

ON-BOARD DIAGNOSTIC [FORWARD SENSING CAMERA (FSC)]

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Outline

- The on-board diagnostic function consists of the following functions: a malfunction detection function, which detects overall malfunctions in the forward sensing camera (FSC)-related parts; a memory function, which stores detected DTCs; a display function, which indicates malfunction locations and status via DTC output; and a PID/data monitoring function, which reads out specific input/output signals and verifies the input/output condition.
- Using the Mazda Modular Diagnostic System (M-MDS), DTCs can be read out and deleted, and the PID/data monitoring function can be activated.

Malfunction detection function

- Detects malfunctions in input/output signals.
- If a malfunction occurs, the FSC records the malfunction as a DTC. A recorded DTC can be read by the Mazda Modular Diagnostic System (M-MDS).

×: Applicable
—: Not applicable

DTC No.	High beam control system (HBC) warning light (amber)/ Lane departure warning system (LDWS) warning light (amber)	Description	Fail-safe function	Drive cycle	Self test type*1	Memory function
B115E:54	Flash	Forward sensing camera (FSC) aiming not completed	×	—	C, D	×
B13A6:11	Flash	LDWS switch circuit malfunction	×	—	C, D	×
C1001:92	Illuminate	Poor functioning of forward sensing camera (FSC)	×	—	C, D	×
C1001:97	Illuminate	Forward sensing camera (FSC) poor visibility	×	—	C, D	×
U0001:88	Flash	Module communication error (HS-CAN)	×	—	C, D	×
U0100:00	Flash	Communication error with PCM	×	—	C, D	×
U0121:00	Flash	Communication error with DSC HU/CM	×	—	C, D	×
U0131:00	Flash	Communication error with EPS control module	×	—	C, D	×
U0140:00	Flash	Communication error with front body control module (FBCM)	×	—	C, D	×
U0155:00	Flash	Communication error with instrument cluster	×	—	C, D	×
U0214:00	Flash	Communication error with start stop unit	×	—	C, D	×
U0401:68	Flash	Error signal received from PCM	×	—	C, D	×
U0415:68	Flash	Error signal received from DSC HU/CM	×	—	C, D	×
U0420:68	Flash	Error signal received from EPS control module	×	—	C, D	×
U0423:68	Flash	Error signal received from instrument cluster	×	—	C, D	×
U0515:68	Flash	Error signal received from start stop unit	×	—	C, D	×
U2005:86	Flash	Error signal received from PCM	×	—	C, D	×
U2100:00	Illuminate	Forward sensing camera (FSC) configuration error	×	—	C, D	×
U2101:00	Illuminate	Forward sensing camera (FSC) configuration error	×	—	C, D	×
U3000:04	Flash	Forward sensing camera (FSC) internal malfunction	×	—	C, D	×

DTC No.	High beam control system (HBC) warning light (amber)/ Lane departure warning system (LDWS) warning light (amber)	Description	Fail-safe function	Drive cycle	Self test type*1	Memory function
U3000:09	Flash	Forward sensing camera (FSC) internal malfunction	×	—	C, D	×
U3000:42	Flash	Forward sensing camera (FSC) internal malfunction	×	—	C, D	×
U3000:49	Flash	Forward sensing camera (FSC) internal malfunction	×	—	C, D	×
U3003:16	Flash	Forward sensing camera (FSC) low power supply voltage input	×	—	C, D	×
U3003:17	Flash	Forward sensing camera (FSC) high power supply voltage input	×	—	C, D	×

*1 : C: CMDTC self test, D: ODDTC self test

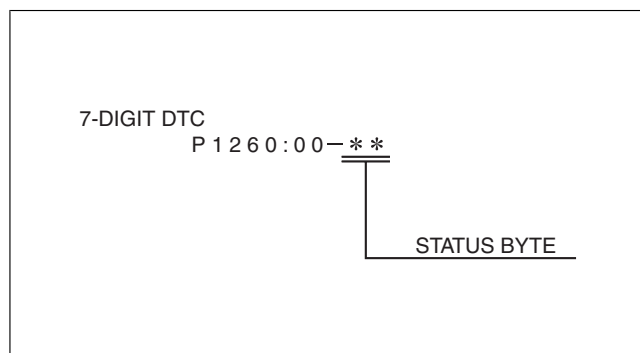
DTC 7-digit code definition

- When related systems or components have failed, the CM stores the DTC of the malfunctioning part in the CM 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.

