1. PREPARATIONS

Perform the preparation of the adjustment and inspection for the stereo camera.

When performing adjustment or inspection by affixing RANDOM CHART onto partition

1) Before preparation, check the following items.

- (1) The headlight is off.
- (2) The vehicle is parked on a level surface.
- (3) The inflation pressure of tires is correct.
- (4) The vehicle does not have load.

(5) The front wheels are directed to the straight ahead position, when the steering wheel is set to the center position.

NOTE:

When the front wheels are not directed to the straight ahead position, adjust the alignment. < Ref. to FS-12, ADJUSTMENT. Wheel Alianment.>

2) Prepare the Subaru Select Monitor, measure, plumb bob, leveling line and RANDOM CHART (ST: 87599VA000).

3) Stop the vehicle on a level surface where approximately 5 m (16.41 ft) space can be secured in front of the vehicle.

4) Suspend the plumb bob with leveling line from front center position of vehicle (center of number plate base), and mark the position where the plumb bob touches the ground. (Point A)



(b) Plumb bob

NOTE:

Stick the packing tape etc. on the floor, then make a marking on the tape.

(d)

5) Suspend the plumb bob with leveling line from rear center position of vehicle (center of rear bumper), and mark the position where the plumb bob touches the ground.



6) Strain approximately 5 m (16.41 ft) leveling line from the marking point B through the marking point A toward front of the vehicle, and fix it with packing tape. (A-B line)



NOTE:

Confirm that there is no wet condition or unevenness on the floor, to strain the leveling line correctly.

7) Mark the installation position of the partition.

(1) Suspend the plumb bob from the center of each front wheel, and mark the point C and point D.

(2) Strain the leveling line from the point C and point D toward the front of vehicle parallel to the vehicle body center line (A-B line), and fix the leveling line with packing tape.

(3) Make markings at the points 4,000 mm (13 ft, 1 1/2 in) ahead of the vehicle from the point C and point D. (Point E and point F)

(4) Strain the leveling line so that it passes through the point E and point F. (E-F line)



EyeSight

8) Place the partition and RANDOM CHART.

CAUTION:

• Affix the RANDOM CHART onto the vertical partition with flat surface.

• When affixing the RANDOM CHART using tape, place the tape within 10 mm (0.39 in) from the edge of the CHART. In this case, do not affix with lustrous tapes which may reflect the light.

• Perform the adjustment work at lighted places. If the lighting is not enough, adjustment cannot be done, and accuracy rate may not be acquired.

• The adjustment in the outdoors cannot be recommended. Note the sun position, when adjusting it in outdoor by necessity. (It is not acceptable when the sunlight comes from front or rear of the vehicle)

(1) Using the plumb bob, attach the RANDOM CHART on the partition, so that the setting reference (vertical line) center is aligned with the vehicle body center line (leveling line) and the height of the setting reference (horizontal line) center from the floor is 1,000 mm (3 ft, 3 3/8 in).

(2) Adjust the partition so that it is parallel to E-F line.



- (a) ① = Setting reference (vertical line) and vehicle body center line (A-B line)
- (b) (2) = Setting reference (horizontal (d) E-F line line)
 (c) Plumb bob (e) 1,000 m
 - (e) 1,000 mm (3 ft, 3 3/8 in)

CAUTION:

• Centering accuracy of the plumb bob shall be \pm 4.0 mm (\pm 0.16 in) or less.



- Positioning accuracy of the measure shall be ± 2.0 mm (± 0.08 in) or less.
- Centering accuracy of the tire shall be ± 4.0 mm (± 0.16 in) or less.



(b) Tire center line

• Apply the lighting from the upper direction of RANDOM CHART, and make adjustment so that brightness is even in the CHART. (If the lighting is applied from the position where light reflects at RANDOM CHART, the adjustment cannot be done, because the reflected light enters the camera.)



• When using a white board as a partition, affix the RANDOM CHART on the flat surface without protrusion such as penholder. When suspending the plumb bob, suspend it vertically from the RANDOM CHART by avoiding protrusion.



9) Turn the ignition to OFF.

