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MSD Thread Subject

Steering angle sensors - Theory, faults and diagnostics

MSD Post Content

Good afternoon MSD community! I wanted to share with you all today some of the theory of operation with the Steering angle sensors (SAS) on Slingshot models. I will highlight the operation of the MY20+ models as well as some issues we have been seeing on ask polaris cases and some of the challenges in diagnostics also some of the items to look for when using DW1, we are currently working on some challenges with DW2 for viewing the rack angle. Theory of operation: The Steering Angle sensor is used by the Electronic Stability Program (ESP/ABS) to determine steering wheel position in relation to a calibrated central location. Direct CAN signal from the Rack Angle sensor within the steering rack to the ESP module is used in conjunction with other ESP/ABS inputs (wheel speed, gradient and yaw rate) to determine vehicle stability. The hydraulic modulator is activated during stability control events to control individual wheel speed and braking needs to correct vehicle attitude. The rack angle is calibrated into what is known as the Steering angle sensor reading and needs to be calibrated to the unit due to tolerance stacking within the entire steering system. