Installation Instructions

Steering Angle Sensor

SAFE MAINTENANCE PRACTICES

WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed at all times:

1. **Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses. Where specifically directed, the parking brakes may have to be released, and/or spring brakes caged, and this will require that the vehicle be prevented from moving by other means for the duration of these tests/procedures.**
2. **Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components.**
3. **Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.**
4. **If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with an AD-IS® air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.**
5. **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.**
6. **Never exceed manufacturer's recommended pressures.**
7. **Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.**
8. **Use only genuine Bendix® replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.**
9. **Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.**

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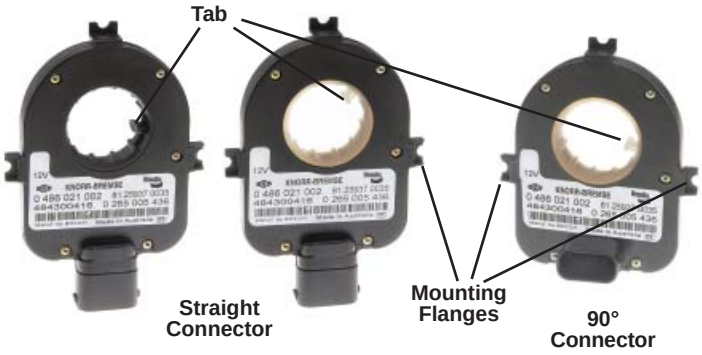

FIGURE 1 - EXAMPLES OF STEERING ANGLE SENSORS

10. **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**
11. **For vehicles with Antilock Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.**

WARNING! If the Steering Angle Sensor is not recalibrated, the yaw control system may not function properly, which can result in incidents leading to loss of vehicle control and/or personal injury. Refer to the vehicle/steering column manufacturer's manual(s) for instructions regarding recalibration of the Steering Angle Sensor.

NOTE: In some cases, the vehicle will need to be connected to a computer with PC Diagnostic Software to calibrate the new sensor before a vehicle's full advanced ABS features will be restored - refer to the vehicle manufacturer's manual.

WARNING! Only technicians who have had specific training for diagnosing or repairing steering systems should attempt to make the repairs outlined in these instructions. This service procedure does not replace your manuals; use both these instructions and your vehicle/steering column manufacturer's manual(s) together as your guide in carrying out the diagnosis and/or replacement. Use of the correct equipment, tools, etc. are necessary to perform the work correctly and safely. If in doubt, contact the vehicle and or steering column manufacturer(s) for further information.

Sensor Location Modifications

The location and orientation of the Steering Angle Sensor must not be altered. When servicing, an identical component must be used in the same orientation (using OEM brackets & torque requirements). Reference the OEM and/or steering column manufacturer's documentation for instructions and replacement interfacing parts.

WARNING! Install only OE-approved steering wheels on vehicles with steering angle sensors. Non-approved steering wheels could potentially interfere with the correct functioning of the sensor and/or cause an ABS diagnostic trouble code. Damage to this sensor may lead to loss of vehicle control and/or personal injury.

Preparation

1. Inspect all wiring and connectors. Note that some installations also include an intermediate connector from the steering angle sensor to the main vehicle wire harness. Make sure all connections are free from visible damage.
2. Examine the sensor. Make sure the sensor, its mounting screws, and the interface between the tab and the steering column are not damaged.

Diagnostics

No independent diagnostics can be performed on the sensor.

Removal

1. Remove the steering column shroud/sheathing.
2. Depending upon the manufacturer, the steering angle sensor may be located either near the steering wheel, necessitating the removal of the steering wheel, or near the joint to the vehicle steering mechanism, necessitating the disconnection of this linkage. Follow all vehicle OEM and/or steering column manufacturer instructions for disassembly of these components, which must be removed before the steering angle sensor can be accessed.
3. Unplug the sensor cable assembly from the sensor body by squeezing the mounting tabs and pulling gently on the connector until it disengages.
4. Unscrew the two (or three) mounting screws that hold the body of the sensor to the steering column body. Note: In certain vehicles, one of the mounting flanges fits into a slot instead of being held in position by a screw. Retain the screws for reinstallation.
5. Remove the sensor by sliding it off the steering column. Make a note whether the sensor label is facing upward or downward since the replacement sensor needs to be installed with the same orientation. The sensor is not repairable in the field.
6. It is recommended that if the sensor is mounted to a vehicle component made of plastic, the plastic piece should be replaced by a new original equipment part. See the vehicle OEM and/or steering column manufacturer instructions for replacement parts.

Installation

1. Slide the sensor over the column, following the arrangement used for the original, including the direction that the label faces. **The center tab of the sensor (see Figure 1) must be aligned with the corresponding notch in the column.**
2. Fasten the steering angle sensor body to the column with three self-locking screws (or two in cases where the third mounting flange is inserted into a slot).

WARNING! All mounting flanges must be affixed to the non rotating portion of the steering column in order to prevent mis-alignment and damage.

3. Tighten screws to 1.4 N•m (1 lb-ft, or 12 lb-in). [As of the date of this document (5/07) TRW recommended a torque of 15 lb•in for its aluminum columns.] Where recommended by the steering column manufacturer, apply a high-temperature thread sealant (e.g. Loctite® Dri-Seal™ 513, or similar) to the screws. Take care to prevent excess sealant from reaching any part of the sensor.
4. Ensure that the inner hub of the steering angle sensor rotates freely, and that it turns at the same rate as the steering wheel.
5. Reconnect the connector. Ensure that the connector wiring is routed so that, when installed, there will be no pulling force applied to the sensor throughout the full range of motion of the steering wheel because of insufficient connector wiring.
5. In cases where the wire harness leading to the sensor is being replaced, ensure that it is adequately tie wrapped so that the full motion of the steering column can be achieved without pulling on the connector.
6. Take care not to permit any dirt, water etc. to enter the sensor during installation. Reinstall the column sheathing etc as removed during the removal process.

Sensor Calibration

Use the method recommended by the vehicle manufacturer to calibrate the new sensor. In some cases, this will include using PC software to communicate with the vehicle's ABS controller. Be sure that any Diagnostic Trouble Codes present in the vehicle's ABS system are investigated and resolved before returning the vehicle to service.

WARNING! In typical ABS systems, if the Steering Angle Sensor is not recalibrated, advanced ABS control systems may not function properly, which can result in incidents leading to loss of vehicle control and/or personal injury.

Typical situations where the sensor must be recalibrated are:

- Replacement or removal of the steering angle sensor
- Any maintenance or repair work on the steering linkage, steering gear or other related mechanism
- Adjustment of the wheel alignment or wheel track
- After an accident that may have led to damage of the steering angle sensor or assembly