfunction diagnostic function for detailed information regarding DTCs. (See [Self-malfunction diagnostic function](#).)

Flowchart



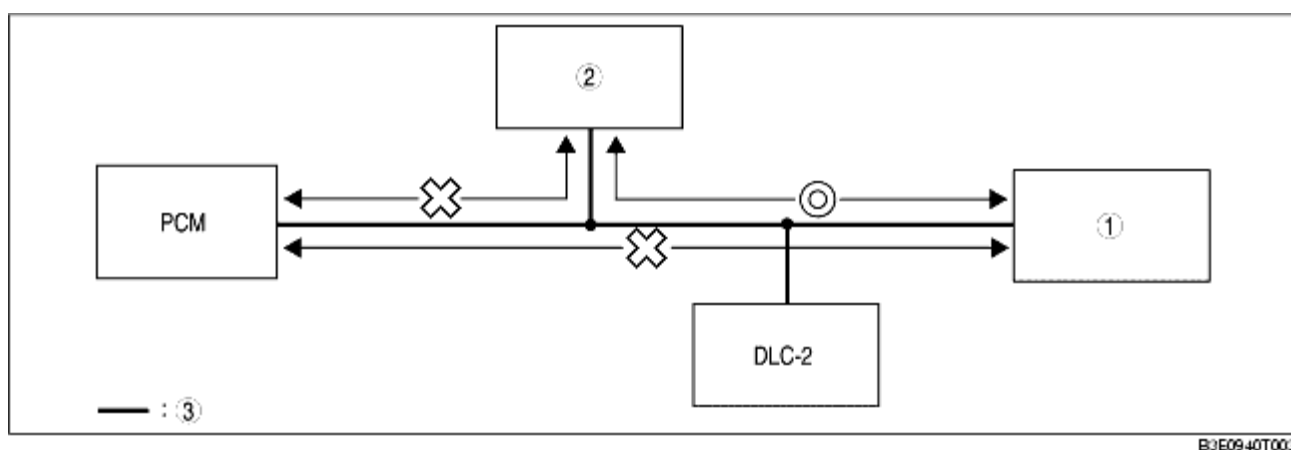
Example (PCM-related communication error)

Note

- This example is for Z6 with DSC.

1. DTCs for the PCM, DSC HU/CM and instrument cluster can be verified using the WDS or equivalent.

Module	Displayed DTC	Probable malfunction location
PCM	U0073	PCM-related CAN system malfunction
	U0121	Communication error between PCM and DSC HU/CM
	U0155	Communication error between PCM and instrument cluster
DSC HU/CM	U2523	Communication error between DSC HU/CM and PCM
Instrument cluster	U0100	Communication error between instrument cluster and PCM



1	Instrument cluster
2	DSC HU/CM
3	Twisted pair

2. If there is a communication error between the instrument cluster and PCM, even if the communication between the DSC HU/CM and the instrument cluster is normal, it is probable that there is a malfunction in the

PCM or PCM-related wiring harnesses.