ON-BOARD DIAGNOSTIC [ADAPTIVE FRONT LIGHTING SYSTEM (AFS)]

id091800693100

Outline

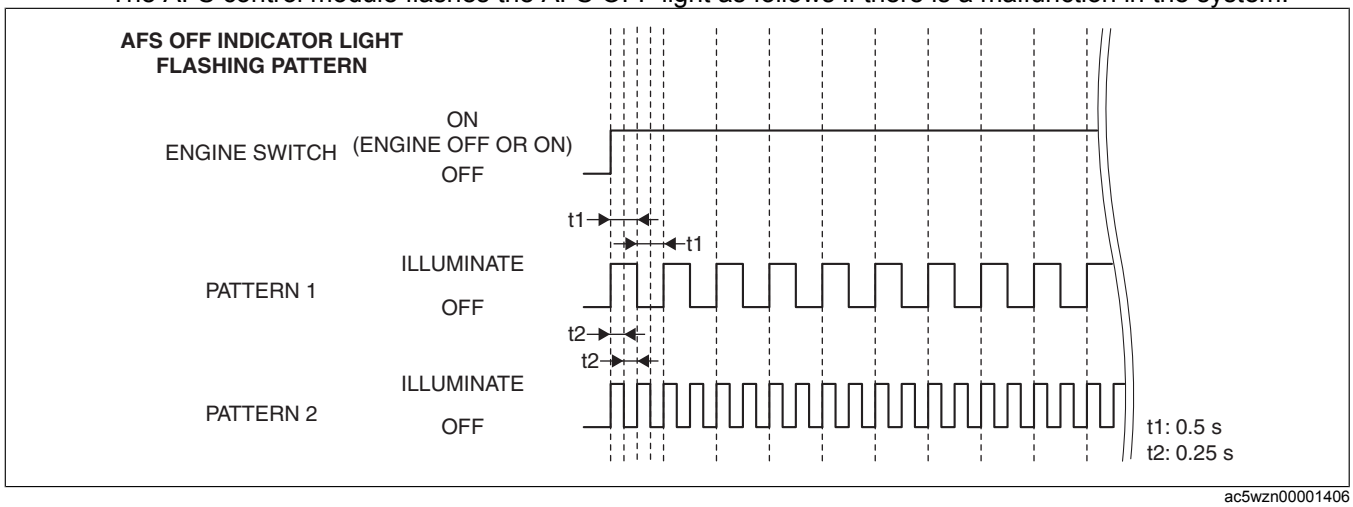
- The on-board diagnostic function consists of the following functions: a malfunction detection function, which detects overall malfunctions in the AFS control module-related parts; a memory function, which stores detected DTCs; a display function, which indicates malfunction locations and status via 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 AFS control module records the malfunction as a DTC. A recorded DTC can be read by the Mazda Modular Diagnostic System (M-MDS).

Note

- The AFS control module flashes the AFS OFF light as follows if there is a malfunction in the system.



