Service Bulletin No. 327B

MODEL	TYPE	SECTION/GROUP	DATE
D Series Coaches	Field Change Program	11 – Steering	Sept. 8, 2009

SUBJECT: STEERING ANGLE SENSOR (SAS)

CONDITIONS:

THIS BULLETIN SUPERSEDES SERVICE BULLETIN 327 IN ITS ENTIRETY.

Ref. NHTSA Meritor WABCO Recall No.: 09E–032

Ref. NHTSA MCI Recall No.: 09V–196

Ref. Transport Canada MCI Recall No.: 09–154

NOTICE

Meritor WABCO (WABCO) previously notified Motor Coach Industries (MCI) that WABCO was recalling its steering angle sensors (SAS) with a serial number below 3000. WABCO has now notified MCI that WABCO is expanding its recall to include steering angle sensors below serial number 3404.

Customer Complaint:

Meritor WABCO has reported to Motor Coach Industries (MCI) that a defect relating to motor vehicle safety exists in certain steering angle sensors used in Meritor WABCO commercial vehicle Electronic Stability Control (ESC) system applications. Meritor WABCO reports that the sensor rotor drive tab in certain Steering Angle Sensors (SAS) can break while driving, resulting in unnecessary brake activation that could pose a safety issue. Please see the attached Meritor WABCO letter dated July 20, 2009, and Meritor WABCO Installation Guide TP–09131 / Revised 07–09.

Cause:

Meritor WABCO reports that the potential malfunction is the result of the sensor rotor drive tab of the steering angle sensor shearing off due to internal friction developing between the sensor gears and the sensor housing. Meritor WABCO advises that the affected steering angle sensors were the original design with serial numbers below 3404.

Corrective Action:

MCI recommends that the steering angle sensor on affected coaches be inspected and replaced, if necessary, in order to eliminate any unexpected brake activations.

The MCI coach models that need to be inspected for this defect are the following:

-E4500 model with the following VIN's (inclusive): 61996, 65203, 65335, 65337, 65339 and 65341.

-D4000ISTV, D4500 and D4505 models with the following VIN's (inclusive): 58890, 58907, 58980 to 59031, 59038 to 59045, 59047 to 59050, 59053, 59057, 59058, 59061, 59062, 59080, 59092 to 59127, 59130 to 59132, 59137, 59139, 59142, 59144, 59146, 59148, 59150, 59153 and 59155.

-J4500 model with the following VIN's (inclusive): 64618, 64918, 64919, 64948 to 64950, 64953 to 64964, 64966, 64968, 64970, 64972, 64974, 64976, 64978 to 64988, 64990 to 65004, 65006, 65011, 65013 to 65032, 65035 to 65082, 65086 to 65098, 65106, 65108, 65110, 65112 to 65118, 65120, 65122, 65124 to 65147, 65149, 65151 to 65170, 65172, 65174, 65176, 65178, 65180, 65182, 65184, 65186 to 65188, 65190 to 65194, 65196 to 65202, 65204 to 65213, 65215 to 65282, 65284 to 65334, 65336, 65338, 65340 and 65342 to 65374.

Accordingly, MCI is instituting a field change program to inspect and replace, if necessary, the Meritor WABCO steering angle sensors in all of the coaches listed above. This bulletin describes the procedures for properly replacing the Meritor WABCO steering angle sensors in the D series coaches.

MCI's Service Bulletin 328B describes the procedures for properly inspecting and, if necessary, replacing the Meritor WABCO steering angle sensor in E and J models.

Printed in Canada

Parts

Qty.	New P/N	Description
1	11-02-1166	Kit, Steering Angle Sensor Replacement
		Kit Contents Are:
1	11-02-1144	Steering Angle Sensor
3		Screw
1		Lubricant, Packet

Service Procedure:

General notes

Read this entire procedure before beginning work. Meritor WABCO Toolbox™ Software Version 8.12.2 is required to perform the outlined procedure steps in this service bulletin.

Use Safe Shop Practices At All Times.

1. Turn the main battery disconnect switch to the OFF position. Chock both sides of the tires.
2. Locate the steering column cover assembly below the steering wheel. Remove and retain the four screws on the top plate, and the eight screws on the steering column cover assembly (refer to Figure 1).

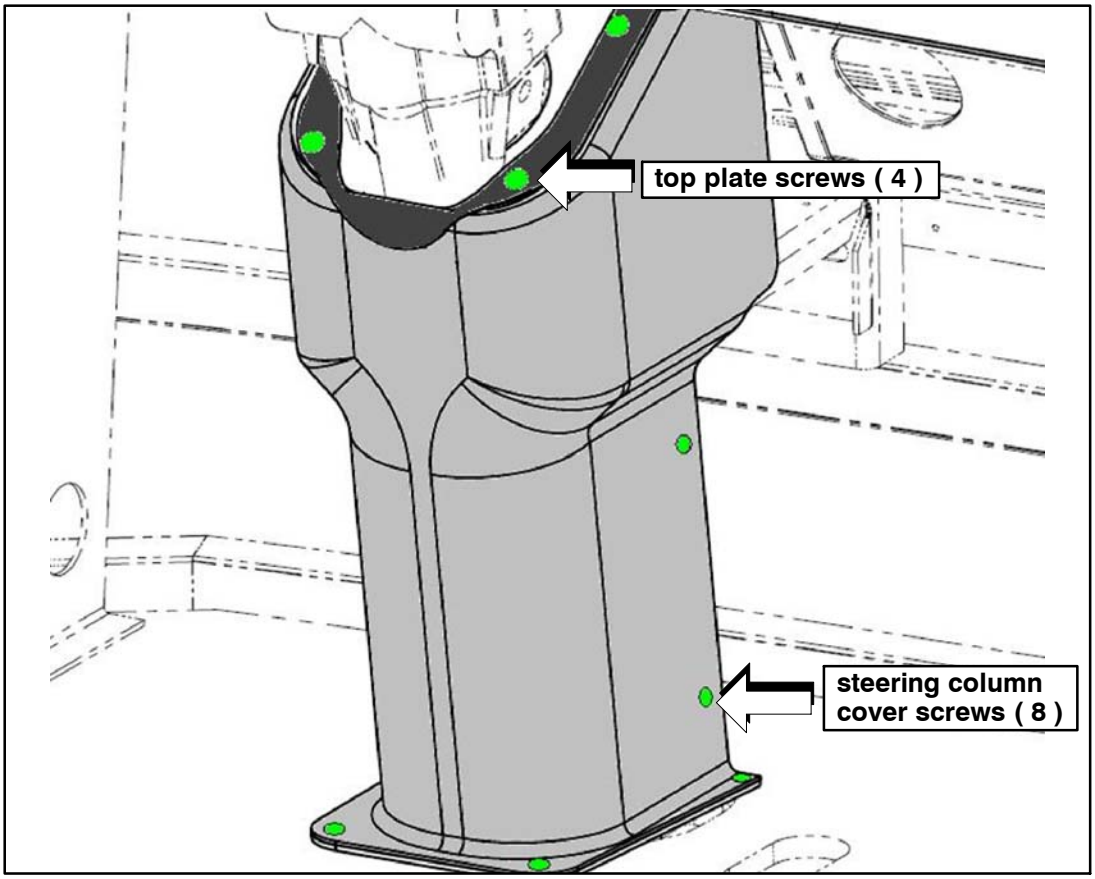

Figure 1.

3. Remove and retain the top plate and the steering column cover, to be re-installed at a later step in this procedure.

4. Locate the steering angle sensor serial number label (refer to Figure 2).

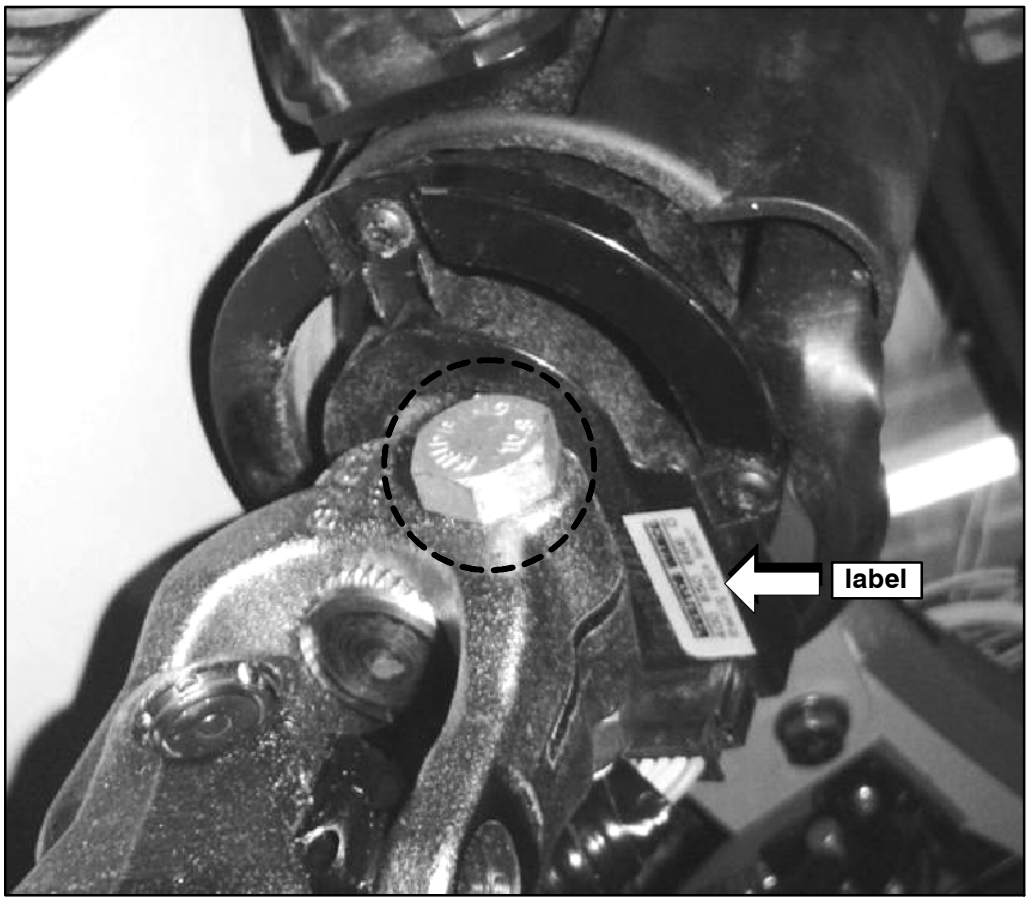

Figure 2.

5. Using a small mirror, view the steering angle sensor serial number label and record the serial number (refer to Figures 3, 4 or 6 for the three { 3 } versions of label).

Figure 3. Meritor WABCO steering angle sensor requiring replacement.

Figure 4. Figure 5. Meritor WABCO steering angle sensor requiring replacement.

Figure 6. Meritor WABCO steering angle sensor NOT affected by campaign.

NOTICE

If the steering angle sensor serial number is between 1 and 3403, ensure that a laptop computer with Meritor WABCO Toolbox ™ software version 8.12.2, or higher, is available . Proceed to Step 6.

If the steering angle sensor serial number is 3404 or above, record the steering angle sensor serial number and submit with paperwork to be returned to MCI. Re-install the steering column cover. No further action required.
Procedure complete.

6. Locate and note the orientation of the steering angle sensor wiring harness connector (refer to Figure 7). Carefully disconnect the steering angle sensor harness.
7. Locate and remove the clamp bolt and nut that secure the upper universal joint yoke to the steering column shaft (refer to Figure 2).
8. Carefully mark the orientation of the upper universal joint yoke with respect to the steering column shaft so that correct alignment of the steering column shaft and universal joint yoke can be obtained during reassembly.
9. Mark the relative position of the steering column to the mounting bracket.
10. Loosen the four (4) 3/8 capscrews mounting the steering column to the mounting bracket allowing the column to be rotated upward and forward. This will allow the universal joint yoke to separate from the steering column shaft splines.
11. Locate the steering angle sensor (refer to Figure 7).
12. Remove and discard the three (3) steering angle sensor mounting screws (refer to Figure 7).
13. Remove and retain the existing steering angle sensor (refer to Figure 7), to be returned to MCI.
14. Apply the supplied lubricant to the mating surface of the new steering angle sensor drive tab and the keyway of the shaft (refer to Figure 7).

NOTICE

To avoid component damage, do not over–torque the steering angle sensor mounting screws.

15. Align the new steering angle sensor drive tab and the keyway of the shaft. Carefully install the new steering angle sensor as per Figure 7 and secure using the three (3) screws in the Parts kit. Torque screws to 20–22 lb-in. Record the new steering angle sensor serial number and submit with paperwork to be returned to MCI.