10) Check the windshield glass and the dashboard. <Ref. to ES(diag)-7, WINDSHIELD GLASS AND DASH-BOARD, INSPECTION, General Description.>

CAUTION:

If there are any dirt, object or reflection from dashboard within the visibility of stereo camera, the correct adjustment and inspection can not be performed. Especially, do not put paper etc. on the dashboard.

11) Connect the Subaru Select Monitor.

NOTE:

Use the Subaru Select Monitor equipped with the latest version of the software.

12) Turn the ignition to ON.

13) Wait for 10 seconds.

14) On «Main Menu» display, select «Each System Check».

15) On «System Selection Menu» display, select «ADA adaptive cruise control system».

16) Select «EyeSight (from 2009MY)» while pressing the pre-collision brake OFF switch and lane departure warning OFF switch mounted on the stereo camera cover assembly at the same time.

NOTE:

If «EyeSight (from 2009MY)» is selected without pressing two switches at the same time, «Camera adjustment, inspection» is not displayed. (for preventing misoperation)

Also, the message is not displayed, when the camera is still not activated (approx. 10 seconds after ignition ON). In this case, repeat from the selection of «EyeSight (from 2009MY)».

17) On «EyeSight (from 2009MY)» display, select «Work Support».

18) On «Work Support» display, select «Camera adjustment, inspection», to perform the camera adjustment or inspection.

NOTE:

• When performing {Camera adjustment, inspection}, pre-collision brake OFF indicator light, lane departure warning OFF indicator light in the meter will illuminate, and the normal function will be disabled.

• After camera adjustment, the function will be enabled, when the ignition is turned to OFF and system is restarted.

• When performing adjustment or inspection by affixing RANDOM CHART onto wall.

1) Before preparation, check the following items.

- (1) The headlight is off.
- (2) The vehicle is parked on a level surface.
- (3) The inflation pressure of tires is correct.
- (4) The vehicle does not have load.

(5) The front wheels are directed to the straight ahead position, when the steering wheel is set to the center position.

NOTE:

When the front wheels are not directed to the straight ahead position, adjust the alignment. <Ref. to FS-12, ADJUSTMENT, Wheel Alignment.>

2) Prepare the Subaru Select Monitor, measure, plumb bob, leveling line and RANDOM CHART (ST: 87599VA000).

3) Mark the park position of the vehicle.

(1) Strain the leveling line so that it is at right angles to wall on which the RANDOM CHART is affixed, and fix the leveling line with packing tape.

(2) Make a marking 4,000 mm (13 ft, 1 1/2 in) away from the wall where the leveling line is fixed. (Point A and point B)

NOTE:

Stick the packing tape etc. on the floor, then make a marking on the tape.

(3) Strain the leveling line so that it passes through the point A and point B. (A-B line)



(b) Point B

4) Suspend the plumb bob from the center of each front wheel of the vehicle, and place the vehicle so that it is aligned with the leveling line (A-B line).

5) Suspend the plumb bob with leveling line from front center position of vehicle (center of number plate base), and mark the position where the plumb bob touches the ground. (Point C)



NOTE:

Stick the packing tape etc. on the floor, then make a marking on the tape.

6) Suspend the plumb bob with leveling line from rear center position of vehicle (center of rear bumper), and mark the position where the plumb bob touches the ground. (Point D)



EyeSight

7) Strain the leveling line from the making point D through the marking point C to the wall, and fix it with packing tape. (C-D line)



Point C (a)

Point D

Place the RANDOM CHART.

CAUTION:

Affix the RANDOM CHART onto the vertical wall, etc. with flat surface.

When affixing the RANDOM CHART using tape, place the tape within 10 mm (0.39 in) from the edge of the CHART. In this case, do not affix with lustrous tapes which may reflect the light.

Perform the adjustment work at lighted places. If the lighting is not enough, adjustment cannot be done, and accuracy rate may not be acquired.