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DTC table

×: Applicable
—: Not applicable

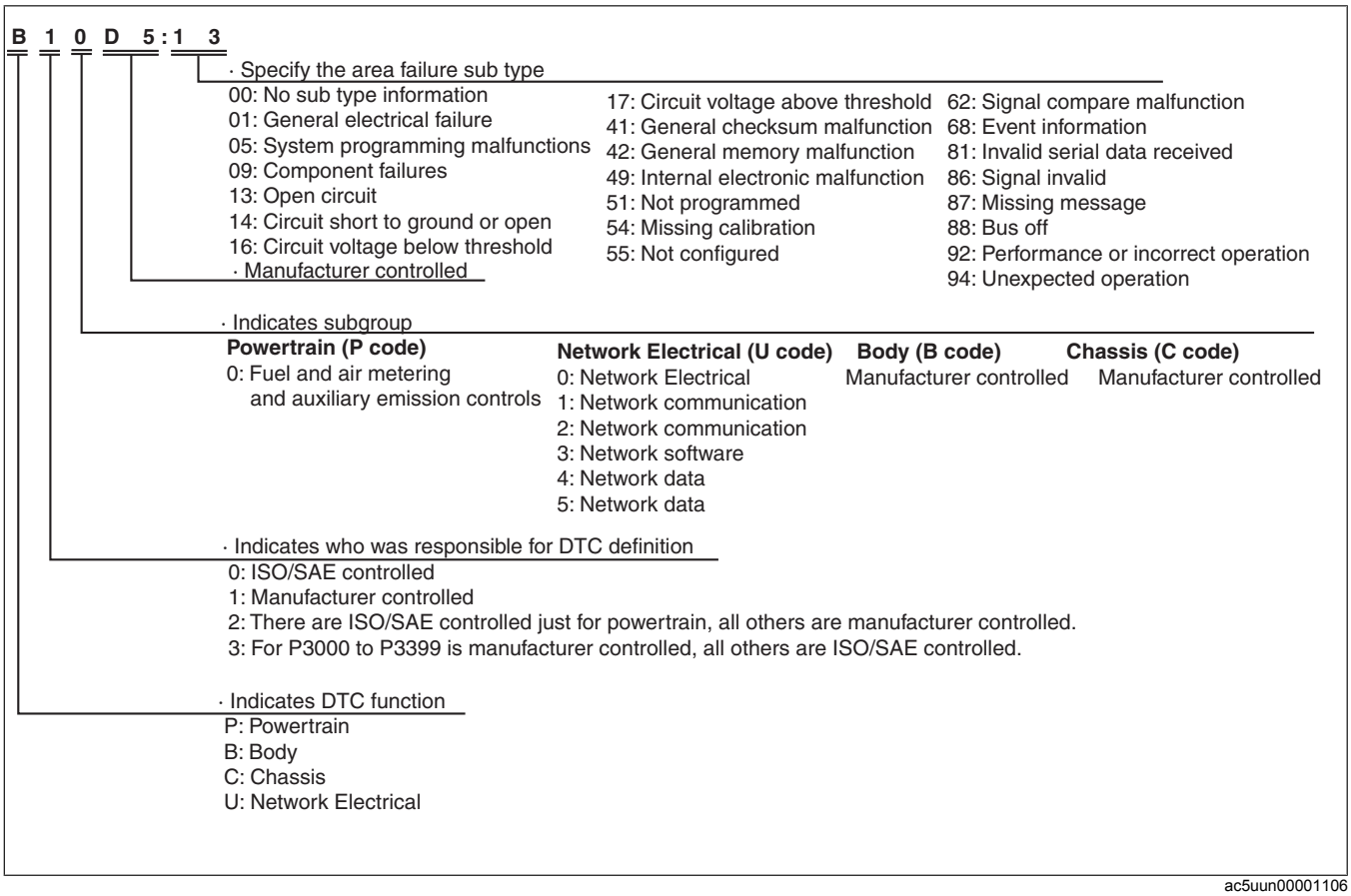
DTC No.	AFS OFF indicator light	Description	Fail-safe function	Drive cycle	Self test type*1	Memory function
B1041:14	Flash (Pattern 1)	Headlight leveling actuator circuit malfunction	×	—	D	×
B1041:54	Flash (Pattern 2)	Headlight auto leveling system initial setting error	×	—	D	×
B1044:01	Flash (Pattern 1)	Auto leveling sensor circuit malfunction	×	—	D	×
B10A3:86	Flash (Pattern 1)	Communication error with swivel actuator (LH)	×	—	D	×
B10A3:87	Flash (Pattern 1)	Communication error with swivel actuator (LH)	×	—	D	×
B10A4:86	Flash (Pattern 1)	Communication error with swivel actuator (RH)	×	—	D	×
B10A4:87	Flash (Pattern 1)	Communication error with swivel actuator (RH)	×	—	D	×
C0051:86	Flash (Pattern 1)	Error steering angle signal received from EPS control module	×	—	C, D	×
U0001:88	Flash (Pattern 1)	Unit communication error (HS-CAN)	×	—	C, D	×
U0100:00	Flash (Pattern 1)	Communication error with PCM	×	—	C, D	×
U0131:00	Flash (Pattern 1)	Communication error with EPS control module	×	—	C, D	×

DTC No.	AFS OFF indicator light	Description	Fail-safe function	Drive cycle	Self test type*1	Memory function
U0140:00	Flash (Pattern 1)	Communication error with front body control module (FBCM)	×	—	C, D	×
U0155:00	Flash (Pattern 1)	Communication error with instrument cluster	×	—	C, D	×
U0320:09	Flash (Pattern 1)	EPS control module malfunction	×	—	C, D	×
U0420:68	Flash (Pattern 1)	Error signal received from EPS control module	×	—	C, D	×
U0423:68	—	Error signal received from instrument cluster • AFS OFF switch error signal	×	—	C, D	—
	—	Error signal received from instrument cluster • Ignition switch error signal	×	—	C, D	—
	Flash (Pattern 1)	Error signal received from instrument cluster • Selector lever position (R position) (ATX)/ Reverse (MTX) signal error	×	—	C, D	×
	—	Error signal received from instrument cluster • Selector lever position (R position) (ATX)/ Reverse (MTX) signal not determined	×	—	C, D	—
U2005:86	Flash (Pattern 1)	Error signal received from PCM	×	—	C, D	×
U2300:54	Flash (Pattern 1)	Error configuration data received from instrument cluster	×	—	C, D	×
U2300:55	—	Instrument cluster configuration not implemented	×	—	C, D	×
U2300:56	Flash (Pattern 1)	Configuration data unmatched with instrument cluster	×	—	C, D	×
U3000:42	Flash (Pattern 1)	AFS control module internal malfunction	×	—	C, D	×
U3000:49	—	AFS control module internal malfunction • RAM/ROM malfunction	×	—	C, D	×
	—	AFS control module internal malfunction • AFS function malfunction	—	—	C, D	—
	—	AFS control module internal malfunction • CAN hardware malfunction	×	—	C, D	×
U3003:16	—	AFS control module low power supply voltage input	×	—	C, D	—
U3003:17	—	AFS control module 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.



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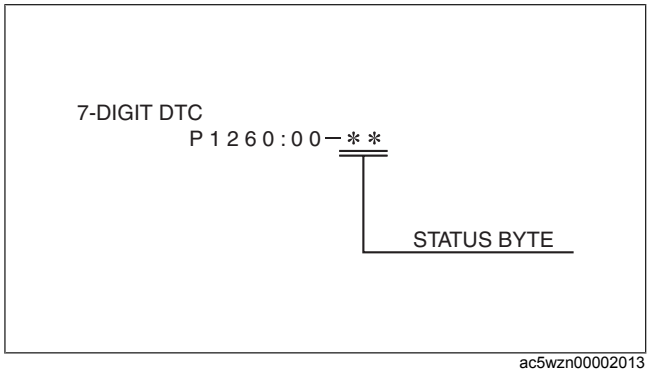
Status byte for DTC

- 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
B1041:14	Headlight leveling actuator circuit malfunction	Headlight leveling actuator circuit voltage of 3.2 V or less is detected for 5 s or more with the ignition switched ON (engine off or on).
B1041:54	Headlight auto leveling system initialization error	Ignition is switched ON (engine off or on) and headlight auto leveling system initialization is not performed.
B1044:01	Auto leveling sensor circuit malfunction	Auto leveling sensor circuit voltage of 0.25 V or less or 4.75 V or more is detected by AFS control module for 10 s or more with the ignition switched ON (engine off or on).
B10A3:86	Communication error with swivel actuator (LH)	• The AFS control module received error signals from the swivel actuator (LH) three times continuously with the ignition switched ON (engine off or on). • The AFS control module could not receive the signal from the swivel actuator (LH) for 5 s or more with the ignition switched ON (engine off or on).
B10A3:87	Communication error with swivel actuator (LH)	The AFS control module detected communication error with the swivel actuator (LH) for 5 s or more with the ignition switched ON (engine off or on).