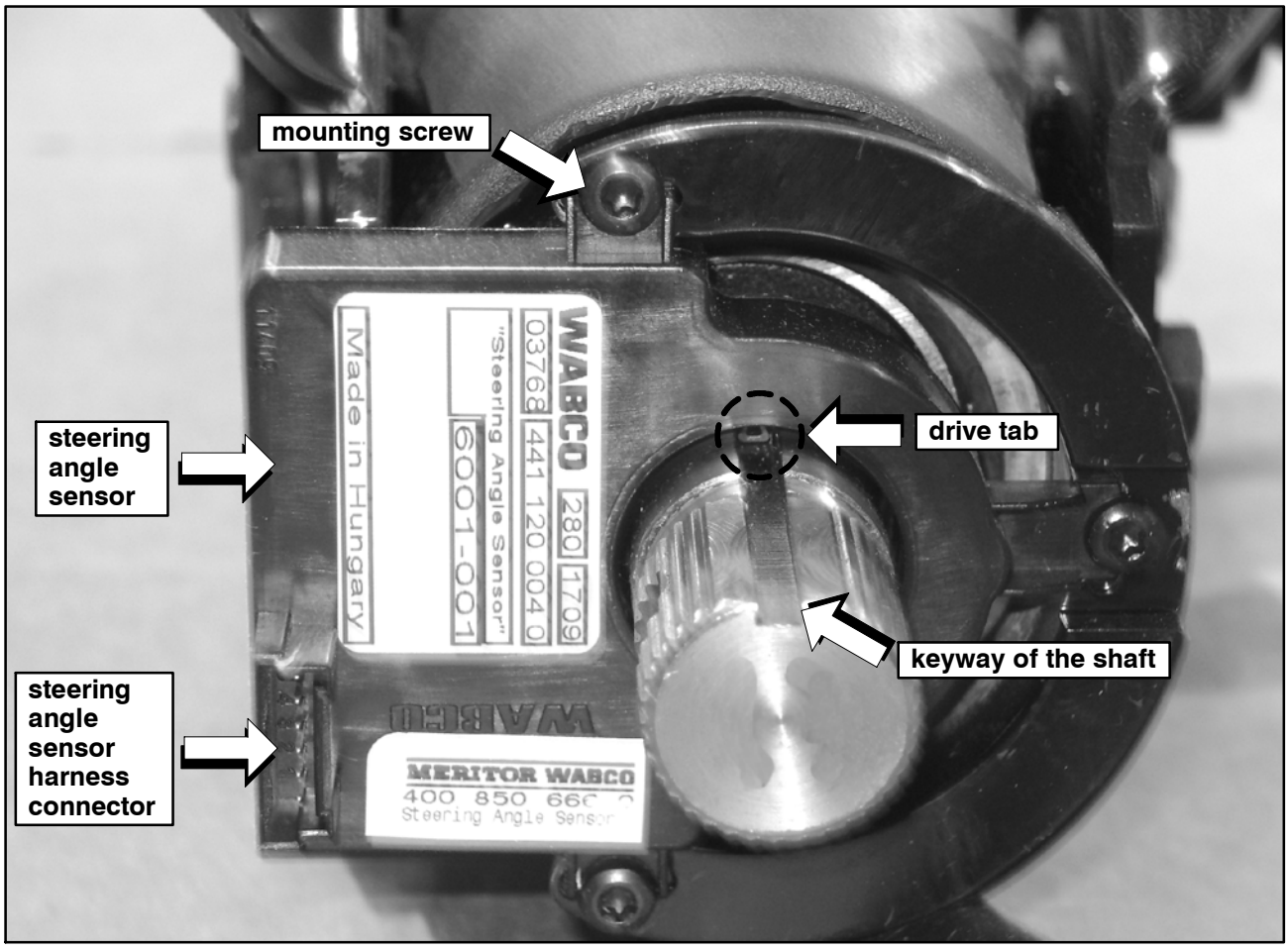

Figure 7.

NOTICE

Use caution to realign splines as marked in Step 8.

16. Re-engage the universal joint yoke with the steering column shaft splines. Install the universal joint yoke clamp bolt and nut, finger tight only.

NOTICE

Ensure that the steering angle sensor harness is clear of any possible interference with the universal joint.

17. Re-connect the steering angle sensor harness, ensuring that the small tab snaps into the connector groove.

CAUTION

If there is downward thrust on the steering box input shaft, the coach will pull to the right.

18. Adjust the steering column final position using reference marks made previously during disassembly. Ensure there is no downward thrust being applied to the steering gearbox input shaft. This can be verified by moving the universal joint yoke clamp bolt and nut freely using only light finger pressure.
19. Verify that the universal joint clamp bolt and nut can move freely by hand. Torque the 3/8 column mounting bolts to 45–50 lb-ft. (refer to Figure 8).

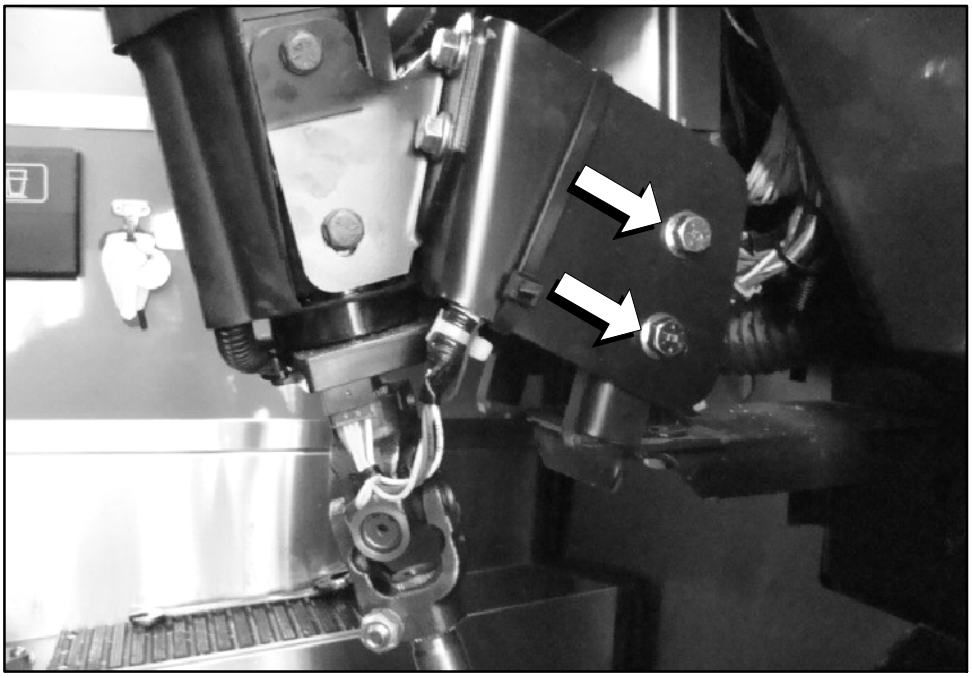

Figure 8.

20. Torque the universal joint clamp bolt and nut to 30–35 lb-ft.

21. Re-install the steering column cover and the top plate, removed in Step 3.
22. Using the attached Meritor WABCO Technical Bulletin TP–09127 titled Steering Angle Sensor Calibration and Electronic Stability Control Initialization and Meritor WABCO Toolbox™ Software Version 8.12.2, calibrate the new steering angle sensor.

NOTICE

It is important to the correct functioning of the ESC system that the entire SAS Calibration Procedure as well as Steps 1 to 6 and Steps 11 to 12 of the ESC Initialization Procedure occur exactly as outlined in the attached Meritor WABCO Technical Bulletin TP–09131.

Since MCI's coaches are configured with a preset steering ratio, Steps 7 to 10 of the attached ESC Initialization Procedure (refer to Page 6 of attached TP–09131) do not apply and will not display on the laptop screen.

After completion of Step 6, proceed to Steps 11 and 12 to ensure procedure is completely performed.

Procedure complete.

Mail or fax the completed warranty claim form to MCI's warranty department, or photocopy and mail it to:

MCI Fleet Support
Attn: Warranty Department
7001 Universal Coach Drive
Louisville, KY 40258
Fax Number 1-800–360–8886

to receive credit for the hours used to complete this task. Contact the MCI Fleet Support Technical Center at 1-800-241-2947 for any further information.

Field Change Program Conditions:

The parts required for this change will be supplied without charge. Specialized equipment is required to perform the outlined procedure steps in this service bulletin.

ONLY ONE (1) CLAIM CAN BE FILED AGAINST THE COACH VIN, SB 327 OR SB 327B.

A labor allowance of 0.4 hours will be granted against claim SB327B.1, for the procedure of inspecting the steering angle sensor serial number label only.

A labor allowance of 1.2 hours will be granted against claim SB327B.2, for the procedure of inspecting the steering angle sensor serial number label, replacing the steering angle sensor and re–calibrating the steering angle sensor.

NO PAYMENT WILL BE ISSUED BY MOTOR COACH INDUSTRIES UNTIL THE COMPLETED WARRANTY CLAIM FORM, THE STEERING ANGLE SENSOR AND THE SERIAL NUMBER OF THE REPLACEMENT STEERING ANGLE SENSOR HAVE BEEN RECEIVED BY MCI.

This labor allowance will be credited to your MCI Fleet Support Parts Account on receipt of a "Warranty Claim Form" as detailed in your Owner Warranty manual.

Motor Coach apologizes for any inconvenience resulting from this campaign, but urges you to implement this change as soon as possible.

Sincerely,

Motor Coach Industries
U.S. and Canadian Service Departments.

TP-09131
Revised 07-09

MERITOR WABCO

Installation Guide

Steering Angle Sensor (SAS) Replacement on Vehicles Equipped with Electronic Stability Control (ESC)

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

How to Obtain Additional Maintenance and Service Information

Refer to Maintenance Manual MM-0112, Anti-Lock Braking System (ABS) for Trucks, Tractors and Buses. Call ArvinMeritor's Customer Service Center at 800-535-5560 to obtain this publication. Meritor WABCO publications are also available on our website:

www.meritorwabco.com

How to Obtain Kits

Contact the OnTrac Customer Service Center at 866-668-7221.

Kit 400 850 360 0

The steering angle sensor field kit (part number 400 850 360 0) is required for completing the replacement procedure. The kit consists of the following parts.

- Steering angle sensor (SAS)
- Grease packet
- Three screws
- Field inspection, replacement and calibration instructions
- Return envelope for removed SAS with serial number less than 3404
- Tag to record Vehicle Identification Number (VIN) that will accompany SAS in the return envelope

Tools

To complete this procedure, you will need screwdrivers appropriate for the type of screws used to attach the steering column lower shroud, and the steering angle sensor to the mounting bracket.

This installation guide provides steps for SAS replacement on vehicles equipped with ESC.

- Inspecting part number and serial number on SAS
- SAS replacement
- SAS calibration and ESC initialization

Inspecting Part Number and Serial Number on the Steering Angle Sensor (SAS)

This section provides instructions on how to identify the part number and serial number of the Meritor WABCO Steering Angle Sensor, a component used in vehicles equipped with Electronic Stability Control (ESC). Figure 1.

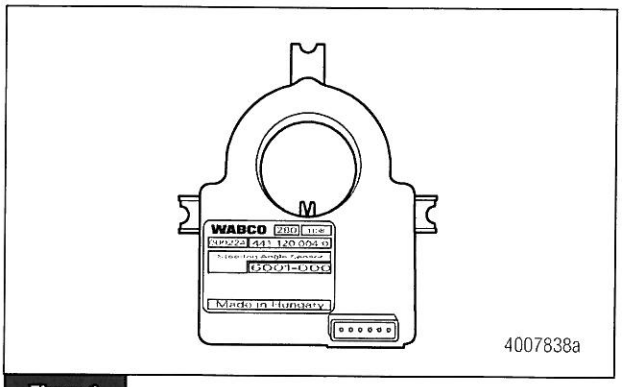

Figure 1

Inspection Procedure

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Use a screwdriver to remove the screws on the shroud covering the lower portion of the steering column. Remove the shroud. This will expose the connection between the steering shaft and the I-shaft. The SAS is mounted just above this joint. Figure 2.

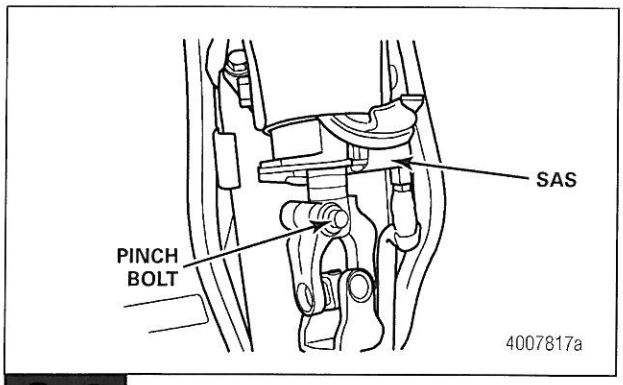

Figure 2

3. Locate the label on the exposed face of the SAS. It may be necessary to use a small mirror to view this while installed on the column. Record the part number and serial number of the SAS according to the type of label you find.

Types of Labels

There are three types of labels you may find on the SAS.

For the label type in Figure 3, the part number is the 10-digit number starting with 441 in the second line of the text below "WABCO". The serial number is the 6-digit number directly below "WABCO".

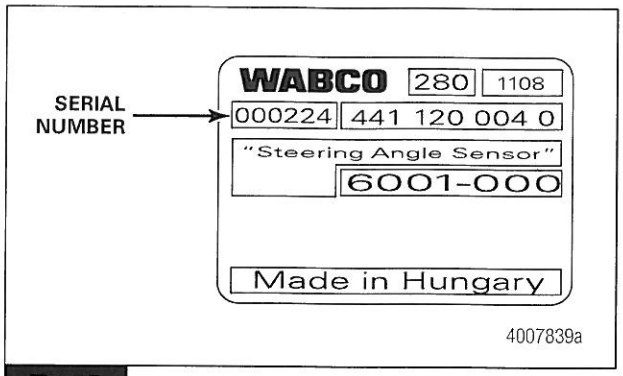

Figure 3

For the label type in Figure 4, the 10-digit part number which starts with 400 is directly below "MERITOR WABCO" and the 6-digit serial number is directly above the "Made in Hungary" text.

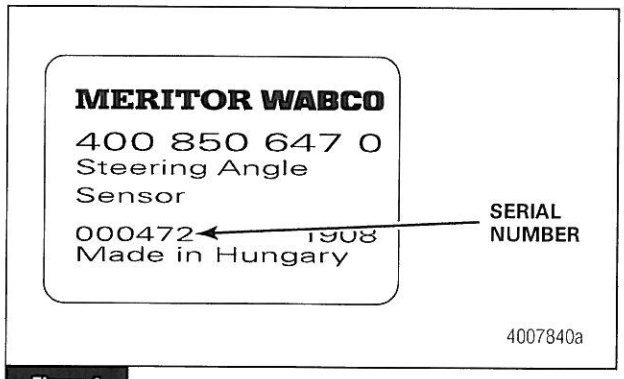

Figure 4

A third variation of the SAS shown in Figure 5 contains the label in Figure 3 as well as another label to the right containing the part number 400 850 666 0. The serial number should be read using the method described for the label in Figure 3.

