

Service Information

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Category T	Technical	Ref. No. E006/17	Page 1 of 9
Coverage <input type="checkbox"/> Distributor only <input checked="" type="checkbox"/> Please inform your dealers		Date Issued April 25, 2017	
Please convey this information to your <input type="checkbox"/> Director <input checked="" type="checkbox"/> General Manager <input checked="" type="checkbox"/> Warranty Dept. <input checked="" type="checkbox"/> Parts Dept. <input checked="" type="checkbox"/> Training Dept. <input checked="" type="checkbox"/> Field Rep.		Date Revised	
Applicable Model and Equipment Mazda3 (BN), Mazda6 (GL), CX-3 (DK) and CX-5 (KF) with ALH		Applicable Countries and/or Vehicle Specifications Europe, Australia, New Zealand and 4A	

Subject: Adaptive LED headlight warning light illuminates due to poor visibility of FSC

DESCRIPTION

Due to poor visibility caused by dirty/foggy windshield, rain at night, heavy rain, dense fog and/or snow etc., FSC (Forward Sensing Camera) may deactivate its operation. In this case the control system notifies the driver about the deactivation by illuminating following warning lights.

- ALH – Adaptive LED headlight
- LAS – Lane keep Assist System
- LDWS - Lane departure warning system
- SCBS – Smart City Brake Support

	Master Warning Light
	Adaptive LED Headlights (ALH) Warning Light
	Lane-keep Assist System (LAS) & Lane Departure Warning System (LDWS) Warning Light
	Smart Brake Support/Smart City Brake Support (SBS/SCBS) Indicator Light

When you encounter the customer complaint on this matter, diagnose the system according to the following flow chart.

If DTC C1001:92 (FSC) or C1001:97 (FSC) is stored in memory, this is current state of the art and thus cannot be repaired by replacing the FSC at this time.

C1001:92: Forward sensing camera (FSC) poor field of view

C1001:97: Forward sensing camera (FSC) poor visibility

Explain this to the customer using attached document and movie clips.

SUBJECT VIN & PRODUCTION DATE (Range)

Mazda3 (BN)/(BM with VIN 500001~ for Russia)

Japan Built

Spec.	VIN Range		Production Date Range
Australia	JM0 BN **** **	100001 - 999999	(ALL)
General (R.H.D.)	JM6 BN **** **		
General (L.H.D.)	JM7 BN **** **		
Israel	JMZ BN **** **	500001 - 999999	
Europe (L.H.D. & UK Specs.)	JMZ BN **** **		
Russia	JMZ BM **** **		

Thailand Built

Thailand	MM8 BN **** **	200001 - 999999	(ALL)
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México Built

General (L.H.D.)	3MZ BN **** **	200001 - 999999	(ALL)
Europe (L.H.D.)	3MZ BN **** **	300001 - 999999	

Mazda6 (GL) / (GJ with VIN 500001~ for Russia)

Spec.	VIN Range		Production Date Range
Australia	JM0 GL**** **	100001 - 499999	(ALL)
General (R.H.D.)	JM6 GL**** **		
General (L.H.D.)	JM7 GL**** **		
Israel	JMZ GL**** **	500001 - 999999	
Europe (L.H.D. & UK Specs.)	JMZ GL**** **		
Russia	JMZ GJ**** **		

CX-3 (DK)

Japan Built

Spec.	VIN Range		Production Date Range
General (R.H.D.)	JM6 DK**** **	300001 - 999999	(ALL)
Europe (L.H.D. & UK Specs.)	JMZ DK**** **	300001 - 999999	

Thailand Built





Australia	MM0 DK**** **	200001 - 999999	(ALL)
UK Spec.	MMZ DK**** **		
Thailand	MM8 DK**** **		





CX-5 (KF) / (KE with VIN 600001~ for Russia)

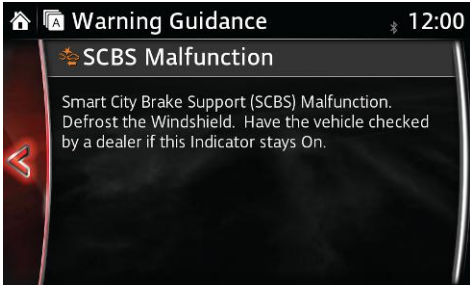
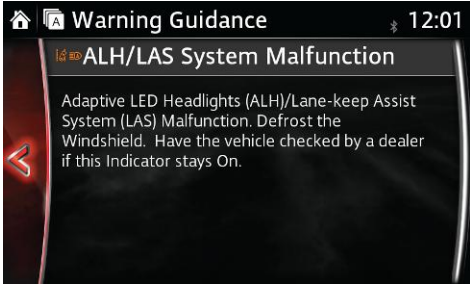
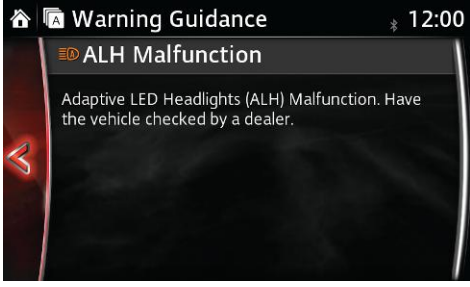
Spec.	VIN Range		Production Date Range
Australia	JM0 KF**** **	100001 - 999999	(ALL)
General (R.H.D.)	JM6 KF**** **		
General (L.H.D.)	JM7 KF**** **		
Israel	JMZ KF**** **	600001 - 999999	
Europe (L.H.D. & UK Specs.)	JMZ KF**** **		
Russia	JMZ KE**** **		

Diagnostic flow

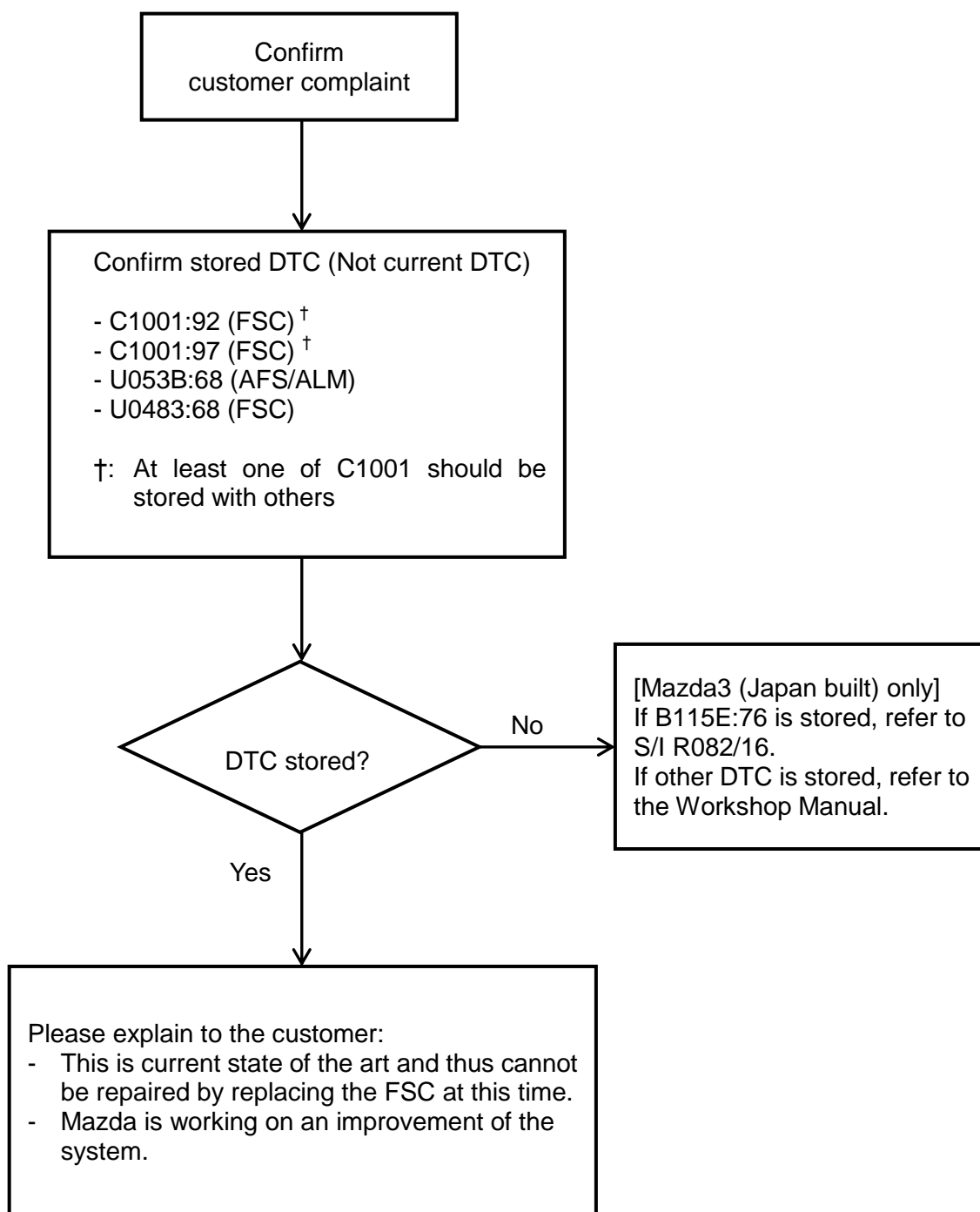
1. Confirm the detail of the customer complaint especially for warning lamps, message on the MID and/or the center display.