DTC No.	System malfunction location	Detection condition
B10A4:86	Communication error with swivel actuator (RH)	• The AFS control module received error signals from the swivel actuator (RH) three times continuously with the ignition switched ON (engine off or on). • The AFS control module could not receive the signal from the swivel actuator (RH) for 5 s or more with the ignition switched ON (engine off or on).
B10A4:87	Communication error with swivel actuator (RH)	The AFS control module detected communication error with the swivel actuator (RH) for 5 s or more with the ignition switched ON (engine off or on).
C0051:86	Error steering angle signal received from EPS control module	Either a condition in which the steering angle sensor has a malfunction and the EPS control module has not performed steering angle neutral position auto learning, or a condition in which the EPS control module has a malfunction is detected for 5 s or more.
U0001:88	Unit communication error (HS-CAN)	The AFS control module detected CAN bus communication line (HS-CAN) malfunction ten times continuously.
U0100:00	Communication error with PCM	The AFS control module could not receive CAN signal from the PCM for 5 s or more.
U0131:00	Communication error with EPS control module	The AFS control module could not receive CAN signal from the EPS control module for 5 s or more.
U0140:00	Communication error with front body control module (FBCM)	The AFS control module could not receive CAN signal from the front body control module (FBCM) for 5 s or more.
U0155:00	Communication error with instrument cluster	The AFS control module could not receive CAN signal from the instrument cluster for 5 s or more.
U0320:09	EPS control module malfunction	The AFS control module received CAN error signal from the EPS control module for 5 s or more with the ignition switched ON (engine off or on).
U0420:68	Error signal received from EPS control module	The AFS control module received error signal from the EPS control module for 5 s or more with the ignition switched ON (engine off or on).
U0423:68	AFS OFF switch error signal	The AFS control module received AFS OFF switch error signal for 5 s or more with the ignition switched ON (engine off or on).
	Ignition switch error signal	The AFS control module received ignition switch error signal for 5 s or more with the ignition switched ON (engine off or on).
	Selector lever position (R position) (ATX)/Reverse (MTX) signal error	The AFS control module received selector lever position (R position) (ATX)/Reverse (MTX) signal error for 5 s or more with the ignition switched ON (engine off or on).
	Selector lever position (R position) (ATX)/Reverse (MTX) signal not determined	The AFS control module detected undetermined selector lever position (R position) (ATX)/Reverse (MTX) signal.
U2005:86	Error signal received from PCM	The AFS control module received vehicle speed signal error from the PCM for 5 s or more with the ignition switched ON (engine off or on).
U2300:54	Error configuration data received from instrument cluster	The AFS control module received error configuration data from the instrument cluster for 30 s or more with the ignition switched ON (engine off or on).
U2300:55	Instrument cluster configuration not implemented	The AFS control module received a signal which indicates the instrument cluster configuration is not performed.
U2300:56	Configuration data unmatched with instrument cluster	Configuration data of the AFS control module and instrument cluster are not matched.
U3000:42	AFS control module internal malfunction	Malfunction in the AFS control module internal EEPROM is detected.
U3000:49	RAM/ROM malfunction	The AFS control module detected a malfunction in the internal RAM/ROM.
	AFS function malfunction	The AFS control module detected AFS function malfunction three times.
	CAN hardware malfunction	The AFS control module detected CAN hardware malfunction three times.
U3003:16	AFS control module low power supply voltage input	AFS control module power supply circuit voltage of 9 V or less is detected for 5 s or more with the ignition switched ON (engine off or on).

DTC No.	System malfunction location	Detection condition
U3003:17	AFS control module high power supply voltage input	AFS control module power supply circuit voltage of 18.1 V or more is detected for 5 s or more with the ignition switched ON (engine off or on).

Snapshot 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
AAT	°C	°F	Ambient temperature	—	—
APP_STATUS	Accelerator Pedal Off/ Under20%/ Over20%/FAIL		Accelerator pedal position status	—	—
CFG_STATUS	Config Complete/Not Configured/ Config Error		Instrument cluster configuration status	—	—
ECT_STATUS	Under 0 degrees C/0 - Under 80 degrees C/Over 80 degrees C/ FAIL		Engine coolant temperature status	—	—
IC_VPWR	V		Instrument cluster power supply voltage	• The AFS control module constantly receives the power supply voltage value of the instrument cluster sent via CAN signal from the instrument cluster. • If a DTC is detected, the AFS control module records the power supply voltage of the instrument cluster when the DTC was detected, and it is displayed in the M-MDS.	VPWR*1
IG-ON_TIMER	hh:mm:ss*2		Elapsed time since ignition was switched ON (engine off or on) **Note** • The instrument cluster records the elapsed time since the ignition was switched ON (engine off or on).	• The AFS control module constantly receives the elapsed time since the ignition was switched ON (engine off or on) sent via CAN signal from the instrument cluster. • If a DTC is detected, the AFS control module records the elapsed time since the ignition was switched ON (engine off or on) when the DTC was detected, and it is displayed in the M-MDS.	—