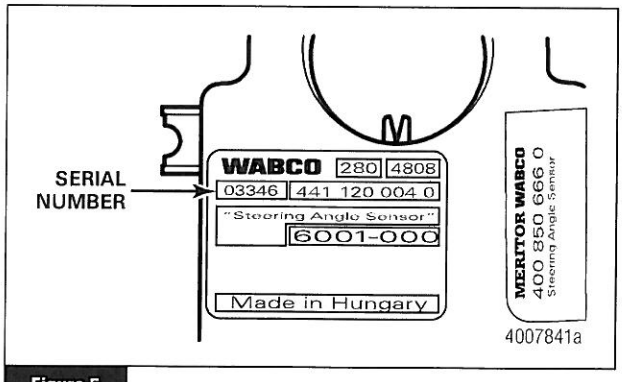

Figure 5

NOTE: Steering angle sensors with serial numbers less than 3404 must be replaced with an SAS with a serial number of 3404 or higher. Refer to the Steering Angle Sensor Replacement instructions in this guide; or to Maintenance Manual MM-0112.

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Steering Angle Sensor Replacement

This section provides procedures for replacing the Meritor WABCO Steering Angle Sensor on vehicles equipped with ESC. Figure 6.

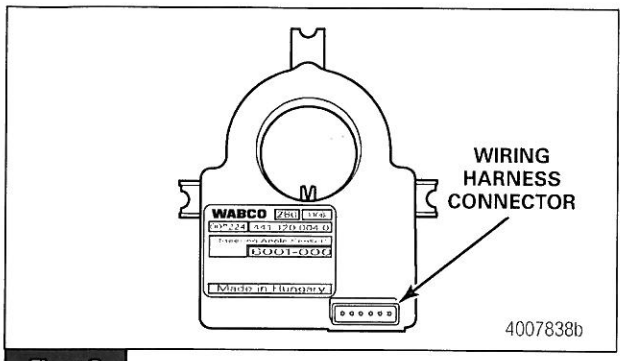

Figure 6

Remove the Steering Angle Sensor

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

1. Park the vehicle on a level surface with the steering wheel centered and the front wheels positioned straight ahead.
2. Turn the ignition switch to the OFF position and apply the parking brake.
3. Block the wheels to prevent the vehicle from moving.
4. Remove the shroud that covers the lower portion of the steering column. This exposes the connection between the steering shaft and the I-shaft. The steering angle sensor is mounted just above this joint. Figure 7.

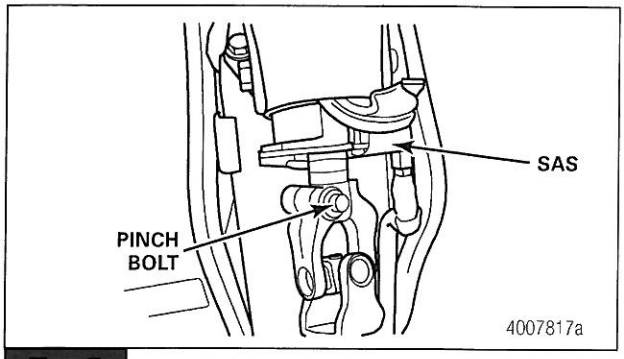

Figure 7

5. Remove the pinch bolt on the top portion of the universal steering joint. This will allow you to slide the joint down and off the steering column.
6. Note the position of the SAS wiring harness connector (Figure 7) — either facing UP or DOWN. The new SAS will need to be positioned the same way when installed. Disconnect the wiring harness connector from the SAS.
7. Remove the three screws that attach the SAS to the steering column and slide the SAS off the shaft. Note the tab in the center of the SAS fits into a groove machined into the steering shaft.

Install the New Steering Angle Sensor

1. Apply a small amount of the supplied grease to the tab in the center of the SAS and to the machined groove on the steering shaft.

   NOTE: The SAS must be installed in the correct orientation or it will not function correctly.

2. Place the SAS over the shaft making sure that the connector is facing the same direction as the original one. Slide the SAS into place. Check to ensure the tab is in the machined groove on the column.
3. Install the three mounting screws provided in the kit and tighten to a maximum of 22 in-lb (2.5 N•m). Do not reinstall the original screws.
4. Install the wiring harness connector. Push the connector together until the small tab snaps into the connector groove.
5. Replace the universal steering joint and tighten the pinch bolt to the vehicle manufacturer specification.
6. Install the steering column shroud.
7. Remove the wheel blocks.
8. Test the SAS installation using the test procedure in this installation guide.

Testing the SAS Installation

The SAS must be calibrated and the ESC initialized in order to test the SAS installation.

1. Perform the SAS calibration and ESC initialization procedures. Refer to the procedures in this installation guide.
2. When the SAS calibration and ESC initialization procedures are complete, turn the ignition power on. The ABS and ATC/ESC lamps should come on and go out. The ATC/ESC lamp may also remain on briefly after the ABS lamp goes off.

3. Check to ensure there are no active faults displayed in the ABS ECU memory.

NOTE: If the SAS does not function as described above, contact the OnTrac Customer Service Center at 866-668-7221 for further information on how to correct any problems with the installation. The ESC may not function correctly if the SAS does not perform as described in this section.

Filing Instructions and Return Parts Procedure

File the claim according to the vehicle manufacturer instructions. A return envelope and tag for recording any required information is included for the return.

SAS Calibration and ESC Initialization Procedures

This section provides instructions for SAS calibration and ESC initialization. These procedures, sometimes referred to as the "ESC End-of-Line" procedure, must be performed as part of the final assembly of the vehicle at the vehicle manufacturer site. These procedures are also required when all or any component such as the SAS, the ESC Module or the ECU have been replaced or a major steering system repair or replacement has been completed including alignment of the front tires. Failure to do so may result in the ESC not functioning correctly.

The SAS calibration procedure must be performed before the ESC initialization.

The status of the procedures can be verified using one of the following faults.

SAS not calibrated — 89 13

ESC initialization required — 88 13

ESC initialization not completed — 88 01

NOTE: Additional faults must not be active when you begin these procedures. If any other faults are present, you must resolve those issues before the main calibration menu items will become available.

SAS Calibration Procedure

NOTE: You must align the front tires before you perform the SAS calibration.

1. To access the Meritor WABCO TOOLBOX™ Software, double-click on the Meritor WABCO TOOLBOX™ icon from the desktop. Figure 8.

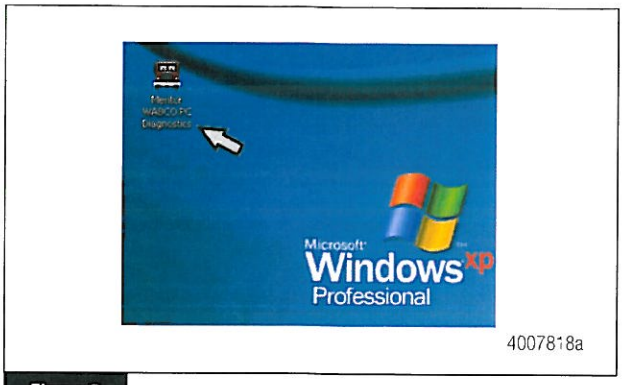

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Figure 8

2. From the message box, click on the Pneumatic ABS button. Figure 9.

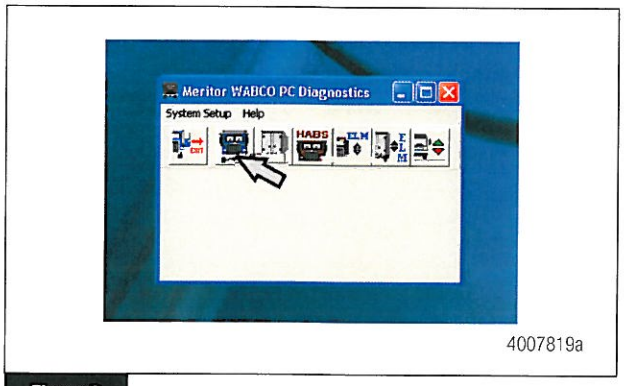

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Figure 9

3. To verify status of the ESC initialization, double-click on the fault box from the initial screen. Figure 10.

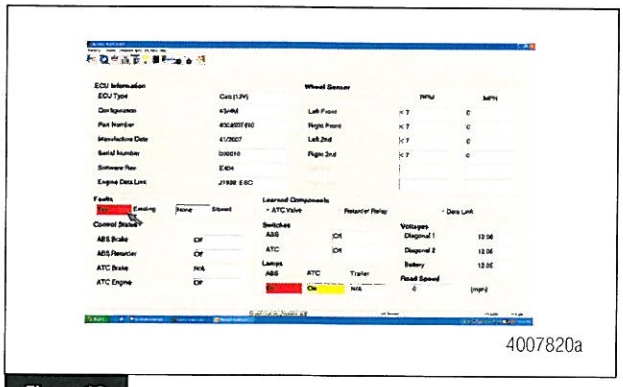

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Figure 10

4. For new vehicles or vehicles where the SAS has been replaced, the message box should show the Steering Angle Sensor code 89-13. Check the code to ensure it is correct. Figure 11.

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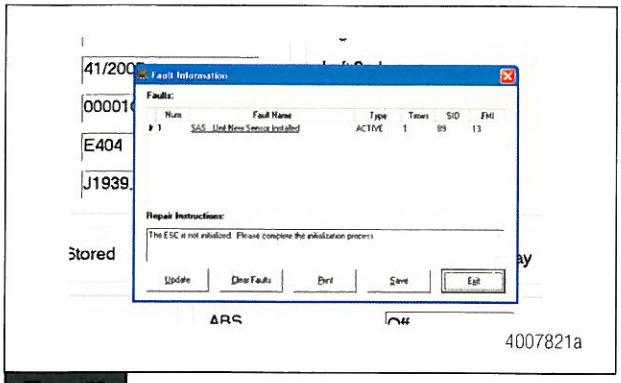

Figure 11

5. To access SAS Calibration, click on the ESC Menu from the bar menu at the initial screen. A drop box will illuminate. Select the "End of Line" option. Figure 12.

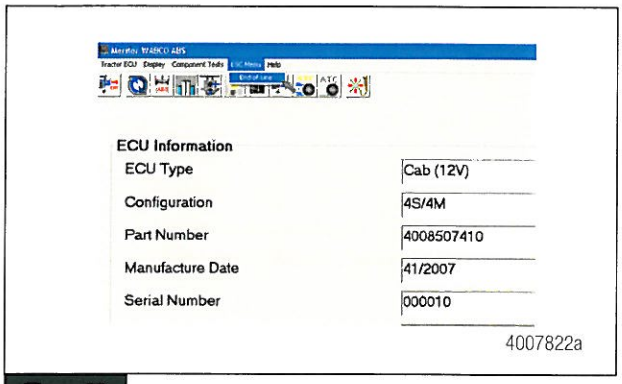

Figure 12

6. Click SAS Calibration in the message box. Figure 13.

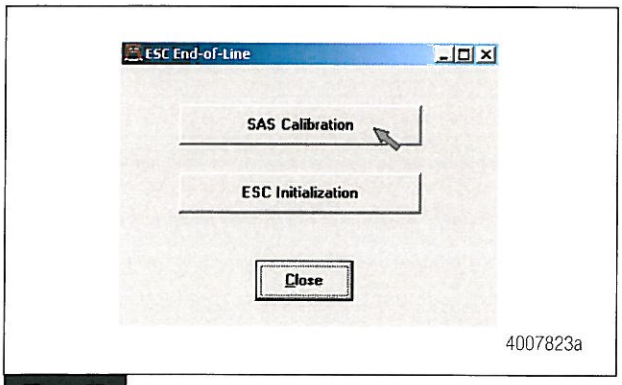

Figure 13

7. Follow the instruction in the message box. Figure 14.

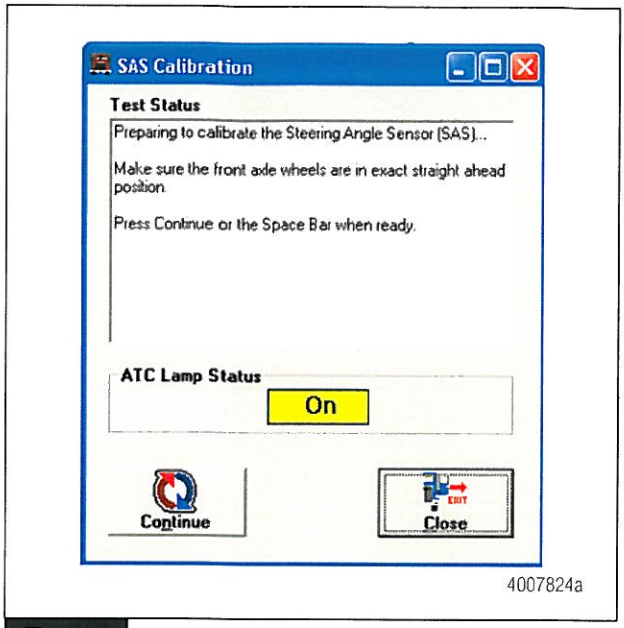

Figure 14

8. The message box will indicate when the SAS has been calibrated. Once the SAS is calibrated, press Close or the space bar to continue. The ESC initialization procedure can now be performed. Figure 15.

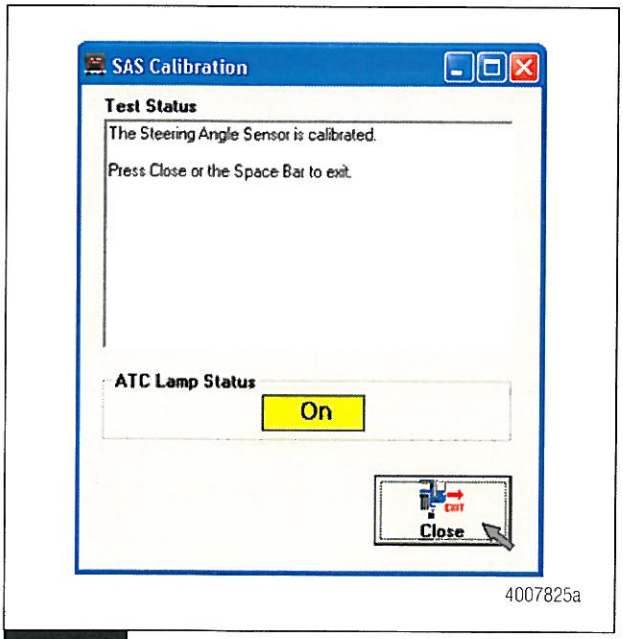

Figure 15

ESC Initialization Procedure

After the SAS calibration is completed, use the following procedure to initialize the ESC.

1. To verify the status of the ESC initialization, double-click on the fault box from the initial screen. Figure 16.

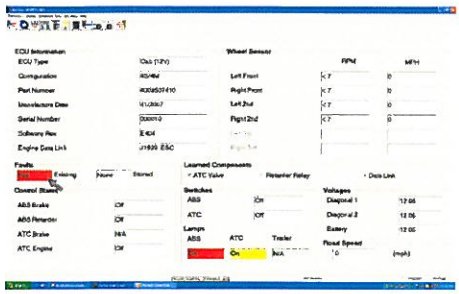

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Figure 16

2. The message box should show the ESC Initialization Not Complete code 88-1. Verify the code is correct. Figure 17.

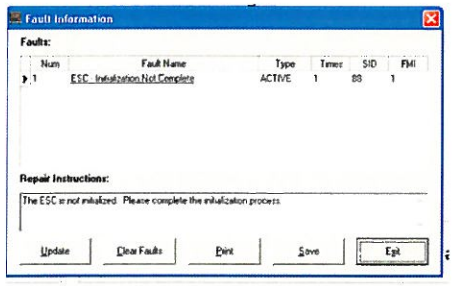

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Figure 17

3. Again click on the ESC Menu from the bar menu at the initial screen. Select the "End of Line" option. Figure 18.

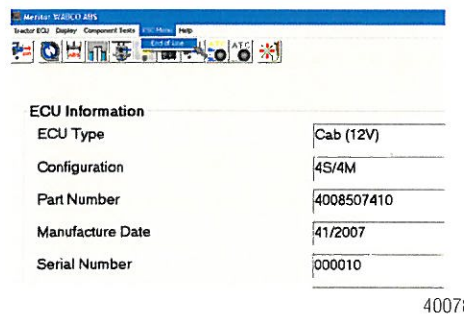

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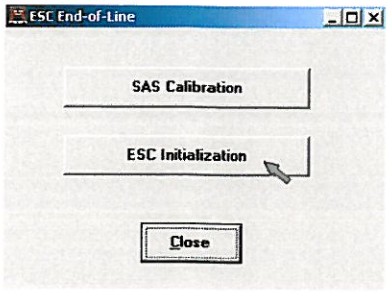
Figure 18

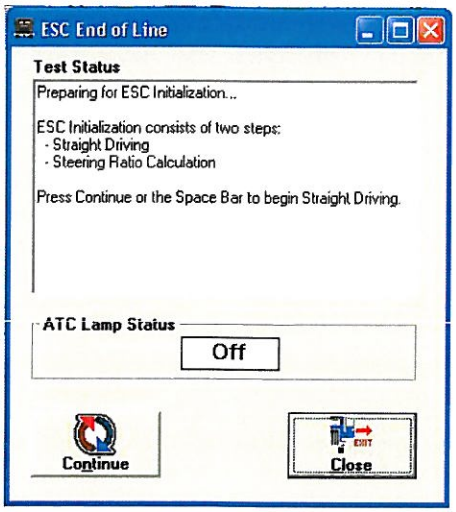
4. Click on ESC Initialization. Figure 19.



4007829a

Figure 19

5. Read the information in the message box. When you are ready to proceed, press the space bar or click Continue. Once the calibration process has started, it will continue until the calibration is complete. No further keyboard inputs are required. Once the calibration process has begun, instructions will appear in the message box and will continue until the calibration is complete. Figure 20.



4007830a

Figure 20

6. Carefully read and follow the instruction in the message box. The ATC/RSC/ESC lamp will start blinking when the 15 mph speed has been reached. When "straight driving" is completed after about 800 feet, the ATC/RSC/ESC lamp will stop blinking and will be on solid. Figure 21.

   NOTE: The "straight driving" can be done in segments and the ECU will accumulate the information until the 800 feet are reached, but it must be done in the same ignition cycle.

NOTE: In some applications, you may have preset steering ratios and a message box will appear indicating the calibration procedure is complete. In this case, click Close and cycle the ignition. When the ignition is turned back on, check that no active faults are logged and the ABS and ATC/RSC/ESC warning lamps are off. The calibration is complete.

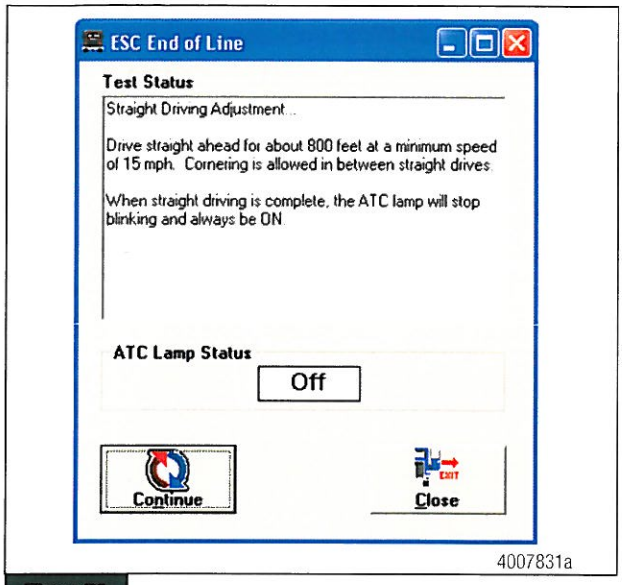


Figure 21

7. A message will appear after the "straight driving" is complete. Carefully read and follow the instructions in the message box. Start driving in a circle with the steering wheel rotated 360 degrees. No keyboard input is required. Figure 22.

   NOTE: The "circle driving" may also be done in segments and the ECU will accumulate the information until the required distance is reached, but it must be done in the same ignition cycle.

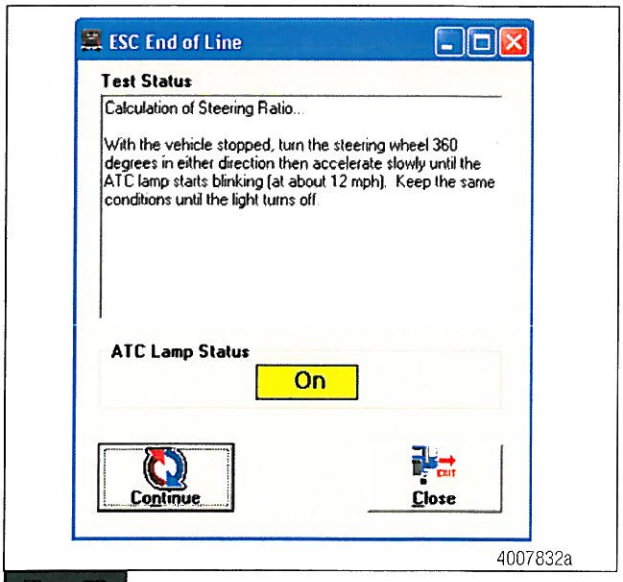


Figure 22

8. Read the message box carefully. The ATC/RSC/ESC lamp will start blinking when the required conditions are met. Keep driving until the lamp turns off. Figure 23.

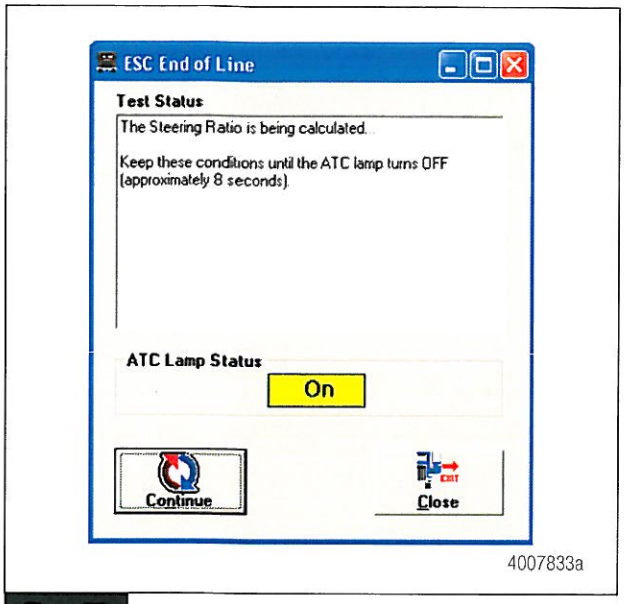


Figure 23

9. This message will appear after the steering ratio has been calculated. Figure 23. Stop the vehicle. Read the message box carefully and follow the instructions. Turn the steering wheel 360 degrees in the opposite direction from being centered. Repeat the driving conditions. Again, the ATC/RSC/ESC lamp will start blinking when the required conditions are met. Keep driving until the light turns off. Figure 24.

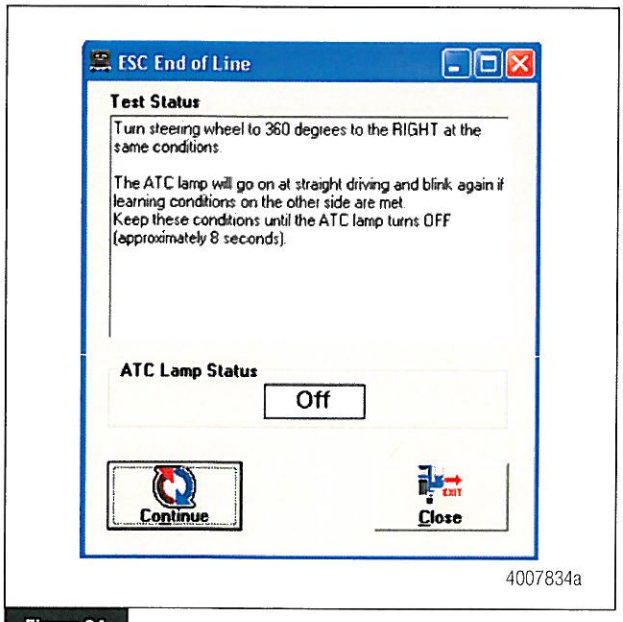


Figure 24

10. A message box will appear with the Steering Ratio and Steering Angle Offset values. Click Close. Figure 25.

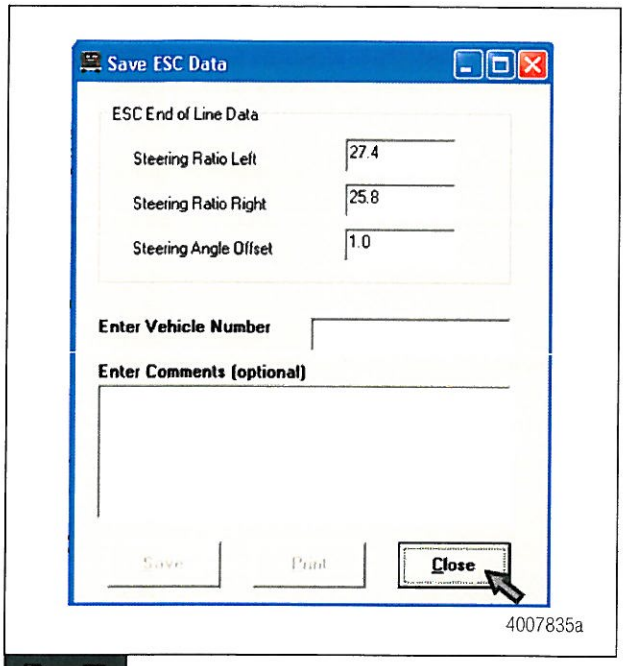


Figure 25

11. Read the message box and follow the instructions carefully. Click Close. Cycle the ignition. Figure 26.

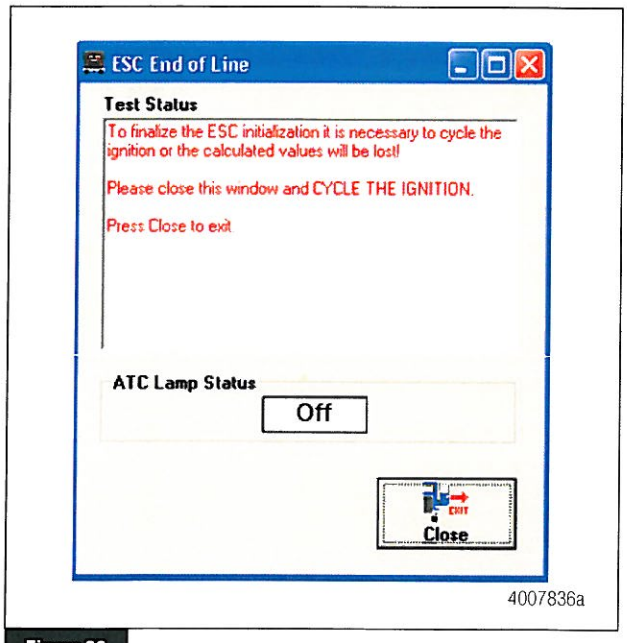


Figure 26

12. When the ignition is turned back on, check that no active or stored faults are logged in the ECU and the ABS and ATC/RSC/ESC warning lamps are off. Figure 27.

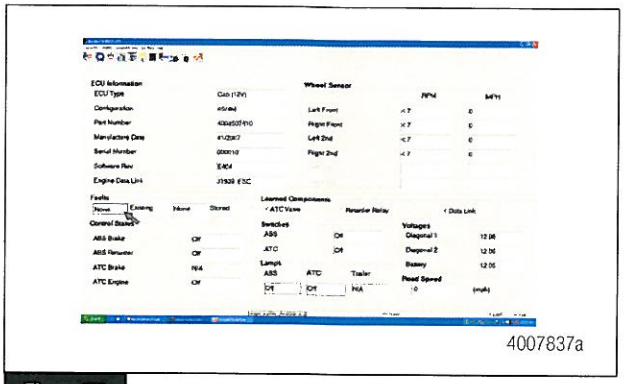


Figure 27

It is important to the correct functioning of the ESC that the ESC/SAS calibration procedure occur exactly as outlined in this document. If the SAS or ESC calibration instructions and procedures do not occur as described above, refer to Maintenance Manual MM-0112, or contact the OnTrac Customer Service Center at 866-668-7221.

MERITOR WABCO

Meritor WABCO Vehicle Control Systems
2135 West Maple Road
Troy, MI 48084-7121 USA
800-535-5560
meritorwabco.com

Printed in USA

TP-09131
Revised 07-09
(16579/22882)

Service Bulletin No. 328B

MODEL	TYPE	SECTION/GROUP	DATE
E4500 / J4500 Series Coaches	Field Change Program	11 – Steering	Sept. 8, 2009

SUBJECT: **STEERING ANGLE SENSOR (SAS)**

CONDITIONS:

THIS BULLETIN SUPERSEDES SERVICE BULLETIN 328 IN ITS ENTIRETY.

Ref. NHTSA Meritor WABCO Recall No.: 09E – 032

Ref. NHTSA MCI Recall No.: 09V – 196

Ref. Transport Canada MCI Recall No.: 09 – 154

NOTICE

Meritor WABCO (WABCO) previously notified Motor Coach Industries (MCI) that WABCO was recalling its steering angle sensors (SAS) with a serial number below 3000. WABCO has now notified MCI that WABCO is expanding its recall to include steering angle sensors below serial number 3404.

Customer Complaint:

Meritor WABCO has reported to Motor Coach Industries (MCI) that a defect relating to motor vehicle safety exists in certain steering angle sensors used in Meritor WABCO commercial vehicle Electronic Stability Control (ESC) system applications. Meritor WABCO reports that the sensor rotor drive tab in certain Steering Angle Sensors (SAS) can break while driving, resulting in unnecessary brake activation that could pose a safety issue. Please see the attached Meritor WABCO letter dated July 20, 2009, and Meritor WABCO Installation Guide TP – 09131 / Revised 07 – 09.

Cause:

Meritor WABCO reports that the potential malfunction is the result of the sensor rotor drive tab of the steering angle sensor shearing off due to internal friction developing between the sensor gears and the sensor housing. Meritor WABCO advises that the affected steering angle sensors were the original design with serial numbers below 3404.

Corrective Action:

MCI recommends that the steering angle sensor on affected coaches be inspected and replaced, if necessary, in order to eliminate any unexpected brake activations.

The MCI coach models that need to be inspected for by this defect are the following:

-E4500 model with the following VIN's (inclusive): 61996, 65203, 65335, 65337, 65339 and 65341.

-J4500 model with the following VIN's (inclusive): 64618, 64918, 64919, 64948 to 64950, 64953 to 64964, 64966, 64968, 64970, 64972, 64974, 64976, 64978 to 64988, 64990 to 65004, 65006, 65011, 65013 to 65032, 65035 to 65082, 65086 to 65098, 65106, 65108, 65110, 65112 to 65118, 65120, 65122, 65124 to 65147, 65149, 65151 to 65170, 65172, 65174, 65176, 65178, 65180, 65182, 65184, 65186 to 65188, 65190 to 65194, 65196 to 65202, 65204 to 65213, 65215 to 65282, 65284 to 65334, 65336, 65338, 65340 and 65342 to 65374.

-D4000ISTV, D4500 and D4505 models with the following VIN's (inclusive): 58890, 58907, 58980 to 59031, 59038 to 59045, 59047 to 59050, 59053, 59057, 59058, 59061, 59062, 59080, 59092 to 59127, 59130 to 59132, 59137, 59139, 59142, 59144, 59146, 59148, 59150, 59153 and 59155.

Accordingly, MCI is instituting a field change program to inspect and replace, if necessary, the Meritor WABCO steering angle sensors in all of the coaches listed above. This bulletin describes the procedures for properly replacing the Meritor WABCO steering angle sensors in the E and J series coaches.

MCI's Service Bulletin 327B describes the procedures for properly inspecting and, if necessary, replacing the Meritor WABCO steering angle sensor in D models.

Parts

Qty.	New P/N	Description
1	11-02-1166	Kit, Steering Angle Sensor Replacement
		Kit Contents Are:
1	11-02-1144	Steering Angle Sensor
3		Screw
1		Lubricant, Packet

Service Procedure:

General notes

Read this entire procedure before beginning work. Meritor WABCO Toolbox™ Software Version 8.12.2 is required to perform the outlined procedure steps in this service bulletin.

Use Safe Shop Practices At All Times.

1. Turn the main battery disconnect switch to the OFF position. Chock both sides of the tires.
2. Locate the steering column cover assembly below the steering wheel. Remove and retain the four (4) screws from the bottom of the steering column cover assembly (refer to Figure 1).

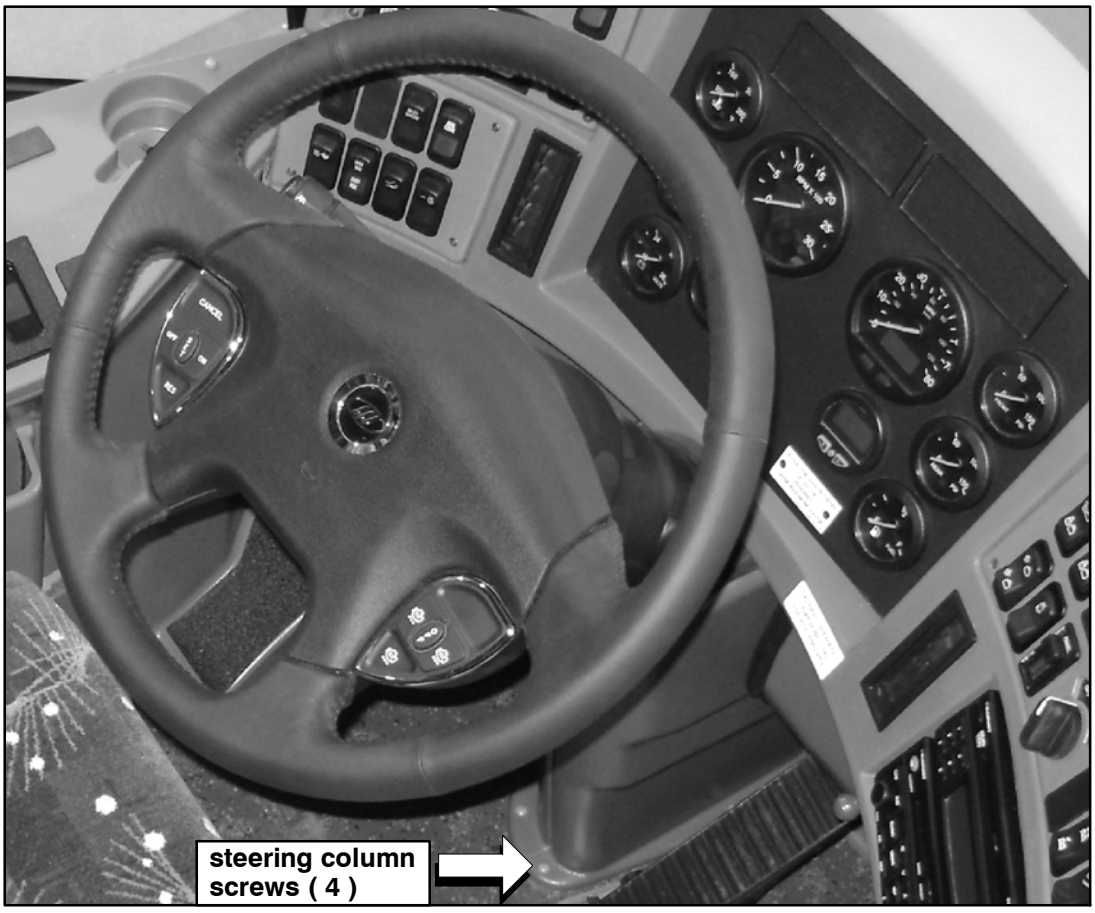


Figure 1.

3. Remove and retain the steering column cover, to be re-installed at a later step in this procedure.

4. Locate the steering angle sensor serial number label (refer to Figure 2).

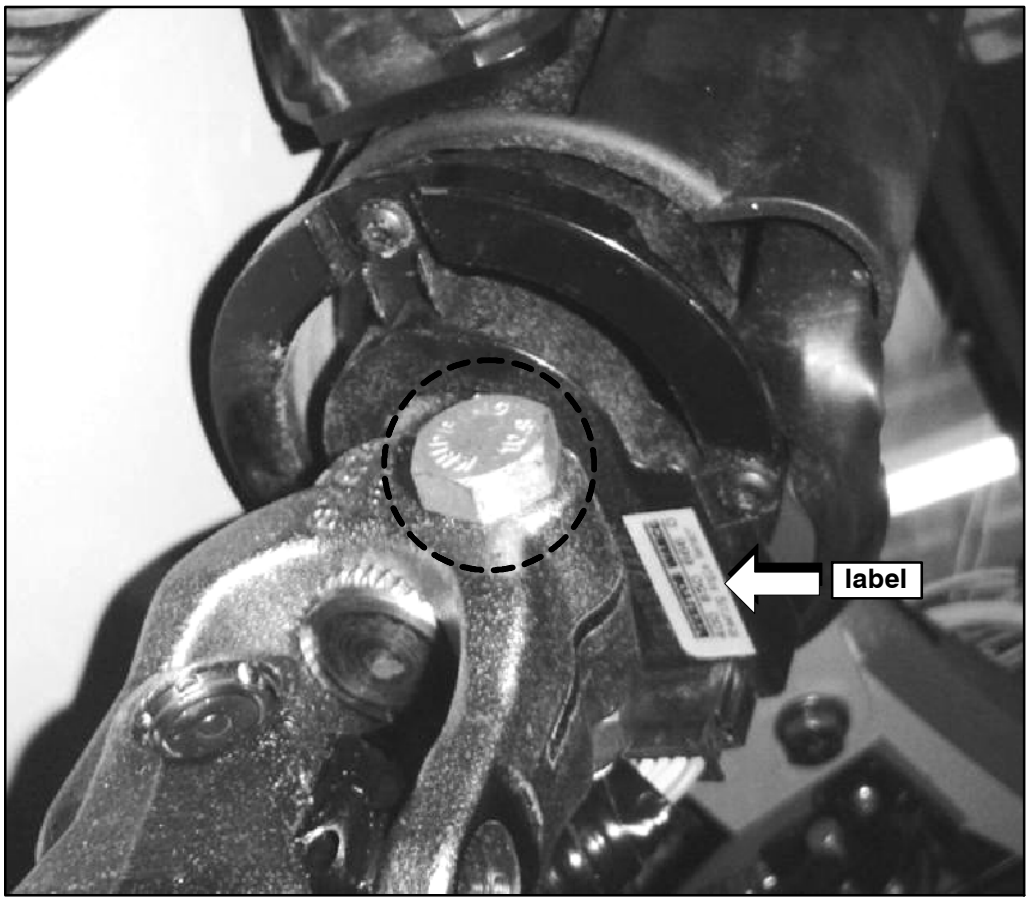


Figure 2.

5. Using a small mirror, view the steering angle sensor serial number label and record the serial number (refer to Figures 3, 4 or 5 for the three { 3 } versions of labels).

Figure 3. Meritor WABCO steering angle sensor requiring replacement.

Figure 4. Meritor WABCO steering angle sensor requiring replacement.

Figure 5. Meritor WABCO steering angle sensor NOT affected by campaign.

NOTICE

If the steering angle sensor serial number is between 1 and 3403, ensure that a laptop computer with Meritor WABCO Toolbox ™ software version 8.12.2, or higher, is available . Proceed to Step 6.

If the steering angle sensor serial number is 3404 or above, record the new steering angle sensor serial number and submit with paperwork to be returned to MCI. Re-install the steering column cover. No further action required.
Procedure complete.

6. Locate and note the orientation of the steering angle sensor wiring harness connector (refer to Figure 6). Carefully disconnect the steering angle sensor harness.
7. Locate and remove the clamp bolt and nut that secures the universal joint yoke to the steering column shaft (refer to Figure 2).
8. Carefully mark the orientation of the universal joint yoke with respect to the steering column shaft so that correct alignment of the steering column shaft and universal joint yoke can be obtained during reassembly.
9. Slide the universal joint yoke downward, off of the steering column shaft splines to access to the steering angle sensor.
10. Remove and discard the three (3) steering angle sensor mounting screws (refer to Figure 6).
11. Remove and retain the existing steering angle sensor (refer to Figure 6), to be returned to MCI.
12. Apply the supplied lubricant to the mating surface of the new steering angle sensor drive tab and the keyway of the shaft (refer to Figure 6).

NOTICE

To avoid component damage, do not over−torque the steering angle sensor screws.

13. Align the new steering angle sensor drive tab and the keyway of the shaft. Carefully install the new steering angle sensor and secure using the three (3) screws in the Parts kit. Torque screws to 20−22 lb-in. Record the new steering angle sensor serial number and submit with paperwork to be returned to MCI.

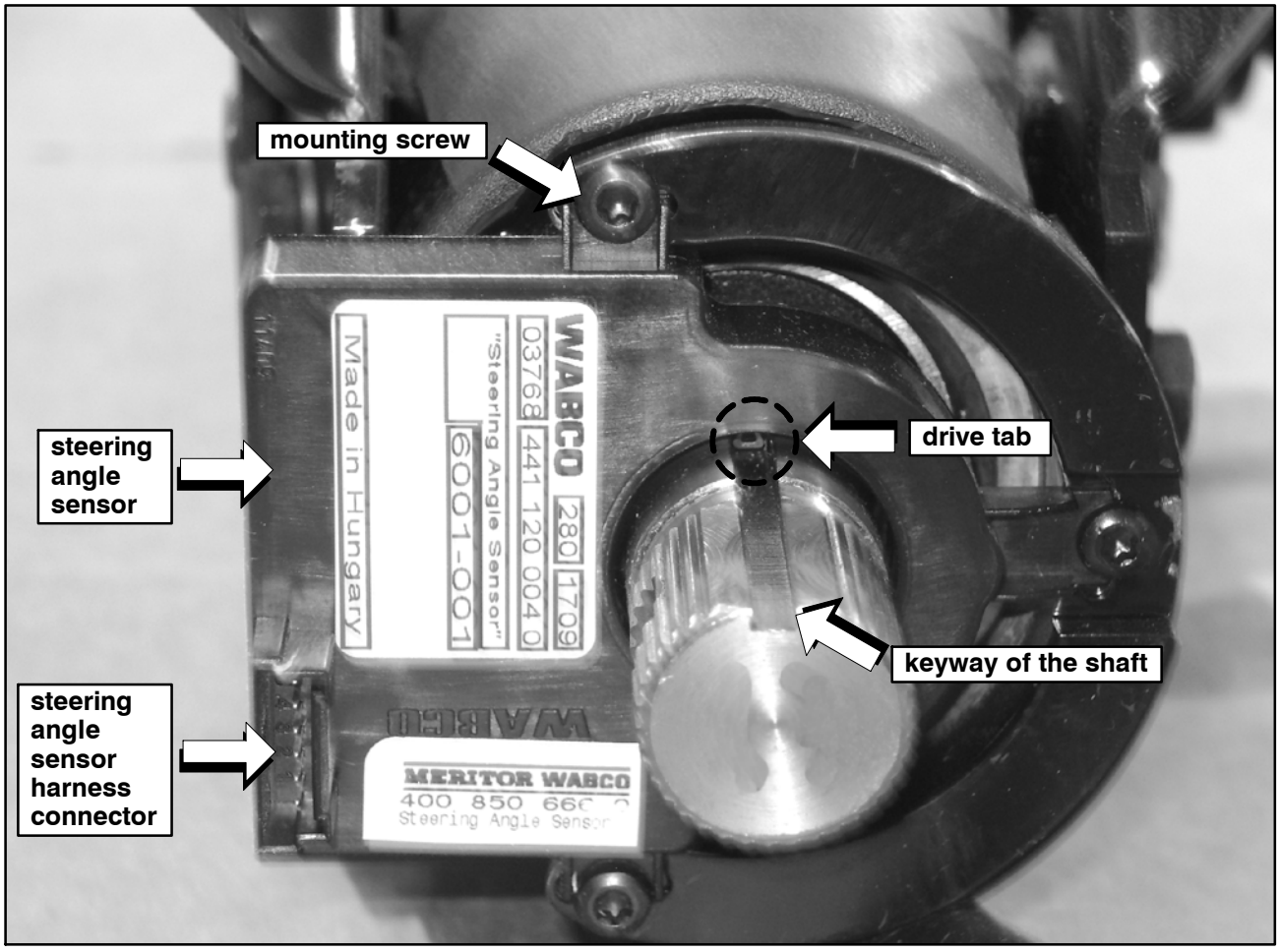


Figure 6.

14. Re-install the universal joint yoke onto the steering column shaft, using caution to re-align splines as marked in Step 8. Using the clamp bolt and nut removed in Step 7. , secure the universal joint yoke. Torque clamp bolt to 35–38 lb ft.

NOTICE

Ensure that the steering angle sensor harness is clear of any possible interference with the universal joint.

15. Re-connect the steering angle sensor harness, ensuring that the small tab snaps into the connector groove.
16. Re-install the steering column cover, removed in Step 3.
17. Using the attached Meritor WABCO Technical Bulletin TP–09127 titled Steering Angle Sensor Calibration and Electronic Stability Control Initialization and Meritor WABCO Toolbox™ Software Version 8.12.2, calibrate the new steering angle sensor.

NOTICE

It is important to the correct functioning of the ESC that the entire SAS Calibration Procedure as well as Steps 1 to 6 and Steps 11 to 12 of the ESC Initialization Procedure occur exactly as outlined in the attached Meritor WABCO Technical Bulletin TP–09131.

Since MCI's coaches are configured with a preset steering ratio, Steps 7 to 10 of the attached ESC Initialization Procedure (refer to Page 6 of attached TP–09131) do not apply and will not display on the laptop screen.

After completion of Step 6, proceed to Steps 11 and 12 to ensure procedure is completely performed.

Procedure complete.

Mail or fax the completed warranty claim form to MCI's warranty department, or photocopy and mail it to:

MCI Fleet Support
Attn: Warranty Department
7001 Universal Coach Drive
Louisville, KY 40258
Fax Number 1-800–360–8886

to receive credit for the hours used to complete this task. Contact the MCI Fleet Support Technical Center at 1-800-241-2947 for any further information.

Field Change Program Conditions:

The parts required for this change will be supplied without charge.

ONLY ONE (1) CLAIM CAN BE FILED AGAINST THE COACH VIN, SB 328 OR SB 328B.

A labor allowance of 0.4 hours will be granted against claim SB328B.1, for the procedure of inspecting the steering angle sensor serial number label only.

A labor allowance of 1.2 hours will be granted against claim SB328B.2, for the procedure of inspecting the steering angle sensor serial number label, replacing the steering angle sensor and re–calibrating the steering angle sensor.

NO PAYMENT WILL BE ISSUED BY MOTOR COACH INDUSTRIES UNTIL THE COMPLETED WARRANTY CLAIM FORM, THE STEERING ANGLE SENSOR AND THE SERIAL NUMBER OF THE REPLACEMENT STEERING ANGLE SENSOR HAVE BEEN RECEIVED BY MCI.

This labor allowance will be credited to your MCI Fleet Support Parts Account on receipt of a "Warranty Claim Form" as detailed in your Owner Warranty manual.

Motor Coach apologizes for any inconvenience resulting from this campaign, but urges you to implement this change as soon as possible.

Sincerely,

Motor Coach Industries
U.S. and Canadian Service Departments.

TP-09131
Revised 07-09

MERITOR WABCO

Installation Guide

Steering Angle Sensor (SAS) Replacement on Vehicles Equipped with Electronic Stability Control (ESC)

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

How to Obtain Additional Maintenance and Service Information

Refer to Maintenance Manual MM-0112, Anti-Lock Braking System (ABS) for Trucks, Tractors and Buses. Call ArvinMeritor's Customer Service Center at 800-535-5560 to obtain this publication. Meritor WABCO publications are also available on our website:

www.meritorwabco.com

How to Obtain Kits

Contact the OnTrac Customer Service Center at 866-668-7221.

Kit 400 850 360 0

The steering angle sensor field kit (part number 400 850 360 0) is required for completing the replacement procedure. The kit consists of the following parts.

- Steering angle sensor (SAS)
- Grease packet
- Three screws
- Field inspection, replacement and calibration instructions
- Return envelope for removed SAS with serial number less than 3404
- Tag to record Vehicle Identification Number (VIN) that will accompany SAS in the return envelope

Tools

To complete this procedure, you will need screwdrivers appropriate for the type of screws used to attach the steering column lower shroud, and the steering angle sensor to the mounting bracket.

This installation guide provides steps for SAS replacement on vehicles equipped with ESC.

- Inspecting part number and serial number on SAS
- SAS replacement
- SAS calibration and ESC initialization

Inspecting Part Number and Serial Number on the Steering Angle Sensor (SAS)

This section provides instructions on how to identify the part number and serial number of the Meritor WABCO Steering Angle Sensor, a component used in vehicles equipped with Electronic Stability Control (ESC). Figure 1.

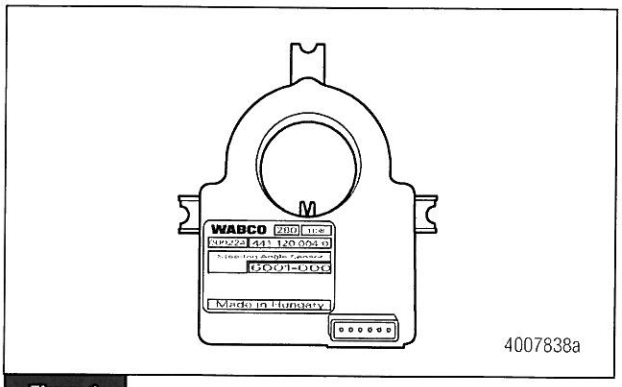


Figure 1

Inspection Procedure

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Use a screwdriver to remove the screws on the shroud covering the lower portion of the steering column. Remove the shroud. This will expose the connection between the steering shaft and the I-shaft. The SAS is mounted just above this joint. Figure 2.

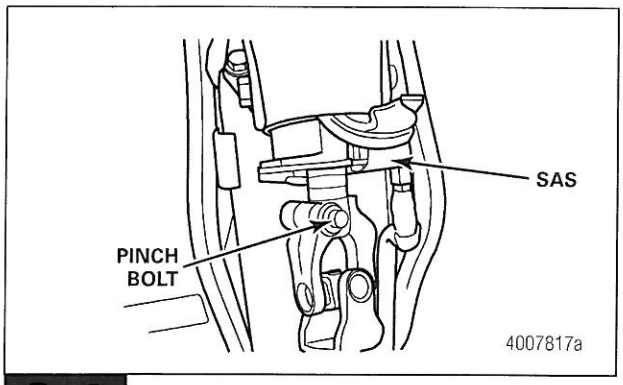


Figure 2

3. Locate the label on the exposed face of the SAS. It may be necessary to use a small mirror to view this while installed on the column. Record the part number and serial number of the SAS according to the type of label you find.

Types of Labels

There are three types of labels you may find on the SAS.

For the label type in Figure 3, the part number is the 10-digit number starting with 441 in the second line of the text below "WABCO". The serial number is the 6-digit number directly below "WABCO".

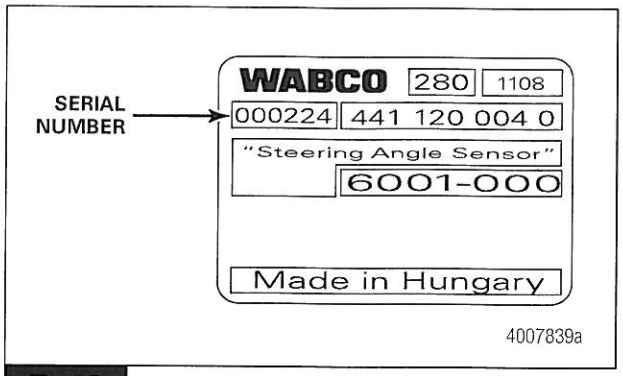


Figure 3

For the label type in Figure 4, the 10-digit part number which starts with 400 is directly below "MERITOR WABCO" and the 6-digit serial number is directly above the "Made in Hungary" text.

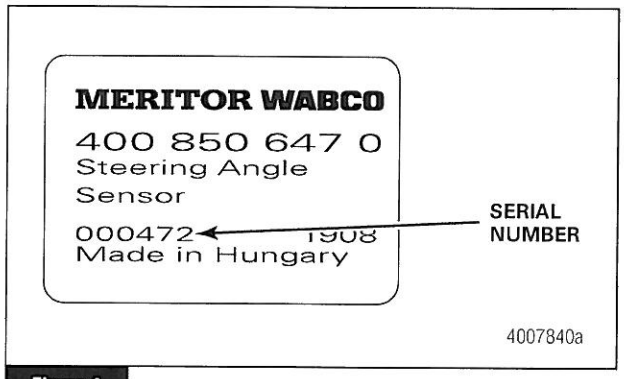


Figure 4

A third variation of the SAS shown in Figure 5 contains the label in Figure 3 as well as another label to the right containing the part number 400 850 666 0. The serial number should be read using the method described for the label in Figure 3.

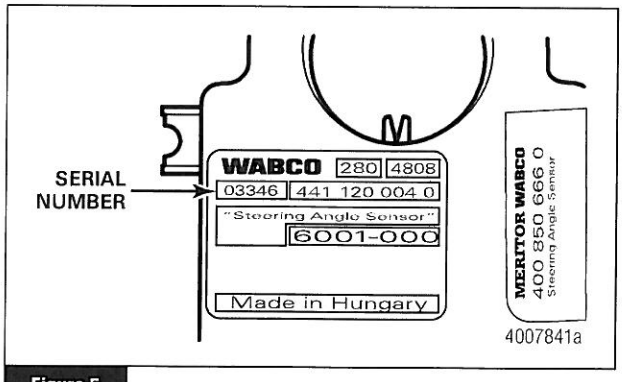


Figure 5

NOTE: Steering angle sensors with serial numbers less than 3404 must be replaced with an SAS with a serial number of 3404 or higher. Refer to the Steering Angle Sensor Replacement instructions in this guide; or to Maintenance Manual MM-0112.

