

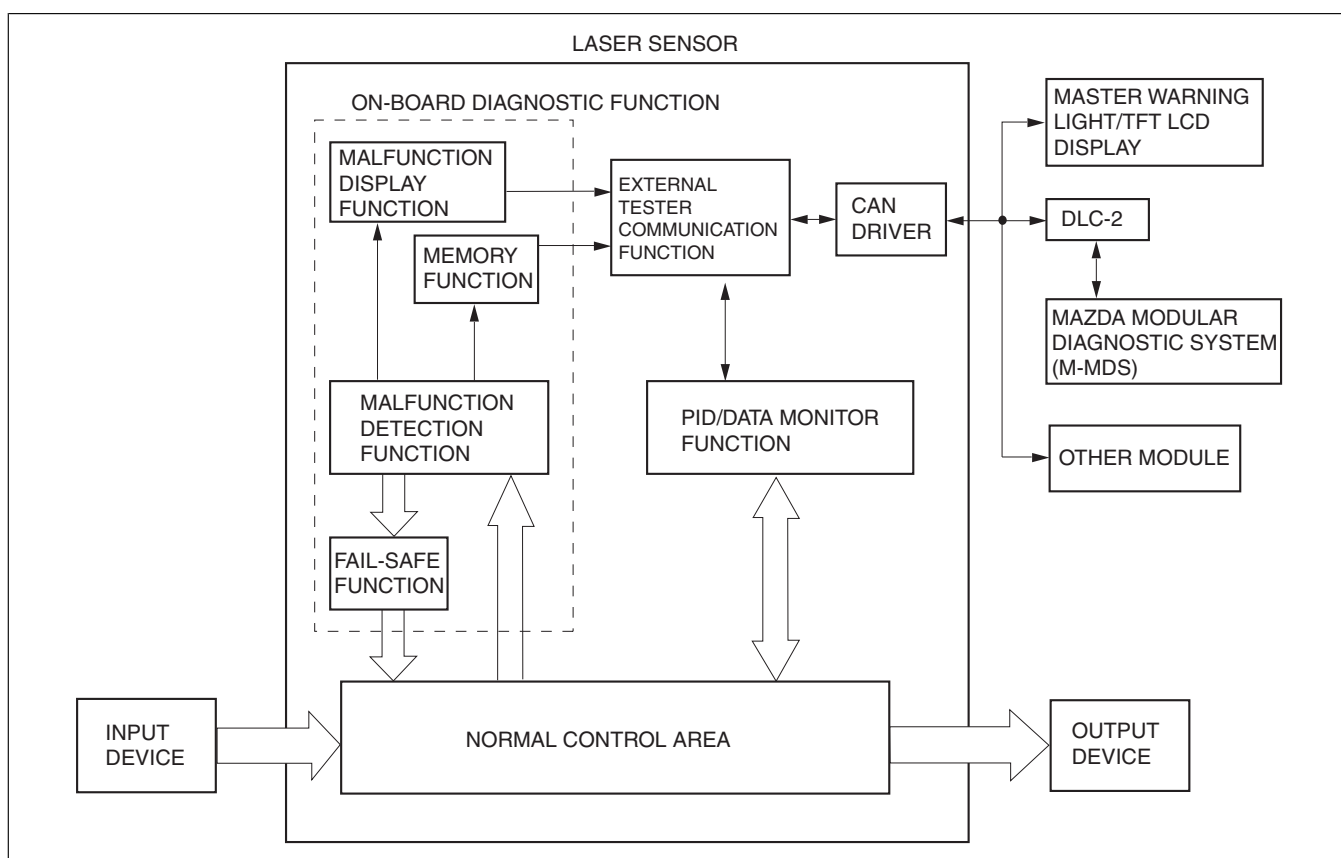
ON-BOARD DIAGNOSTIC SYSTEM [LASER SENSOR]

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OUTLINE

- The on-board diagnostic system consists of a malfunction detection system that detects malfunctions in input/output signals when the ignition is switched to ON, a PID/data monitor function that reads out specified input/output signals, and an active command mode function that allows for override operation of output parts (such as solenoid valves).
- The data link connector 2 (DLC-2), which groups together all the connectors used for malfunction diagnosis and detecting/repair into a single location, has been adopted, thereby improving serviceability. Diagnosis is performed by connecting the Mazda modular diagnostic system (M-MDS) to the DLC-2.
- In addition to DTC read-out, the Mazda modular diagnostic system (M-MDS) is used to clear DTCs using the display screen of the diagnostic tester, and to access the PID/data monitor and active command modes functions, providing enhanced malfunction diagnosis and improved serviceability.