Warning lights in the meter cluster	
	Master warning
	ALH warning
	LAS/LDWS warning
	SCBS/SBS warning

Mazda6 Message sample in MID
 <p>Clear outside of windshield completely</p>

 <p>Smart City Brake Support Forward Malfunction</p>
 <p>Driver Attention Alert Malfunction</p>

Mazda3 Message sample in center display




2. Flow chart



3. Description for movie clips

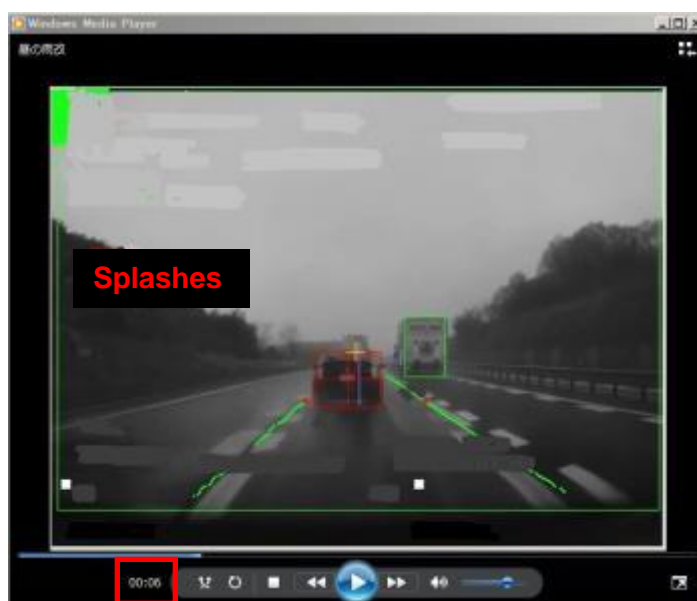
Direct sun light

Between 9-25 sec., “Low Sun” message appears for poor visibility.



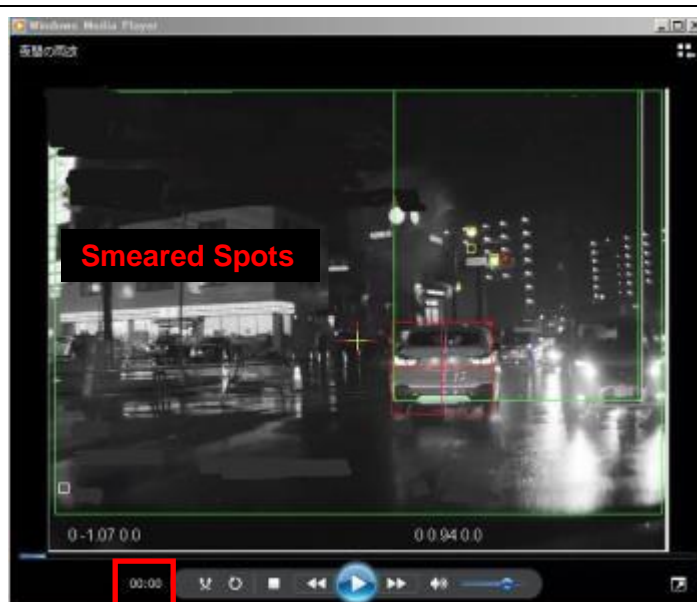
Rain in daytime

Between 6-25 sec., “Splashes” message appears for poor visibility.



Rain at night

Between 0-25 sec., “Smeared Spots” message appears for poor visibility.



