FORWARD SENSING CAMERA (FSC) AIMING

id152000002300

Special Service Tool (SST)

49 L067 003 Plum-bob	49 L067 006 Plum-bob

Note
• Forward sensing camera (FSC) aiming procedure stores the camera shot angle in the FSC by mid-drive aiming (dynamic aiming), which is performed by driving the vehicle for a predetermined time under specific conditions or by stationary aiming (static aiming), which is performed by having the FSC to read a target used for aiming.
• Perform the FSC aiming if any of the following procedure is performed.

— FSC replacement
— Windshield replacement

• If an obstruction on the windshield or camera lens is blocking the scene in front of the vehicle, the target used for aiming cannot be read-in and aiming will not be performed correctly. Perform the following procedure before performing the aiming.

— Verify that there is no water, mud, soiling or sticker adhesion on the windshield, and that there is nothing on the camera lens such as dust or soiling.

• Driving the vehicle for a total of 5 to 10 min under the following conditions is necessary to complete mid-drive aiming (dynamic aiming). However, driving the vehicle while matching the conditions does not have to be continuous.

— Drive the vehicle at a vehicle speed of 40 km/h {25 mph} or more
— Drive the vehicle on a straight road (road with a turning radius of 300 m {11811 in} or more)
— Drive the vehicle on a road with lane markers and structures (buildings and signs)
— Drive the vehicle on a road with a level surface (not rough or inclined roads)

• mid-drive aiming (dynamic aiming) may not complete in an environment where any of the following conditions continues.

— Inclement weather caused by snow, rain, or fog
— Windshield washer is being used or wipers are not used during rain
— Exhaust gas from the vehicle ahead, sand or snow, or smoke and water-spray caused by steam from manholes rise up from the road
— Vehicle is driven with significantly worn tires
— Vehicle is driven downhill or on extremely rough or uneven roads
— Area is dark such as at nighttime or evening, early morning, and in a tunnel or indoor parking
— Headlight lens is dirty or its optical axis is deviated, or the headlights are not bright enough
— Vehicle is subjected to strong light (driving towards the sun or high-beams) from the vehicle front
— Vehicle is driven with tire chains or a spare tire equipped
— Vehicle is driven downhill or on extremely rough or uneven roads

• Perform stationary aiming (static aiming) when mid-drive aiming (dynamic aiming) is not performed.

Aiming Procedure

Mid-drive aiming (Dynamic aiming)

1. Empty the vehicle by having all occupants leave the vehicle and remove all the cargo except for the spare tire, jack and tools.

2. Adjust the air pressure of each tire to the specified value. (See WHEEL AND TIRE SPECIFICATION.)

3. Connect the M-MDS to the DLC-2.

4. Perform the DTC inspection for the FSC using the M-MDS and verify that no DTCs other than B115E:54 are displayed. (See DTC INSPECTION [FORWARD SENSING CAMERA (FSC)].)

Note
• Because DTC B115E:54 is output if aiming is not performed, continue to perform the FSC aiming if only DTC B115E:54 is output. (See DTC TABLE [FORWARD SENSING CAMERA (FSC)].)

5. After the vehicle is identified, select the following items from the initial screen of the M-MDS.

1. "Electrical"
2. "FSC Aiming"
3. "Dynamic Aiming"

Note
• When in mid-drive aiming (dynamic aiming) mode, the SCBS warning light, LDWS warning light (if equipped), and HBC warning light(if equipped) flash. (without multi-information display)

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• When in mid-drive aiming mode, the message [Forward Sensing Camera Calibration Needed: Please Contact Your Nearest Mazda Dealer] is displayed in the multi-information display. (with multi-information display)
• M-MDS can be removed or left connected to the vehicle during the mid-drive aiming (dynamic aiming) road drive.

6. Drive the vehicle on a road and verify that the warning lights in the instrument cluster turn off. (without multi-information display)

7. Drive the vehicle on a road and verify that the message in the multi-information display is no longer displayed. (with multi-information display)

Stationary aiming (Static aiming)

1. Empty the vehicle by having all occupants leave the vehicle and remove all the cargo except for the spare tire, jack and tools.

2. Adjust the air pressure of each tire to the specified value. (See WHEEL AND TIRE SPECIFICATION.)

3. Move the vehicle to level ground.

Caution
• If the setting surface height and angle between the vehicle and the target differs, correct FSC aiming cannot be done. Perform the FSC aiming with the vehicle and target setting surface on level ground.

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4. Verify that there are no obstructions such as metal objects in the shaded areas shown in the figure.