 The adjustment in the outdoors cannot be recommended. Note the sun position, when adjusting it in outdoor by necessity. (It is not acceptable when the sunlight comes from front or rear of the vehicle)

(1) Using the plumb bob, attach the RANDOM CHART on the partition, so that the setting reference (vertical line) center is aligned with the vehicle body center line (leveling line) and the height of the setting reference (horizontal line) center from the floor is 1,000 mm (3 ft. 3 3/8 in).



Wall (a) Vehicle body center line (C-D line) (b)





- line) and vehicle body center line (C-D line)
- line)

- 1,000 mm (3 ft, 3 3/8 in) (e)

EyeSight

CAUTION:

• Centering accuracy of the plumb bob shall be \pm 4.0 mm (\pm 0.16 in) or less.



- Positioning accuracy of the measure shall be ± 2.0 mm (± 0.08 in) or less.
- Centering accuracy of the tire shall be ± 4.0 mm (± 0.16 in) or less.



(b) Tire center line

• Apply the lighting from the upper direction of RANDOM CHART, and make adjustment so that brightness is even in the CHART. (If the lighting is applied from the position where light reflects at RANDOM CHART, the adjustment cannot be done, because the reflected light enters the camera.)



(a) RANDOM CHART

(b) Lighting

9) Turn the ignition to OFF.

10) Check the windshield glass and the dashboard. <Ref. to ES(diag)-7, WINDSHIELD GLASS AND DASH-BOARD, INSPECTION, General Description.>

CAUTION:

If there are any dirt, object or reflection from dashboard within the visibility of stereo camera, the correct adjustment and inspection can not be performed. Especially, do not put paper etc. on the dashboard.

11) Connect the Subaru Select Monitor.

NOTE:

Use the Subaru Select Monitor equipped with the latest version of the software.

12) Turn the ignition to ON.

13) Wait for 10 seconds.

14) On «Main Menu» display, select «Each System Check».

15) On «System Selection Menu» display, select «ADA adaptive cruise control system».

16) Select «EyeSight (from 2009MY)» while pressing the pre-collision brake OFF switch and lane departure warning OFF switch mounted on the stereo camera cover assembly at the same time.

NOTE:

If «EyeSight (from 2009MY)» is selected without pressing two switches at the same time, «Camera adjustment, inspection» is not displayed. (for preventing misoperation)

Also, the message is not displayed, when the camera is still not activated (approx. 10 seconds after ignition ON). In this case, repeat from the selection of «EyeSight (from 2009MY)».

17) On «EyeSight (from 2009MY)» display, select «Work Support».

18) On «Work Support» display, select «Camera adjustment, inspection», to perform the camera adjustment or inspection.

NOTE:

• When performing {Camera adjustment, inspection}, pre-collision brake OFF indicator light, lane departure warning OFF indicator light in the meter will illuminate, and the normal function will be disabled.

• After camera adjustment, the function will be enabled, when the ignition is turned to OFF and system is restarted.

2. ADJUSTMENT VALUE CLEAR

Perform when replacing stereo camera. (Do not perform when performing stereo camera re-adjustment and inspection)

1) On «Camera adjustment, inspection» display, select «Camera individual adjustment mode».

2) On «Camera individual adjustment mode» display, select «Clear adjustment value».

3) When «Perform camera adjustment/inspection. Press OK when the preparations have been made.» is displayed, if preparation is ready, select «OK».

4) When «Clear the adjustment value.» is displayed, select «OK».

5) When «Clearing adjustment value...» is displayed, wait until process finishes.

6) When the adjustment value clear is finished correctly, and «Adjustment value cleared OK!» is displayed, select «OK» to finish.

7) Turn the ignition to OFF and wait for approx. 5 seconds or more.

CAUTION:

If the ignition OFF period is short, the adjustment value clear cannot be performed correctly.

8) Next, perform the camera all adjustment mode (replacement/removal). <Ref. to ES-26, CAMERA ALL AD-JUSTMENT MODE (REPLACEMENT/REMOVAL), PROCEDURE, Camera Adjustment, Inspection.>

3. CAMERA ALL ADJUSTMENT MODE (REPLACEMENT/REMOVAL)

Perform this procedure when the stereo camera is replaced or re-adjustment is necessary (when stereo camera malfunctioning, when stereo camera reinstalled, when windshield glass replaced).