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Steering Angle Sensor Replacement

This section provides procedures for replacing the Meritor WABCO Steering Angle Sensor on vehicles equipped with ESC. Figure 6.

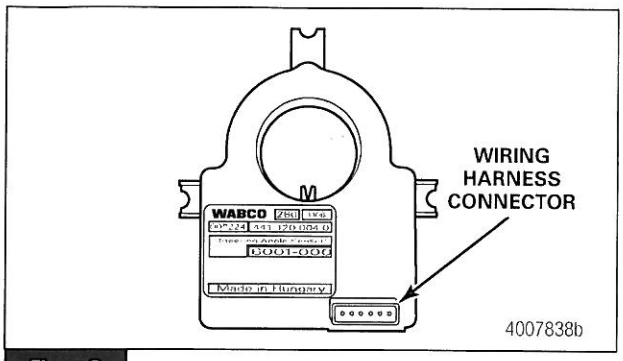


Figure 6

Remove the Steering Angle Sensor

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

1. Park the vehicle on a level surface with the steering wheel centered and the front wheels positioned straight ahead.
2. Turn the ignition switch to the OFF position and apply the parking brake.
3. Block the wheels to prevent the vehicle from moving.
4. Remove the shroud that covers the lower portion of the steering column. This exposes the connection between the steering shaft and the I-shaft. The steering angle sensor is mounted just above this joint. Figure 7.

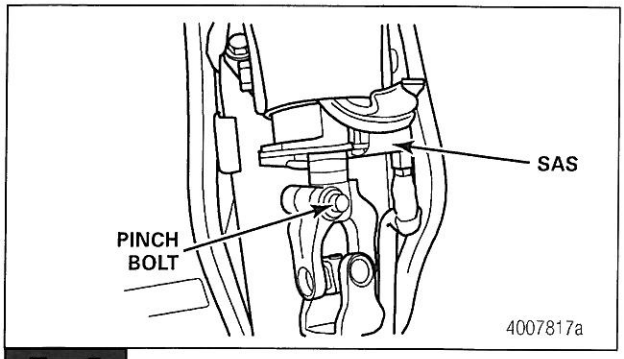


Figure 7

5. Remove the pinch bolt on the top portion of the universal steering joint. This will allow you to slide the joint down and off the steering column.
6. Note the position of the SAS wiring harness connector (Figure 7) — either facing UP or DOWN. The new SAS will need to be positioned the same way when installed. Disconnect the wiring harness connector from the SAS.
7. Remove the three screws that attach the SAS to the steering column and slide the SAS off the shaft. Note the tab in the center of the SAS fits into a groove machined into the steering shaft.

Install the New Steering Angle Sensor

1. Apply a small amount of the supplied grease to the tab in the center of the SAS and to the machined groove on the steering shaft.

   NOTE: The SAS must be installed in the correct orientation or it will not function correctly.

2. Place the SAS over the shaft making sure that the connector is facing the same direction as the original one. Slide the SAS into place. Check to ensure the tab is in the machined groove on the column.
3. Install the three mounting screws provided in the kit and tighten to a maximum of 22 in-lb (2.5 N•m). Do not reinstall the original screws.
4. Install the wiring harness connector. Push the connector together until the small tab snaps into the connector groove.
5. Replace the universal steering joint and tighten the pinch bolt to the vehicle manufacturer specification.
6. Install the steering column shroud.
7. Remove the wheel blocks.
8. Test the SAS installation using the test procedure in this installation guide.

Testing the SAS Installation

The SAS must be calibrated and the ESC initialized in order to test the SAS installation.

1. Perform the SAS calibration and ESC initialization procedures. Refer to the procedures in this installation guide.
2. When the SAS calibration and ESC initialization procedures are complete, turn the ignition power on. The ABS and ATC/ESC lamps should come on and go out. The ATC/ESC lamp may also remain on briefly after the ABS lamp goes off.

3. Check to ensure there are no active faults displayed in the ABS ECU memory.

NOTE: If the SAS does not function as described above, contact the OnTrac Customer Service Center at 866-668-7221 for further information on how to correct any problems with the installation. The ESC may not function correctly if the SAS does not perform as described in this section.

Filing Instructions and Return Parts Procedure

File the claim according to the vehicle manufacturer instructions. A return envelope and tag for recording any required information is included for the return.

SAS Calibration and ESC Initialization Procedures

This section provides instructions for SAS calibration and ESC initialization. These procedures, sometimes referred to as the "ESC End-of-Line" procedure, must be performed as part of the final assembly of the vehicle at the vehicle manufacturer site. These procedures are also required when all or any component such as the SAS, the ESC Module or the ECU have been replaced or a major steering system repair or replacement has been completed including alignment of the front tires. Failure to do so may result in the ESC not functioning correctly.

The SAS calibration procedure must be performed before the ESC initialization.

The status of the procedures can be verified using one of the following faults.

SAS not calibrated — 89 13

ESC initialization required — 88 13

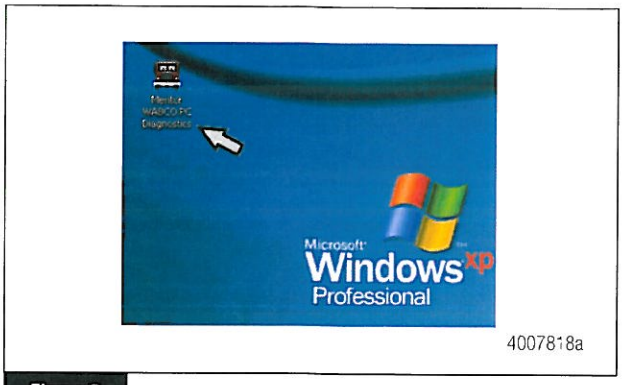
ESC initialization not completed — 88 01

NOTE: Additional faults must not be active when you begin these procedures. If any other faults are present, you must resolve those issues before the main calibration menu items will become available.

SAS Calibration Procedure

NOTE: You must align the front tires before you perform the SAS calibration.

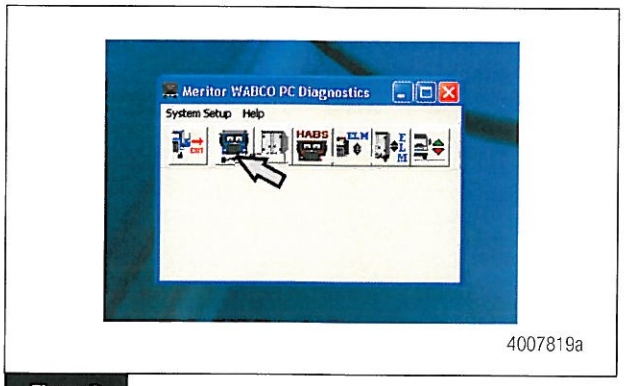
1. To access the Meritor WABCO TOOLBOX™ Software, double-click on the Meritor WABCO TOOLBOX™ icon from the desktop. Figure 8.



4007818a

Figure 8

2. From the message box, click on the Pneumatic ABS button. Figure 9.



4007819a

Figure 9

3. To verify status of the ESC initialization, double-click on the fault box from the initial screen. Figure 10.

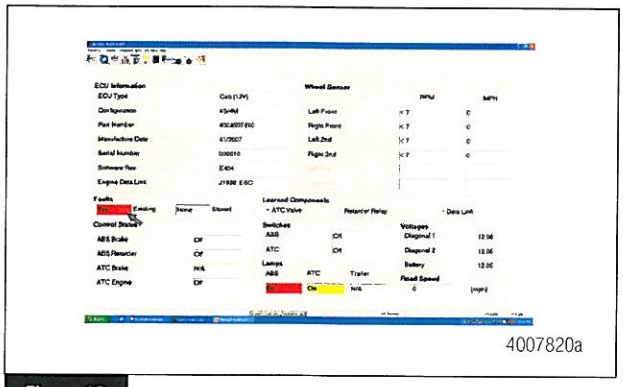


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Figure 10

4. For new vehicles or vehicles where the SAS has been replaced, the message box should show the Steering Angle Sensor code 89-13. Check the code to ensure it is correct. Figure 11.

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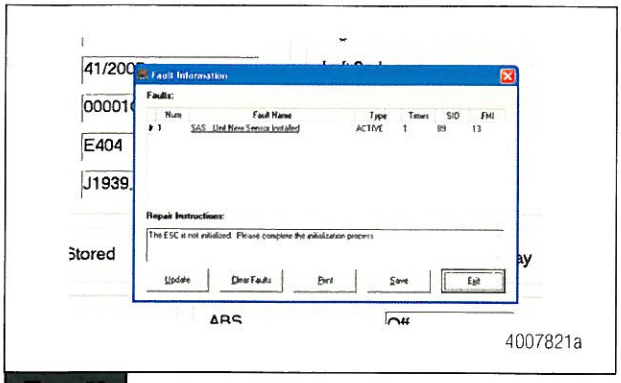

Figure 11

5. To access SAS Calibration, click on the ESC Menu from the bar menu at the initial screen. A drop box will illuminate. Select the "End of Line" option. Figure 12.

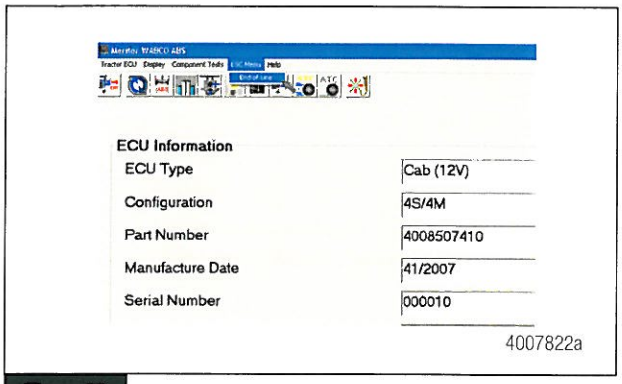

Figure 12

6. Click SAS Calibration in the message box. Figure 13.

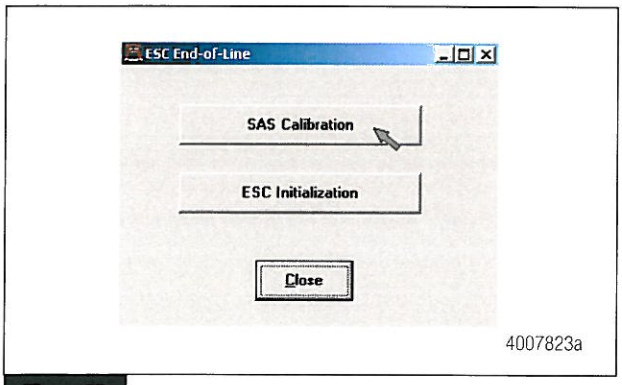

Figure 13

7. Follow the instruction in the message box. Figure 14.

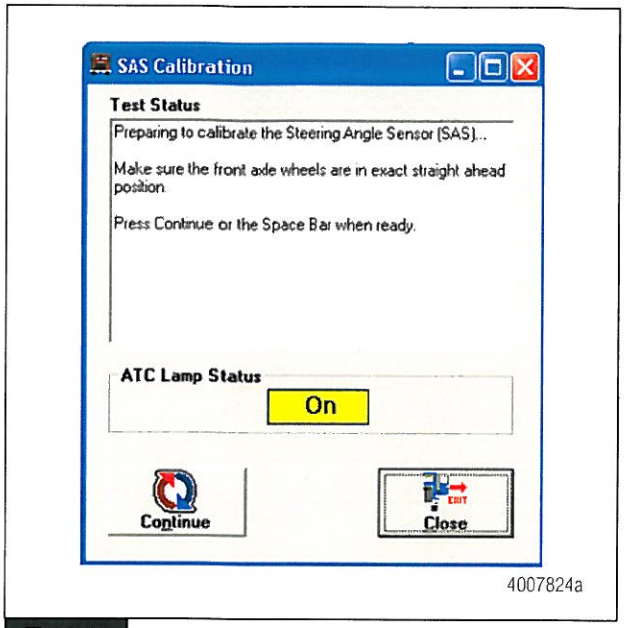

Figure 14

8. The message box will indicate when the SAS has been calibrated. Once the SAS is calibrated, press Close or the space bar to continue. The ESC initialization procedure can now be performed. Figure 15.

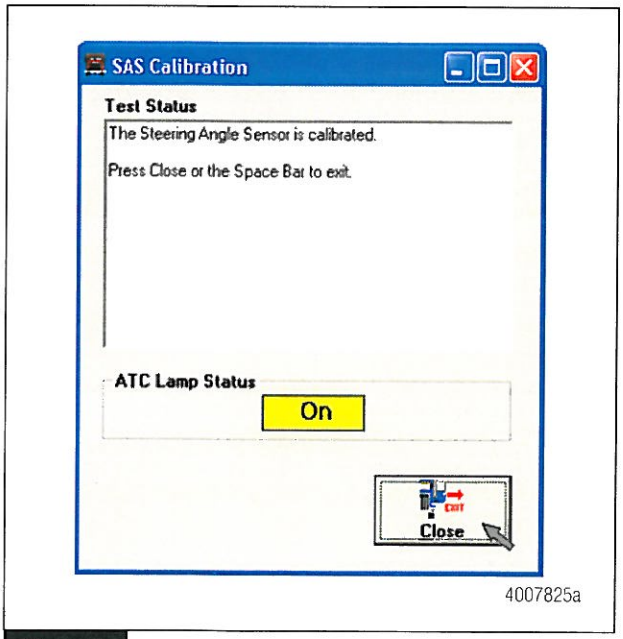

Figure 15

ESC Initialization Procedure

After the SAS calibration is completed, use the following procedure to initialize the ESC.