Caution
• If the FSC aiming is performed with obstructions such as white and black patterned objects or reflective metal in the shaded areas, the FSC will determine such obstructions as targets and the FSC aiming procedure will not be performed correctly. Move all obstructions away from the shaded areas, and when performing the aiming, do not have personnel standing in the shaded areas.

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5. Perform the DTC inspection for the FSC using the M-MDS and verify that no DTCs other than B115E:54 are displayed. (See DTC INSPECTION [FORWARD SENSING CAMERA (FSC)].)

Note
- Because DTC B115E:54 is output if aiming is not performed, continue to perform the FSC aiming if only DTC B115E:54 is output. (See DTC TABLE [FORWARD SENSING CAMERA (FSC)].)

6. Adjust the SST so that it is aligned with the center of the brand emblem, determine the center position at the front of the vehicle, and mark the center position (point A) on the floor surface.


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Note
- The center of the brand emblem indicates the center position of the vehicle.

7. Adjust the SST so that it is aligned with the center of the brand emblem, determine the center position at the rear of the vehicle, and mark the center position (point B) on the floor surface.


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Note
- The center of the brand emblem indicates the center position of the vehicle.

8. Secure the end of the leveling line over point B.

Note
- Use a commercially-available leveling line.


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9. Pull the unsecured end of the leveling line over the vehicle and to the front and adjust it so that it passes over point A.

10. Mark the line (position A) at the point 160 cm {63 in} from point A and in the direction forward of the vehicle.


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11. Mark the points (points D and E) 50 cm {20 in} from point C on the line which runs perpendicular to the vehicle center line.


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12. Pull the connected points D, C and E lines (target setting line).

13. Print out 6 sheets of each of the following target papers without using scaling.

Note
- If the target sheets cannot be printed, follow the dimensions shown in Step 15 to make target sheets.


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14. Cut the printed target sheets along the dotted line and line up the two sheets at their respective center marks as shown in the figure, and then affix cellophane tape to the back of the target.

Caution
• When taping the two target sheets together, if cellophane tape is affixed to the front of the target sheets it could reflect light and adversely affect the aiming accuracy. When taping the two target sheets together, affix the cellophane tape to the back of the target pattern.


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15. Verify that the taped-together target is of the dimensions shown in the figure.


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16. Affix double-sided adhesive tape to the back of the target.

Caution
• When affixing the target, if tape is affixed to the front of the target it could reflect light and adversely affect the aiming accuracy. When affixing the target, affix the double-sided adhesive tape to the back of the target, and then affix it to the board.

17. Align the target to the height shown in the figure, and affix it to a board.

Note
• Use a wooden board which does not reflect light to affix the target.


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18. Align the center of the target with point C using the SST (plum bob).


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19. Align so that the board and the target setting line are level with the center of point C.

20. Connect the M-MDS to the DLC-2.

21. After the vehicle is identified, select the following items from the initial screen of the M-MDS.

1. "Electrical"
2. "FSC Aiming"
3. "Static Aiming"

22. Input the following values according to the instructions on the M-MDS screen.

Item	Value
	mm
Input the distance from the target to the front wheel center.	2527

23. Perform the FSC aiming procedure according to the directions on the M-MDS.

Caution
• Switch the ignition OFF, and after 1 min or more has elapsed, switch the ignition ON. Otherwise, the master warning light in the instrument cluster may turn on and DTC U053B:82/83 may be output.

24. Verify the M-MDS display.

- If "Procedure successful" is displayed

— FSC aiming completed

- If "Procedure unsuccessful" is displayed

  — Perform an inspection according to the following table for the error code procedure.
  — If an error code other than the error codes in the following table is displayed, verify the following and re-perform the FSC aiming if there is no malfunction, as there could be a communication error between the FSC and the diagnostic tester.

    1. Is the battery positive voltage for the vehicle 8 V or more?
    2. Is the ignition switched ON (engine off or on)?

Error code	Detection condition
01	Target set position or input value is incorrect
02	Visibility where aiming is performed is bright or dark, target soiled
03	Target is not detected
04	Target moves during aiming
05	Input vehicle value exceeds specification
06	Aiming result is required during aiming
08	Aiming result is required for FSC with aiming not completed
FF	Aiming cannot be performed due to communication error