B	1	0	D	5	1	3
. Specify the area failure sub type 00: No sub type information 05: System programming malfunctions 11: Circuit short to ground 13: Open circuit 14: Circuit short to ground or open 16: Circuit voltage below threshold 41: General checksum malfunction . Manufacturer controlled . Indicates subgroup Powertrain (P code) 0: Fuel and air metering and auxiliary emission controls Network Electrical (U code) 0: Network Electrical 1: Network communication 2: Network communication 3: Network software 4: Network data 5: 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 P: Powertrain B: Body C: Chassis U: Network Electrical						
09: Component failures 17: Circuit voltage above threshold 42: General memory malfunction 49: Internal electronic malfunction 51: Not programmed 62: Signal compare malfunction 68: Event information 81: Invalid serial data received 04: System internal failures 86: Signal invalid 87: Missing message 88: Bus off 92: Performance or incorrect operation 94: Unexpected operation 97: Component or system operation obstructed or blocked						
Body (B code) Manufacturer controlled Chassis (C code) Manufacturer controlled						

Status byte for DTC

- The status byte is the two digits (two digits after hyphen (-)) after the 7-digit 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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Detection condition for the applicable DTC

DTC No.	System malfunction location	Detection condition
B115E:54	Forward sensing camera (FSC) aiming not completed	Forward sensing camera (FSC) aiming not completed is detected.
B13A6:11	LDWS switch circuit malfunction	Forward sensing camera (FSC) detects that LDWS switch is held pressed for 10 s or more.
C1001:92	Poor functioning of forward sensing camera (FSC)	With the LDWS switch on or the high beam control (HBC) system operating, it is detected that the area around the forward sensing camera (FSC) is excessively bright, and the system is inoperable for 10 min.
C1001:97	Forward sensing camera (FSC) poor visibility	With the LDWS switch on or the high beam control (HBC) system operating, it is detected that the forward sensing camera (FSC) field of view is obstructed for 10 min.
U0001:88	Module communication error (HS-CAN)	Forward sensing camera (FSC) detects CAN bus communication line (HS-CAN) malfunction 10 times continuously.
U0100:00	Communication error with PCM	Forward sensing camera (FSC) cannot receive CAN signal from the PCM for 1 s or more.
U0121:00	Communication error with DSC HU/CM	Forward sensing camera (FSC) cannot receive CAN signal from the DSC HU/CM for 1 s or more.
U0131:00	Communication error with EPS control module	Forward sensing camera (FSC) cannot receive CAN signal from the EPS control module for 1 s or more.
U0140:00	Communication error with front body control module (FBCM)	Forward sensing camera (FSC) cannot receive CAN signal from front body control module (FBCM) for 5 s or more.
U0155:00	Communication error with instrument cluster	Forward sensing camera (FSC) cannot receive CAN signal from instrument cluster for 5 s or more.
U0214:00	Communication error with start stop unit	Forward sensing camera (FSC) cannot receive CAN signal from the start stop unit for 1 s or more.
U0401:68	Error signal received from PCM	Forward sensing camera (FSC) receives error signal from the PCM for 1 s or more.
U0415:68	Error signal received from DSC HU/CM	Forward sensing camera (FSC) receives error signal from the DSC HU/CM for 1 s or more.
U0420:68	Error signal received from EPS control module	Forward sensing camera (FSC) receives error signal from the EPS control module for 1 s or more.
U0423:68	Error signal received from instrument cluster	Forward sensing camera (FSC) receives error signal from the instrument cluster for 5 s or more.
U0515:68	Error signal received from start stop unit	Forward sensing camera (FSC) receives error signal from the start stop unit for 1 s or more.
U2005:86	Error signal received from PCM	Forward sensing camera (FSC) receives vehicle speed signal error from the PCM for 1 s or more.
U2100:00	Forward sensing camera (FSC) configuration error	Forward sensing camera (FSC) configuration not completed is detected.
U2101:00	Forward sensing camera (FSC) configuration error	Detects that forward sensing camera (FSC) has unsupported configuration data.

DTC No.	System malfunction location	Detection condition
U3000:04	Forward sensing camera (FSC) internal malfunction	The front body control module (FBCM) detects an error in the image-related circuit in the forward sensing camera (FSC) with the ignition switched ON (engine off or on).
U3000:09	Forward sensing camera (FSC) internal malfunction	The front body control module (FBCM) detects an internal temperature sensor malfunction in the forward sensing camera (FSC) with the ignition switched ON (engine off or on).
U3000:42	Forward sensing camera (FSC) internal malfunction	The front body control module (FBCM) detects a NVRAM error in the forward sensing camera (FSC) with the ignition switched ON (engine off or on).
U3000:49	Forward sensing camera (FSC) internal malfunction	The front body control module (FBCM) detects a malfunction in the forward sensing camera (FSC) with the ignition switched ON (engine off or on).
U3003:16	Forward sensing camera (FSC) low power supply voltage input	Forward sensing camera (FSC) power supply circuit voltage of 8.2 V or less is detected for 5 s or more with the ignition switched ON (engine off or on).
U3003:17	Forward sensing camera (FSC) high power supply input	Forward sensing camera (FSC) power supply circuit voltage of 16.8 V or more is detected for 5 s or more with the ignition switched ON (engine off or on).

Snap shot data

- The data for all DTCs currently detected is stored.