1. To verify the status of the ESC initialization, double-click on the fault box from the initial screen. Figure 16.

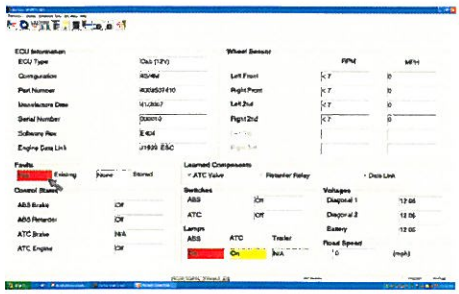

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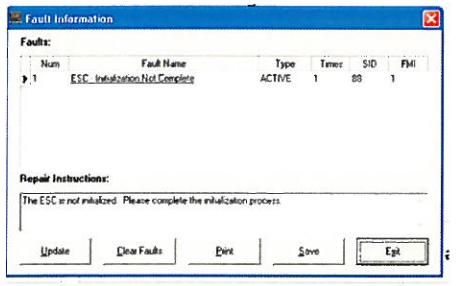
Figure 16

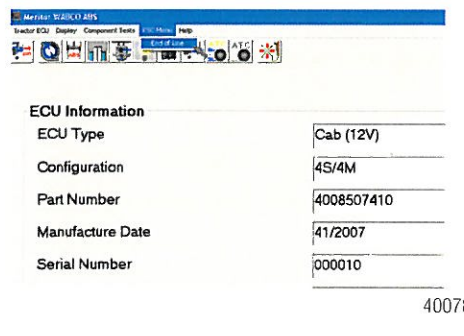
2. The message box should show the ESC Initialization Not Complete code 88-1. Verify the code is correct. Figure 17.



4007827a

Figure 17

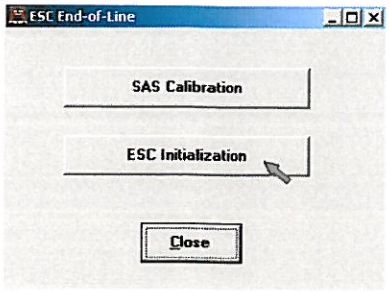
3. Again click on the ESC Menu from the bar menu at the initial screen. Select the "End of Line" option. Figure 18.



4007828a

Figure 18

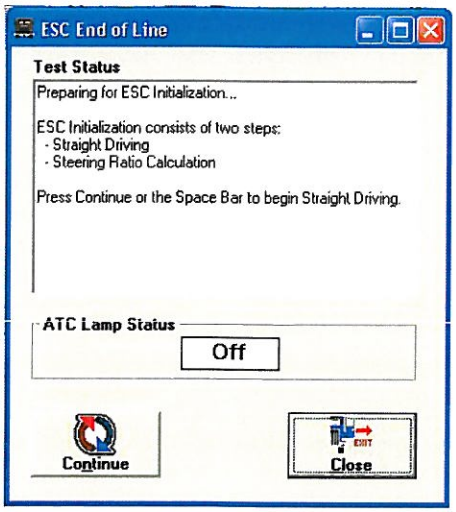
4. Click on ESC Initialization. Figure 19.



4007829a

Figure 19

5. Read the information in the message box. When you are ready to proceed, press the space bar or click Continue. Once the calibration process has started, it will continue until the calibration is complete. No further keyboard inputs are required. Once the calibration process has begun, instructions will appear in the message box and will continue until the calibration is complete. Figure 20.



4007830a

Figure 20

6. Carefully read and follow the instruction in the message box. The ATC/RSC/ESC lamp will start blinking when the 15 mph speed has been reached. When "straight driving" is completed after about 800 feet, the ATC/RSC/ESC lamp will stop blinking and will be on solid. Figure 21.

   NOTE: The "straight driving" can be done in segments and the ECU will accumulate the information until the 800 feet are reached, but it must be done in the same ignition cycle.

NOTE: In some applications, you may have preset steering ratios and a message box will appear indicating the calibration procedure is complete. In this case, click Close and cycle the ignition. When the ignition is turned back on, check that no active faults are logged and the ABS and ATC/RSC/ESC warning lamps are off. The calibration is complete.

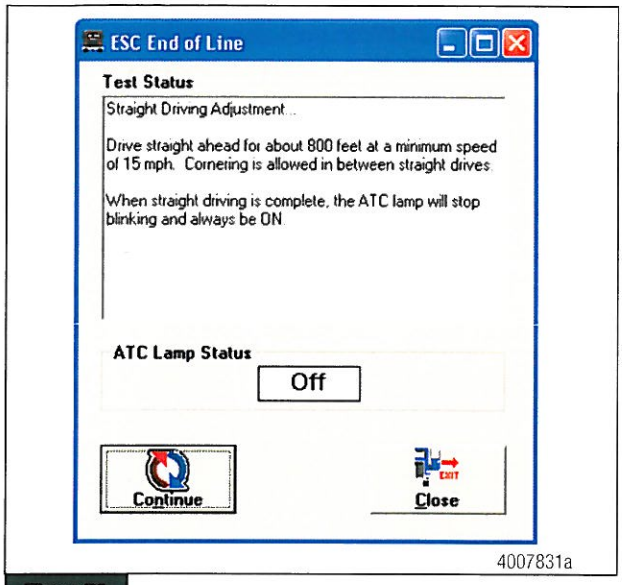


Figure 21

7. A message will appear after the "straight driving" is complete. Carefully read and follow the instructions in the message box. Start driving in a circle with the steering wheel rotated 360 degrees. No keyboard input is required. Figure 22.

   NOTE: The "circle driving" may also be done in segments and the ECU will accumulate the information until the required distance is reached, but it must be done in the same ignition cycle.

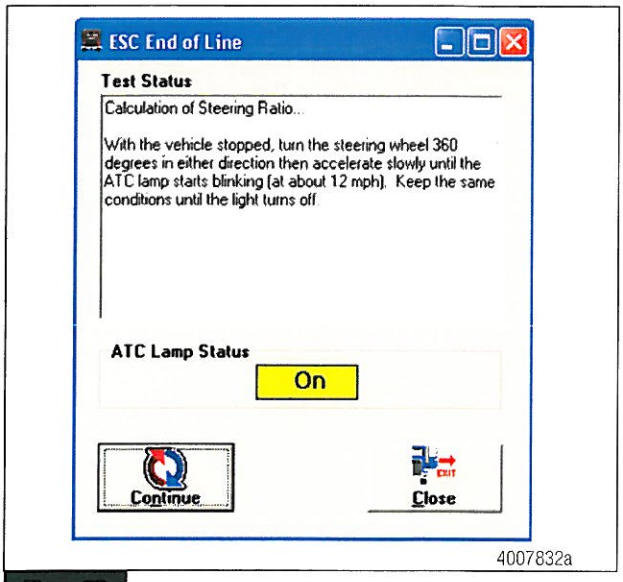


Figure 22

8. Read the message box carefully. The ATC/RSC/ESC lamp will start blinking when the required conditions are met. Keep driving until the lamp turns off. Figure 23.

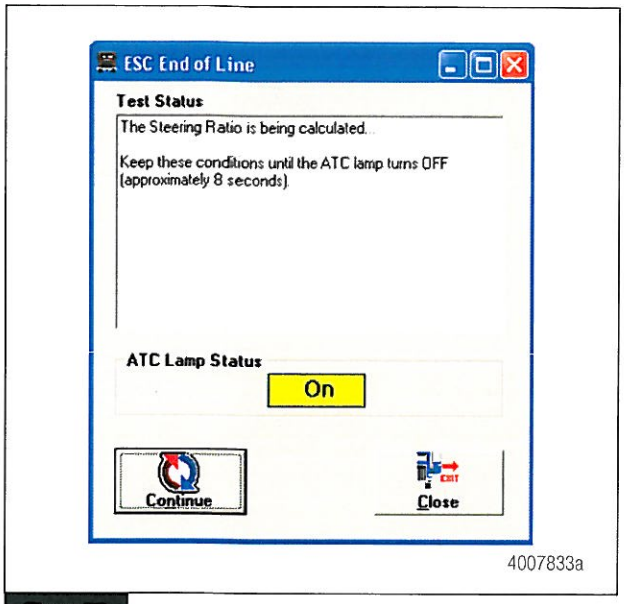


Figure 23

9. This message will appear after the steering ratio has been calculated. Figure 23. Stop the vehicle. Read the message box carefully and follow the instructions. Turn the steering wheel 360 degrees in the opposite direction from being centered. Repeat the driving conditions. Again, the ATC/RSC/ESC lamp will start blinking when the required conditions are met. Keep driving until the light turns off. Figure 24.

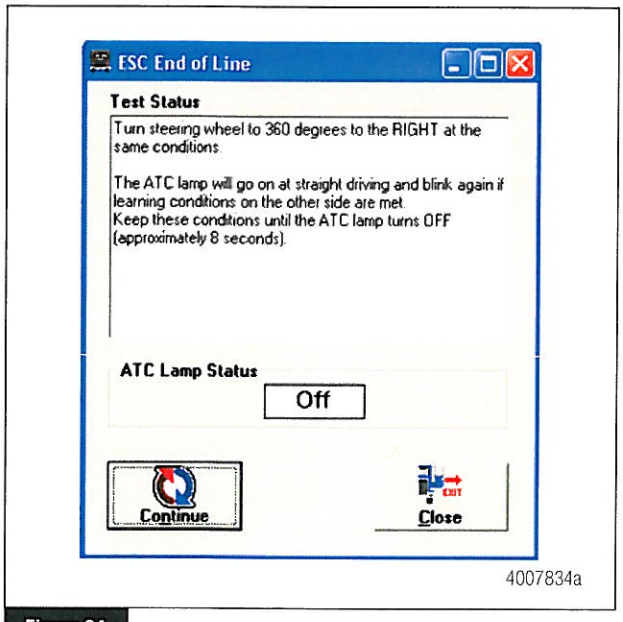


Figure 24

10. A message box will appear with the Steering Ratio and Steering Angle Offset values. Click Close. Figure 25.

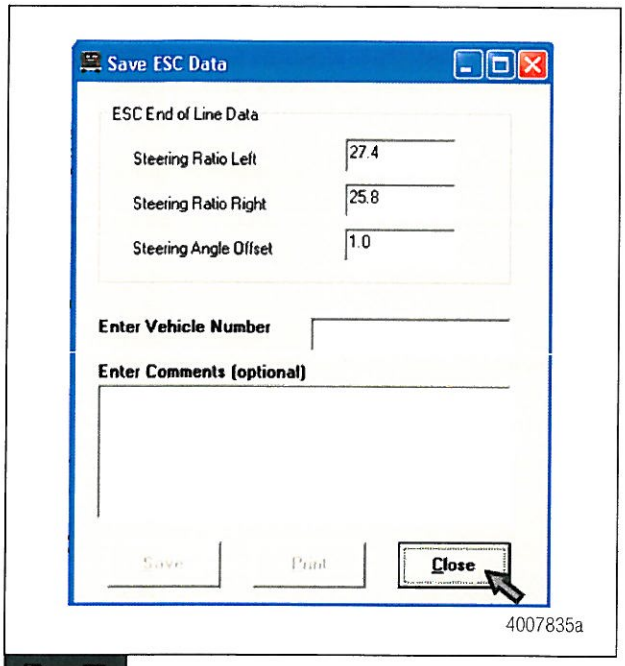


Figure 25

11. Read the message box and follow the instructions carefully. Click Close. Cycle the ignition. Figure 26.

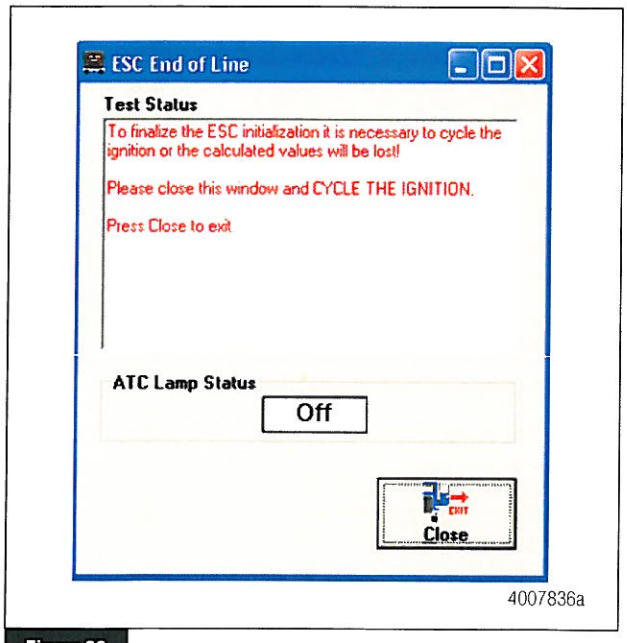


Figure 26

12. When the ignition is turned back on, check that no active or stored faults are logged in the ECU and the ABS and ATC/RSC/ESC warning lamps are off. Figure 27.

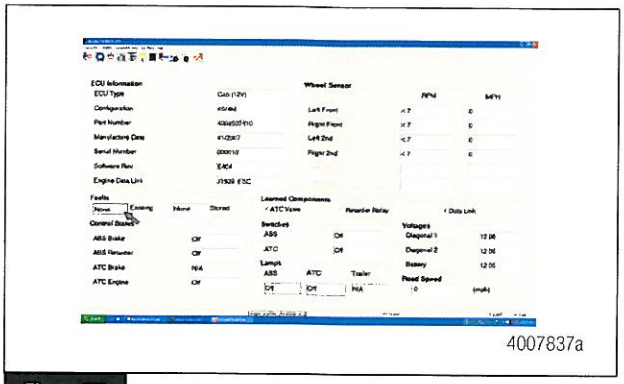


Figure 27

It is important to the correct functioning of the ESC that the ESC/SAS calibration procedure occur exactly as outlined in this document. If the SAS or ESC calibration instructions and procedures do not occur as described above, refer to Maintenance Manual MM-0112, or contact the OnTrac Customer Service Center at 866-668-7221.

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