Error code 01/05

Step	Inspection	Action	
1	VERIFY INPUT VALUE • Verify the value indicated in Step 22 for aiming with the input value. • Is the value input correctly?	Yes	Go to the next step.
		No	Input the value indicated in Step 22 for aiming, then go to the next step.
2	VERIFY TARGET POSITION • Verify the following: — Are the vehicle and target set on level ground? — Is the target set to the position indicated in the procedure? — Are the board and the target set line parallel and is the height at the center of the target correct? — Is the target produced as indicated in the procedure? — Is there any dirt, cracks, damage, or wrinkling on the target and board? • Is there any malfunction?	Yes	Repair the target for malfunction and go to the next step.
		No	Go to the next step.
3	PERFORM FSC AIMING • Perform the FSC aiming. • Is the FSC aiming completed normally?	Yes	FSC aiming is completed.
		No	Error code 01 or 05 is displayed • Go to the next step. Code other than error cord 01 or 05 is displayed • Go to the procedure for the displayed error code.
4	PERFORM FSC AIMING AT ACTUAL MEASURED VALUE OF VEHICLE HEIGHT • Measure the vehicle height according to the actual measurement procedure for the wheel house height. (See Mid-drive aiming (Dynamic aiming).)	Yes	The FSC aiming is completed.
		No	Go to the next step.

Step	Inspection	Action	
	• Input the actual measured value and perform the FSC aiming.		
5	• Is the FSC aiming completed normally? VERIFY DTC • Perform the DTC inspection for the FSC. • Is the DTC displayed?	Yes	• Go to the applicable DTC inspection. (See DTC TABLE [FORWARD SENSING CAMERA (FSC)].) • After the diagnostic procedure is completed, perform the FSC aiming.
		No	Re-perform the FSC aiming, and replace the FSC if the FSC aiming is not completed normally. (See FORWARD SENSING CAMERA (FSC) REMOVAL/INSTALLATION.)

Error code 02/03/04

Step	Inspection	Action	
1	VERIFY TARGET AND TARGET SETTING ENVIRONMENT • Verify the following: — Is there any dirt or damage on the windshield, FSC lens, and FSC cover? — Does direct sunlight penetrate the camera or target surroundings? — Is the camera or target surroundings shadowed? — Is there any dirt, cracks, damage, or wrinkling on the target and board? — Is the target produced in white and black? — Is there any obstruction or moving object within the shaded area indicated in Step 4 for aiming? — Is the target produced as indicated in the procedure? — Does the target move during aiming? • Is there any malfunction?	Yes	Repair the malfunctioning part and go to the next step.
		No	Go to the next step.
2	PERFORM FSC AIMING • Perform the FSC aiming. • Is the FSC aiming completed normally?	Yes	The FSC aiming is completed.
		No	Error code 02 or 03 or 04 is displayed • Go to the next step. Code other than error code 02 or 03 or 04 is displayed • Go to the procedure for the displayed error code.
3	VERIFY DTC • Perform the DTC inspection for the FSC. • Is the DTC displayed?	Yes	• Go to the applicable DTC inspection. (See DTC TABLE [FORWARD SENSING CAMERA (FSC)].) • After the diagnostic procedure is completed, perform the FSC aiming.
		No	Re-perform the FSC aiming, and replace the FSC if the FSC aiming is not completed normally. (See FORWARD SENSING CAMERA (FSC) REMOVAL/INSTALLATION.)

Error code 06/08

Step	Inspection	Action	
1	PERFORM FSC AIMING • Re-perform the FSC aiming. • Is the FSC aiming completed normally?	Yes	The FSC aiming is completed.
		No	Error code 06 or 08 is displayed • Go to the next step. Code other than error code 06 or 08 is displayed • Go to the procedure for the displayed error code.
2	VERIFY DTC • Perform the DTC inspection for the FSC. • Is the DTC displayed?	Yes	• Go to the applicable DTC inspection. (See DTC TABLE [FORWARD SENSING CAMERA (FSC)].) • After the diagnostic procedure is completed, perform the FSC aiming.
		No	Re-perform the FSC aiming, and replace the FSC if the FSC aiming is not completed normally. (See FORWARD SENSING CAMERA (FSC) REMOVAL/INSTALLATION.)

Error code FF

Step	Inspection	Action	
1	VERIFY DTC • Perform the DTC inspection for the FSC. • Is the DTC displayed?	Yes	• Go to the applicable DTC inspection. (See DTC TABLE [FORWARD SENSING CAMERA (FSC)].) • After the diagnostic procedure is completed, perform the FSC aiming.
		No	Re-perform the FSC aiming, and replace the FSC if the FSC aiming is not completed normally. (See FORWARD SENSING CAMERA (FSC) REMOVAL/INSTALLATION.)