CAUTION:

• When the stereo camera is replaced, be sure to perform the «Clear adjustment value» first. When {Clear adjustment value} was skipped, restart the procedure from {Clear adjustment value} again. <Ref. to ES-26, ADJUSTMENT VALUE CLEAR, PROCEDURE, Camera Adjustment, Inspection.>

• Perform the camera adjustment and inspection at curb weight without passengers.

• When the camera all adjustment mode is performed, if the procedures are not completed correctly

to the end, the warning light illuminates, when the vehicle moves.

1) On «Camera adjustment, inspection» display, select «Camera all adjustment mode (replacement/removal)».

2) When «Perform camera adjustment/inspection. Press OK when the preparations have been made.» is displayed, if preparation is ready, select «OK».

3) When «In process...» is displayed, wait until inspection finishes.

4) When the accuracy rate inspection is finished correctly, and «Accuracy rate $\bigcirc \bigcirc \%$ OK!» is displayed, select «OK» to go to step 9).

5) When «Distance inspection NG!» is displayed, refer to the NOTE below.



NOTE:

Distance check and adjustment of RANDOM CHART <Ref. to ES-13, PREPARATIONS, PROCEDURE, Camera Adjustment, Inspection.>

6) When «Perform distance correction.» is displayed, select «OK». When the distance correction is finished correctly, and «Distance correction OK!» is displayed, select «OK» and proceed to the accuracy rate inspection.

7) When «Perform accuracy rate inspection.» is displayed, select «OK». When the accuracy rate inspection is finished correctly, and «Accuracy rate $\bigcirc \bigcirc \%$ OK!» is displayed, select «OK» to go to next.

8) When «OO NG!» is displayed during adjustment, refer to the NOTE below.



LIST

Error code	Display	Check items on error	Remarks
1401	«Vehicle State, Environment NG!»	Check body integrated unit.	_
1402	«Vehicle Model Information Regis- tration NG!»	Confirm the part numbers of EyeSight system components, and reconfirm that the unit should be installed to that vehicle. To confirm the components, check each item.	_
1403	«Optical Axis Con- trast NG!»	 Make sure that the stereo camera cover is installed correctly. There should be no obstacles that blocks the stereo camera. Stereo camera and camera plate are assembled with no gap. Random chart for ver. 3 must be used. There should be no obstacles that blocks the random chart. Random chart must be set correctly for the vehicle. Grid pattern of random chart should not be dirty or damaged. Lighting circumstance for random chart should be normal. Make sure that the headlight is off. There should be no objects (reflection) on the instrument panel. There should be no crack on the windshield. NOTE: Detecting measures for the error codes 1403, 1404, 1405, 1406 and 1407 are different. Check items on error with high relevance are shown in the remarks. 	Highly relevant with the check items 1 to 12.
1404	«Optical Axis Tar- get Detection NG!»		Highly relevant with the check items 4, 6, 7, 8, 9, 10, 11 and 12.
1405	«Optical Axis Tar- get Detection NG!»		Highly relevant with the check items 4, 6, 7, 8, 9, 10, 11 and 12.
1406	«Optical Axis Right and Left Target Detection NG!»		Highly relevant with the check items 1 to 12.
1407	«Out of the Optical Axis Adjustment Range NG!»		Highly relevant with the check items 3 and 6.
1408	«Optical axis adjustment Upward inclination NG!»	 Random chart must be set correctly for the vehicle. Aiming is performed with the vehicle at curb weight. There should be no malfunction in the suspension. If there are no problems above, perform shim adjustment so that optical axis turns downward. 	_