(For Mazda customers)

Control technology using Forward Sensing Camera (FSC)

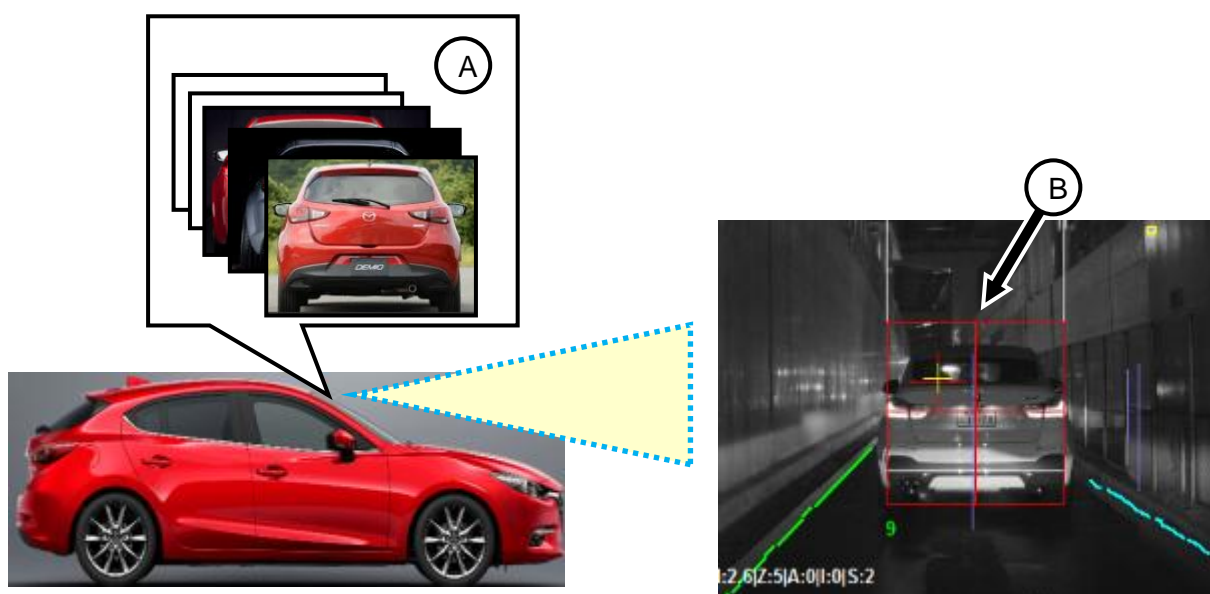
If an object in the view is not clear, a human brain can compensate the view according to their experience and recognize what it is. Current camera technology is not as good as human brain to recognize unclear objects.

This document explains the current control technology using Forward Sensing Camera.

1 Forward Sensing Camera system

1.1 Object recognition

The Forward Sensing Camera recognizes objects comparing pre-defined data (A) for vehicles and pedestrians and the characteristics (B) of captured images. This sample shows a vehicle being detected by its characteristics such as outline etc.



1.2 Distance Calculation

The Forward Sensing Camera calculates the distance and the relative speed of the object watching the object size and the increasing rate per frame.

Further: Smaller object

Closer: Bigger object

When the object size increases faster per frame, the object is recognized as approaching faster.