Block diagram



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FUNCTION

Malfunction detection function

- The malfunction detection function detects and displays malfunctions in the input/output signal system of the laser sensor when the ignition is switched to ON.
- If the laser sensor malfunction is detected, the master warning light is illuminated and the message "SCBS Inspection Required" is indicated in the TFT LCD display. DTCs can be output through the CAN_H and CAN_L of the DLC-2 using the external tester communication function. At the same time, malfunction detection results are sent to the memory and fail-safe functions.

Memory function

- The memory function stores DTCs of malfunctions in input/output signal systems. With this function, once a DTC is stored it is not cleared after the ignition has been switched off, even if the malfunctioning signal system has returned to normal.
- Since the laser sensor has a built-in non-volatile memory, DTCs are not cleared even if the battery is removed. Therefore, it is necessary to clear the memory after performing repairs. Refer to the Workshop Manual for the DTC clearing procedure.

DTC 7-digit code definition

- When related systems or components have failed, the sensor stores the DTC of the malfunctioning part in the sensor memory, and allows for the retrieval of the store data using scanning tool when necessary. The DTCs are indicated using seven digits. Each digit indicates the following.

are indicated using bits higher than eight indicated the following:

C

0

0

0

1

0

1

- Specify the area failure sub type

00: No sub type information

01: General electrical malfunction

07: Mechanical malfunctions

08: Bus signal/message malfunctions

11: Circuit short to ground

15: Circuit short to battery or open circuit

16: Circuit voltage below threshold

17: Circuit voltage above threshold

1C: Circuit voltage out of range

28: Signal bias level out of range/zero adjustment malfunction

46: Calibration/parameter memory malfunction

48: Supervision software malfunction

49: Internal electronic malfunction

54: Missing calibration

62: Signal compare malfunction

64: Signal plausibility malfunction

68: Event information

71: Actuator stuck

86: Signal invalid

88: Bus off

- Manufacturer controlled

- Indicates subgroup

Network Electrical (U code)	Body (B code)	Chassis (C code)
0: Network Electrical	Manufacturer controlled	Manufacturer controlled
1: Network communication		
4: Network data		

- Indicates who was responsible for DTC definition

0: ISO/SAE controlled

1: Manufacturer controlled

2: There are ISO/SAE controlled just for powertrain, all others are manufacturer controlled.

3: For P3000 to P3399 is manufacturer controlled, all others are ISO/SAE controlled.

- Indicates DTC function

B: Body

C: Chassis

U: Network Electrical

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Fail-safe function

- When the malfunction detection function determines a malfunction, the master warning light illuminates and the message "SCBS Inspection Required" is indicated in the TFT LCD display to alert the driver. At this time, the smart city brake support (SCBS) is inhibited.

DTC table

×: Applicable
-: Not applicable

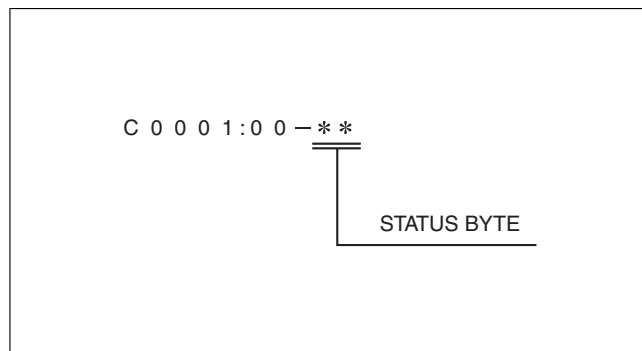
DTC No.	Master warning light	Message in the TFT LCD display	Fail-safe function	Malfunction location	Drive cycle	Self test type*1	Memory function
U0001:00	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	CAN line	-	C	×
U0100:00							
U0121:00							
U0131:00							
U0155:00							
U0401:68	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	Abnormal message from PCM	-	C	×

DTC No.	Master warning light	Message in the TFT LCD display	Fail-safe function	Malfunction location	Drive cycle	Self test type*1	Memory function
U0415:68	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	Abnormal message from DSC HU/CM	-	C	×
U0420:68	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	Abnormal message from EPS CM	-	C	×
U0423:68	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	Abnormal message from instrument cluster	-	C	×
U1A14:49	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	Laser sensor	-	C	×
U2300:55	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	Configuration data not recorded or data error	-	C	×
U2300:56			Smart city brake support (SCBS) control disabled		-	C	×
U3000:00	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	Laser sensor (internal malfunction)	-	C	×
U3000:64			Smart city brake support (SCBS) control disabled		-	C	×
U3000:66	Illuminated	SCBS Inspection Required	Smart city brake support (SCBS) control disabled	Laser sensor	-	C	×

*1 : C: CMDTC self-test

Status byte for DTC

- The status byte is the two-digit code (two digits after hyphen (-)) after the DTC.
- The status byte is a code which indicates the pending code, current/past malfunction status, or warning illumination status.
- The status byte can be read by performing a CMDTC self test using the Mazda Modular Diagnostic System (M-MDS).
- For details on the status byte, refer to the explanation on the Mazda Modular Diagnostic System (M-MDS) when reading the DTC.