—: Not applicable

Snapshot data item	Unit		Data contents	Data read/use method	Corresponding data monitor items
ECU_IN_TMP	°C	°F	ECU Internal Temperature	—	—
IG-ON_TIMER	hh:mm:ss*1		Elapsed time since ignition was switched ON Note <ul style="list-style-type: none"> The instrument cluster records the elapsed time since the ignition was switched ON. 	<ul style="list-style-type: none"> The forward sensing camera (FSC) constantly receives the elapsed time since the ignition was switched ON sent via CAN signal from the instrument cluster. If a DTC is detected, the forward sensing camera (FSC) records the elapsed time since the ignition was switched ON when the DTC was detected, and it is displayed in the M-MDS. 	—
OPE_MODE	Normal/ CALIBRATION/ EMERGENCY		Operation Mode	—	—
VSPD	KPH	MPH	Vehicle speed	—	—

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

Data Monitor Function

- The PID/data monitor function performs reading in real time of optionally selected input/output signal monitor items that are set in the FSC.

PID/data monitor table

—: Not applicable

PID	Unit/ Operation	Data contents	Inspection item(s)
A_ANG_PITCH	° (deg)	Displays forward sensing camera (FSC) aiming angle (pitch).	Forward sensing camera (FSC)
A_ANG_ROLL	° (deg)	Displays forward sensing camera (FSC) aiming angle (roll).	Forward sensing camera (FSC)
A_ANG_YAW	° (deg)	Displays forward sensing camera (FSC) aiming angle (yaw).	Forward sensing camera (FSC)
BRAKE_SW	Off/On	<ul style="list-style-type: none"> Off: Brake switch (No. 2) is off. (Brake pedal is depressed.) On: Brake switch (No. 2) is on. (Brake pedal is not depressed.) 	Brake switch
DSP_LANE_ST	Off/ Dash_Lane/ Solid_Lane	<ul style="list-style-type: none"> Off: Vehicle lanes not displayed in TFT LCD display Dash_Lane: Displays broken lines in TFT LCD display. Solid_Lane: Displays actual lanes in TFT LCD display. 	TFT LCD display (instrument cluster)
DSP_WRN_ST	Off/ LDWS_Left/ LDWS_Right/ LDWS_Fail/ HBC_Fail/ Camera_BLK/FSC_Fail/ Camera_DRDT	<ul style="list-style-type: none"> Off: Warning not displayed in TFT LCD display LDWS_Left: Warning related to lane departure on vehicle left side is displayed in TFT LCD display. LDWS_Right: Warning related to lane departure on vehicle right side is displayed in TFT LCD display. LDWS_Fail: Warning related to malfunction in lane departure warning system (LDWS) is displayed in TFT LCD display. HBC_Fail: Warning related to malfunction in high beam control (HBC) system is displayed in TFT LCD display. Camera_BLK: Warning related to soiling of the forward sensing camera (FSC) is displayed in the TFT LCD display. FSC_Fail: Warning related to malfunction in forward sensing camera (FSC) is displayed in the TFT LCD display. Camera_DRDT: Warning related to fogging of the forward sensing camera (FSC) is displayed in the TFT LCD display. 	TFT LCD display (instrument cluster)
HBC_HI/L_CS	Hi_Request/ Low_Request/ Invalid	<ul style="list-style-type: none"> Hi_Request: HI beam switch signal received Low_Request: LO beam switch signal received Invalid: Error in HI/LO beam switch request signal 	Forward sensing camera (FSC)
IL_ST_HBC	Off/ Green_On/ Green_Flash/ Amber_On/ Amber_Flash	<ul style="list-style-type: none"> Off: HBC indicator light turns off Green_On: HBC indicator light (green) is illuminated. Green_Flash: HBC indicator light (green) is flashing. Amber_On: HBC indicator light (amber) is illuminated. Amber_Flash: HBC indicator light (amber) is flashing. 	HBC indicator light (instrument cluster)
IL_ST_LDWS	Off/ Green_On/ Green_Flash/ Amber_On/ Amber_Flash	<ul style="list-style-type: none"> Off: LDWS indicator light turns off Green_On: LDWS indicator light (green) illuminated Green_Flash: LDWS indicator light (green) is flashing. Amber_On: LDWS indicator light (amber) is illuminated. Amber_Flash: LDWS indicator light (amber) is flashing. 	LDWS indicator light (instrument cluster)
LDWS_BUZZER	Off/On	<ul style="list-style-type: none"> Off: LDWS warning alarm does not sound. On: LDWS warning alarms sounds. 	LDWS warning alarm (instrument cluster)
LDWS_SW	Off/On	<ul style="list-style-type: none"> Off: LDWS switch is off. On: LDWS switch is on. 	LDWS switch
RS_SOUND_CS	Off/Left/ Right	<ul style="list-style-type: none"> Off: Rumble strip sound is not heard. Left: Left side rumble strip sound heard Right: Right side rumble strip sound heard 	Audio unit
VPWR_IG1	V	Displays forward sensing camera (FSC) power supply voltage.	Forward sensing camera (FSC)
VSPD	KPH, MPH	Vehicle speed is displayed.	—