Camera Adjustment, Inspection

Error code	Display	Check items on error	Remarks
1409	«Optical axis adjustment Down- ward inclination NG!»	 Random chart must be set correctly for the vehicle. Aiming is performed with the vehicle at curb weight. There should be no malfunction in the suspension. If there are no problems above, perform shim adjustment so that optical axis turns upward. 	_
140A	«Rough Adjust- ment Matching NG!»	 Make sure that the stereo camera cover is installed correctly. There should be no obstacles that blocks the stereo camera. Stereo camera and camera plate are assembled with no gap. 	Highly relevant with the check items 1 to 9.
140B	«Coarse adjust- ment NG!»	 There should be no obstacles that blocks the random chart. Random pattern of random chart should not be dirty or dam- 	Highly relevant with the check items 3, 5, 7 and 9.
140C	«Coarse adjust- ment NG!»	 aged. 6. Lighting circumstance for random chart should be normal. 7. There should be no objects (reflection) on the instrument panel. 8. Dirt should not adhere to the windshield or the lens filter of the stereo camera. 9. There should be no crack on the windshield. NOTE: Detecting measures for the error codes 140A, 140B and 140C are different. Check items on error with high relevance are shown in the remarks. 	Highly relevant with the check items 3, 5, 7 and 9.
140E	«Inspection range field of view NG!»	 Make sure that the stereo camera cover is installed correctly. There should be no obstacles that blocks the random chart. Random pattern of random chart should not be dirty or damaged. Lighting circumstance for random chart should be normal. There should be no objects (reflection) on the instrument panel. Dirt should not adhere to the windshield or the lens filter of the stereo camera. There should be no crack on the windshield. Windshield for EyeSight should be assembled. 	
140F	«Distance inspec- tion NG!»	 Distance from random chart to wheel center of the vehicle should be 4,000 mm (13.12 ft). Lighting circumstance for random chart should be normal. 	_
1410	«Accuracy rate 00% NG !»	 Lighting circumstance for random chart should be normal. Random pattern of random chart should not be dirty or damaged. There should be no objects (reflection) on the instrument panel. Dirt should not adhere to the windshield or the lens filter of the stereo camera. There should be no crack on the windshield. 	
1501	«Distance correc- tion NG!»	 When «Distance inspection NG!» is displayed and distance correction is performed without inspection, check the following. 1. Distance from random chart to wheel center of the vehicle should be 4,000 mm (13.12 ft). 2. Lighting circumstance for random chart should be normal. 	_

NOTE:

• Shim adjustment: <Ref. to ES-31, SHIM ADJUSTMENT, PROCEDURE, Camera Adjustment, Inspection.>

• Basic inspection items: <Ref. to ES(diag)-7, INSPECTION, General Description.>

• Aiming preparation items: <Ref. to ES-13, PREPARATIONS, PROCEDURE, Camera Adjustment, Inspection.>

9) Turn the ignition to OFF and wait for 5 seconds. (time necessary to save adjustment and inspection result)

CAUTION:

 If the ignition OFF period after adjustment and inspection finished is short, the adjustment and inspection result cannot be saved correctly. The warning is displayed on the meter LCD, when the vehicle moves.

 When aiming begins, normal recognition process stops and the warning is displayed on the meter LCD. The warning display will be cleared by turning the ignition OFF \rightarrow ON.

10) Turn the ignition to ON. Using the Subaru Select Monitor, confirm that «Aiming completion flag» of «Current Data Display & Save» is «Aiming completed». (Note that it is different from «Initial aiming completion flag»)

11) Perform the Clear Memory, and turn the ignition to OFF.

12) Subsequently perform the automatic adjustment and function check by a test driving. < Ref. to ES-30. AUTOMATIC ADJUSTMENT AND FUNCTION CHECK BY DRIVING, PROCEDURE, Camera Adjustment, Inspection.>

4. AUTOMATIC ADJUSTMENT AND FUNCTION CHECK BY DRIVING

NOTE:

 Perform the automatic adjustment and function check by driving to improve the recognition accuracy of stereo camera, when the stereo camera is replaced or re-adjusted, or the EyeSight function does not operate correctly.

 The automatic adjustment and function check by driving adjust the stereo camera more in detail, based on the stereo camera adjustment using RANDOM CHART.

1) Perform this procedure after finishing stereo camera adjustment and inspection.

2) On «ADA adaptive cruise control system» display, select «EyeSight (from 2009MY)».