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Snapshot data

Note

- The laser sensor stores the following two types of information when a DTC is detected and displays snapshot data in the M-MDS.
 - Vehicle information detected by laser sensor
 - Vehicle information detected by instrument cluster and received by start stop unit via CAN signal
- The snapshot data stores the currently detected DTC data

Snapshot data item	Unit	Data contents	Data read/use method	Corresponding data monitor items
DSC_R_BRK	OK/Error	DSC response against brake request from SCBS module	Not applicable	Not applicable
DSC_R_BRK_C	OK/Error	DSC response against brake assist threshold change from SCBS module	Not applicable	Not applicable
DSC_R_NOREQ	OK/Error	DSC response while no request from SCBS module	Not applicable	Not applicable

Snapshot data item	Unit	Data contents	Data read/use method	Corresponding data monitor items
DSC_R_PRECH	OK/Error	DSC response against pre-charge request from SCBS module	Not applicable	Not applicable
DSC_SYSTEM	OK/Error	DSC system condition	Not applicable	Not applicable
ECU_IN_TEMP	°C	ECU internal temperature	Not applicable	Not applicable
PCM_R_NOREQ	OK/Error	PCM response while no request from SCBS module	Not applicable	Not applicable
PCM_R_REQ	OK/Error	PCM response against request from SCBS module	Not applicable	Not applicable
PCM_SYSTEM	OK/Error	PCM system condition	Not applicable	Not applicable
TOTAL_DIST	km/miles	Accumulated total traveled distance from completion of vehicle until laser sensor detects DTC (Odometer value in instrument cluster)	The distance traveled when the laser sensor detected a DTC can be calculated by performing the following procedure. 1. Verify the odometer value in the instrument cluster. 2. Verify the snapshot data item TOTAL_DIST. 3. Subtract 2 from 1.	Not applicable
TOTAL_TIME	hh:mm:ss*1	Accumulated total elapsed time since vehicle completion until laser sensor detects a DTC Note • When the ROOM removed, and the ignition is switched to off, the time is not included in the elapsed time.	The elapsed time when the laser sensor detected a DTC can be calculated by performing the following procedure. 1. Verify the PID item TOTAL_TIME of the instrument cluster. 2. Verify the snapshot data item TOTAL_TIME. 3. Subtract 2 from 1.	TOTAL_TIME*2
VPWR	V	Power supply	Not applicable	Not applicable
VSPD	KPH, MPH	Vehicle speed	Not applicable	VSPD

*1 : The seconds may be indicated after the decimal point.

*2 : Instrument cluster PID (See ON-BOARD DIAGNOSTIC [INSTRUMENT CLUSTER].)

PID/data monitor function

- The PID/data monitor function is used for optionally selecting input/output signal monitor items preset in the laser sensor and reading them out in real-time.

PID/data monitor table

Mazda Modular Diagnostic System (M-MDS) display	Data contents	Unit/Operation (Mazda Modular Diagnostic System (M-MDS) display)
DIST_BMP_TGT	Distance from bumper to target that sensor has detected	m
VPWR_IG1	Module supply voltage (IG1)	V
VSPD	Vehicle speed	KPH, MPH

External tester communication function

- The external tester communication function enables communication of diagnostic data (DTC read-outs, input/output signal read-outs, operation of input/output parts) between the laser sensor and an external tester.

Connections/communication contents

	External tester	
	Mazda Modular Diagnostic System (M-MDS)	
	Connection	Communication method
On-board diagnostic (malfunction detection) function	Input/output: CAN_H (HS), CAN_L (HS) terminals	Serial communication
PID/data monitor function	Input/output: CAN_H (HS), CAN_L (HS) terminals	Serial communication

Serial communication

- Serial communication (two-way communication) allows for multiple data to be sent and received instantly along the same line.
- By connecting the Mazda Modular Diagnostic System (M-MDS) to the DLC-2, diagnostic data can be sent and received between the Mazda Modular Diagnostic System (M-MDS) and the laser sensor using the CAN_H and CAN_L terminals (within the DLC-2).
- The laser sensor receives the command signals of the malfunction detection function and PID/data monitor function based on the Mazda Modular Diagnostic System (M-MDS), and sends DTCs and data regarding the operating condition and status of each input/output part to the Mazda Modular Diagnostic System (M-MDS).

Diagnostic function name	Signal received	Signal sent
Malfunction detection function	DTC verification signal	DTC
PID/data monitor function	Command signal to read selected monitor item	Monitored data for requested monitor item