Snapshot data item	Unit		Data contents	Data read/use method	Corresponding data monitor items
PWR_MODE_KEY	Key Out/Key Recently Out (Position 0)/ Accessory (Position 1)/ Post Ignition (Position 2)/ Ignition On (Position 2)/ Running (Position 2)/ Running - Starting		• Key Out: Ignition switched off • Key Recently Out (Position 0): Elapsed time **within 3 s** since ignition was switched off • Accessory (Position 1): Ignition is switched to ACC • Post Ignition (Position 2): Elapsed time **within 3 s** since ignition was switched ON (engine off or on) • Ignition On (Position 2): Ignition switched ON (engine off) • Running (Position 2): Ignition switched ON (engine on) • Running - Starting: Cranking condition	• The AFS control module constantly receives the ignition switch status sent via CAN signal from the instrument cluster. • If a DTC is detected, the AFS control module records the ignition switch status when the DTC was detected, and it is displayed in the M-MDS.	—
RPM_STATUS	Engine Stop/ Under1500rpm/ Over1500rpm/ FAIL		Engine speed status	• The AFS control module constantly receives the engine speed sent via CAN signal from the instrument cluster. • If a DTC is detected, the AFS control module records the engine speed when the DTC was detected, and it is displayed in the M-MDS.	TACHOMTR*1
SHIFT_STATUS	P/N/D/R/FAIL		Selector lever position status	• The AFS control module constantly receives the selector lever position sent via CAN signal from the instrument cluster. • If a DTC is detected, the AFS control module records the selector lever position when the DTC was detected, and it is displayed in the M-MDS.	—
TOTAL_DIST	km	Miles	Accumulated total traveled distance from completion of vehicle until AFS control module detects DTC (Odometer value in instrument cluster)	The total traveled distance from which the AFS control module detects DTCs to the present 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.	—
TOTAL_TIME	hh:mm:ss*2		Accumulated total elapsed time since vehicle completion until AFS control module detects a DTC **Note** • When the ROOM fuse is removed, and the ignition is switched off, the time is not included in the elapsed time.	The elapsed time from which the AFS control module detects DTCs to the present can be calculated by performing the following procedure. 1. Verify the instrument cluster PID item TOTAL_TIME. 2. Verify the snapshot data item TOTAL_TIME. 3. Subtract 2 from 1.	TOTAL_TIME*1
VPWR	V		AFS control module power supply voltage	—	VPWR_IG

Snapshot data item	Unit	Data contents	Data read/use method	Corresponding data monitor items
VSPD_STATUS	Stop/0-10km/h/ Over10km/h/ FAIL	Vehicle speed status	• The AFS control module constantly receives the vehicle speed sent via CAN signal from the instrument cluster. • If a DTC is detected, the AFS control module records the vehicle speed when the DTC was detected, and it is displayed in the M-MDS.	SPEEDOMTR*1

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

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

Data Monitor Function

- With the PID/data monitor function, input/output signal monitor items set in the AFS control module can be selected and read out in real-time.

PID/data monitor table

PID	Unit/ Operation	Data contents	Inspection item(s)
AFS_ST	Off/On	• Off: AFS is not operated • On: AFS is operated	• AFS OFF switch • AFS control module
H/L_CS	OFF/DRL/ TNS/H/ L_LOW/H/ L_HI	• OFF: Light switch at OFF position • DRL: Light switch at AUTO position and auto light sensor sends turn-off signal • TNS: Light switch at TNS position • H/L_LOW: Light switch at LO position • H/L_HI: Light switch at HI position	Light switch
R_HGT_S	V	Voltage at auto leveling sensor is displayed.	Auto leveling sensor
R_HGT_S_INI	V	Voltage at headlight auto leveling system initial setting is displayed.	Auto leveling sensor
R_LMP_CS	Off/On/ Unknown/ Fault	ATX: • Off: Selector lever position signal (R position) is not received • On: Selector lever position signal (R position) is received • Unknown: Selector lever position signal (R position) is not determined • Fault: Selector lever position signal (R position) error is received MTX: • Off: Reverse signal is not received • On: Reverse signal is received • Unknown: Reverse signal is not determined • Fault: Reverse signal error is received	ATX: • Transaxle range sensor (TCM) MTX: • Back-up light switch

PID	Unit/ Operation	Data contents	Inspection item(s)
STR_AB_ANG	° (deg)	Displays steering angle signal (estimated absolute angle) • Steering wheel in neutral position: Near **0 degrees** • Steering wheel turned to left: Changes from **0 degrees** to positive • Steering wheel turned to right: Changes from **0 degrees** to negative	• Perform the DTC inspection for the PCM, DSC HU/CM, and EPS CM, and if any DTC is displayed, repair the malfunctioning part according to the applicable DTC troubleshooting. • After performing the DTC inspection, perform the following procedures: — Switch the ignition off, and after **2 min or more** have elapsed, switch the ignition ON (engine off or on). — Start the engine and drive the vehicle **10 m {33 ft} or more** in a straight line at a speed of **10 km/h {6.2 mph} or more**. — Stop the vehicle with the wheels in the straight-ahead position. — Verify the operation condition of STR_AB_ANG using the M-MDS. • If an abnormal value is indicated again, replace the EPS CM.
VPWR_IG	V	AFS control module power supply voltage is displayed.	• AFS control module • IG1 relay • Battery
VSPD	KPH, MPH	Vehicle speed is displayed.	—