3) On «EveSight (from 2009MY)» display, select «Current Data Display & Save».

4) On «Current Data Display & Save» display, display the «Automatic adjustment status». < Ref. to ES(diag)-23, OPERATION, Read Current Data.>

5) Drive the vehicle until «Automatic adjustment status» displays «0F» or «1F».

CAUTION:

· For the automatic adjustment, drive the vehicle on straight road with white lines on both sides at a speed of 40 km/h (25 MPH) or more for at least five minutes, while maintaining distance from the preceding vehicle 40 m (132 ft) or more.

Maintain the following conditions until «Automatic adjustment status» displays «OF» or «1F».

- Turn the active lane keep and cruise main to OFF.

- Hold down the pre-collision brake OFF switch for two seconds to turn OFF the pre-collision brake function.

Display	Content	Unit of measure	Note (at idling)
Automatic adjustment status	Index for automatic adjustment operation performed by the driving test after the completion of the optical axis adjustment		«0F» or «1F» is displayed when completed.

NOTE:

• How long time will be needed until «0F» or «1F» is displayed depends on the road condition etc.

 For new vehicles, «00» may be displayed. A test-drive is not necessary before delivery because high-accuracy aiming setting has been performed at the factory.

6) On «Current Data Display & Save» display, display «Lane recognition status» to check if any of the following appears.

NOTE:

When driving did not continue until «0F» or «1F» was displayed, it may take a while before recognition completes.

• Recognizing white lines on both sides during driving at 40 km/h (25 MPH) or more: «03»

Recognizing white lines on both sides with lane width 3 m (10 ft) or more during driving at 65 km/h (40 MPH) or more: «05»

Display	Content	Unit of measure	Note (at idling)
Lane recognition status	Display of lane recognition status	_	Recognized when vehi- cle lane can be seen by 20 m (66 ft) or more.

7) On «Current Data Display & Save» display, display «Distance from leading vehicle» to check if the actual distance from the preceding vehicle is approximately the same as the data.

5. SHIM ADJUSTMENT

1) Turn the ignition to OFF.

2) Detach the stereo camera cover, and remove the stereo camera. <Ref. to ES-7, REMOVAL, Stereo Camera.>

3) Remove the stereo camera plate, and insert the shim into the vehicle body and camera plate.

Shim (washer):

Part No. 031105000

NOTE:

- Inserting the shim into the vehicle front side makes camera downward.
- Inserting the shim into the vehicle rear side makes camera upward.
- There is a case that the shim may be inserted at the production line, but it is not abnormal.

4) Install the stereo camera plate.

Tightening torque:

5.5±1.0 N·m (0.56±0.10 kgf-m, 4.1±0.7 ft-lb)

5) Install the stereo camera. < Ref. to ES-7, REMOVAL, Stereo Camera.>

6) Perform the camera all adjustment mode (replacement/removal). <Ref. to ES-26, CAMERA ALL ADJUST-MENT MODE (REPLACEMENT/REMOVAL), PROCEDURE, Camera Adjustment, Inspection.>

6. CAMERA INITIALIZATION

This is a recovery measures prepared for the data failure caused by the low battery voltage during data storage to inside the stereo camera.

CAUTION:

Do not usually perform camera initialization because it will clear the aiming data and/or DTCs.

Perform the camera initialization only when the aiming result is NG even if the vehicle is placed correctly as shown in the flowchart described in "A: Procedure". After camera initialization, perform the aiming in the same procedure as for camera replacement.

1) Turn the ignition to ON.

2) Wait for 10 seconds.

3) On Main Menu display, select «Each System Check».

4) On «System Selection Menu» display, select «ADA adaptive cruise control system».

5) Select «EyeSight (from 2009MY)».

6) Select «Clear Memory» while pressing the pre-collision brake OFF switch and lane departure warning OFF switch at the same time.

7) Turn the ignition to OFF and wait for 5 seconds.

8) Next, perform the clear adjustment value. <Ref. to ES-26, ADJUSTMENT VALUE CLEAR, PROCEDURE, Camera Adjustment, Inspection.>

ES-31