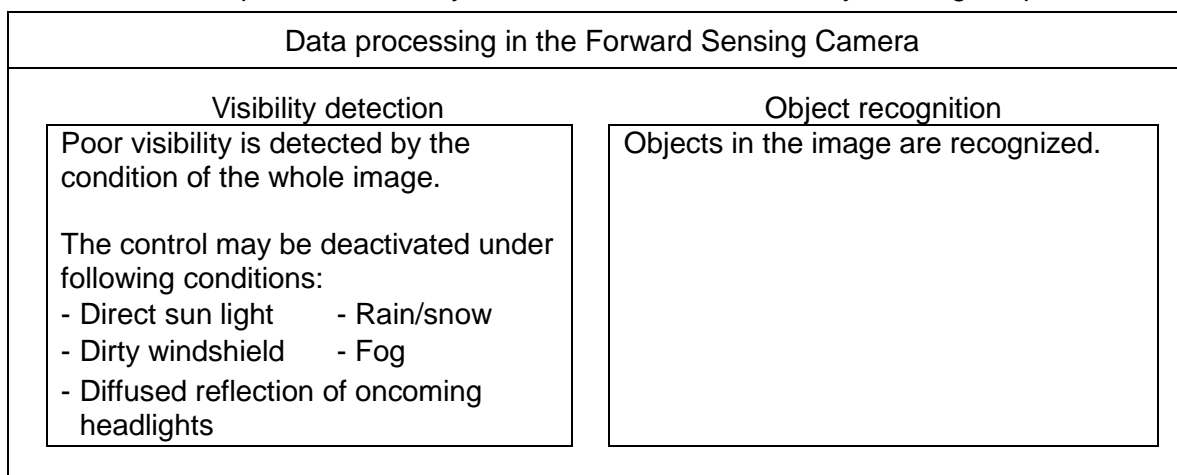
Example

Normal approach (in 10 frames)	Faster approach (in 5 frames)



2 Technical limitations for temporary poor visibility

2.1 Detection of poor visibility

The Forward Sensing Camera monitors the condition of the view as well as the object recognition. If the poor visibility is detected, even when the object recognition and the distance calculation operate normally, the system deactivates the control to avoid no or erroneous operation of the system and notifies the driver by warning lamps etc.



Example of rain at night

<p><u>Visibility detection</u></p> <p>Smeared spots caused by rain etc. are detected in the image.</p> <p>>>> The control may be deactivated.</p>		<p><u>Object recognition</u></p> <p>Object recognition and distance calculation continue.</p>
<p><u>Visibility detection</u></p> <p>Smeared spots caused by rain etc. and diffused reflection of oncoming headlights are detected in the image.</p> <p>>>> The control may be deactivated.</p>		<p><u>Object recognition</u></p> <p>Object recognition and distance calculation continue.</p>

NOTE: Even when rain drops are wiped off, remaining thin layer of water may cause smeared spots.

3 Difference from other brands

3.1 Comparison of Mazda and other brands

Mazda employs the image processor IC same as other brands including some European premium brands.

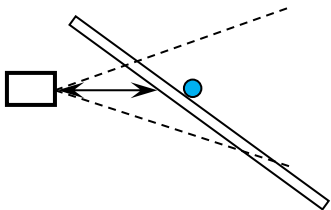
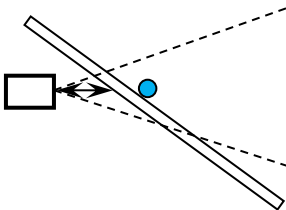
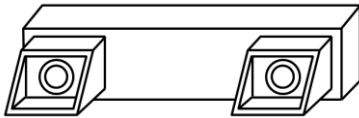

The detection logic of the temporary poor visibility depends on the image processor IC and is common for all brands. (Software version may differ depending on the launch timing of the vehicle.)

It depends on the policy of the brand how to notify the driver of the temporary poor visibility.


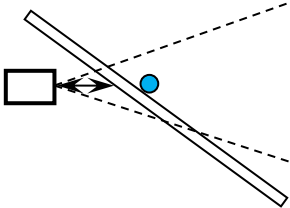
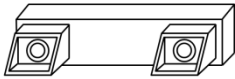
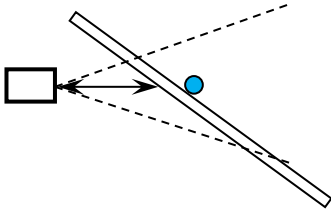
3.2 Stereo camera

Stereo camera detects the parallax information of two sides by side cameras. In case of rain, two cameras will not have rain drops at the same spots of the images and there will be some effects in the parallax information.

However, since the stereo camera is located further from the windshield than the single camera, the single camera will have more effect from same sized rain drops.

Stereo camera system	Mazda
A rain drop looks smaller at further location 	A rain drop looks larger at closer location 
 More effect by dashboard reflection (if not covered)	 Less effect by dashboard reflection (covered)

3.3 Comparison of Mazda and stereo camera system

	Camera	Package	
	Single		Advantage
Mazda			Less effect by dashboard reflection (covered)
			Disadvantage A rain drop looks larger > Larger smeared spot
Stereo Camera system			Advantage A rain drop looks smaller > Smaller smeared spot
			Disadvantage More effect by dashboard reflection (if not covered)

4 Example of poor visibility of the Forward Sensing Camera

Please refer to movie clips for each situation in separate document.

4.1 Direct sun light



4.2 Rain in daytime



4.3 Rain at night

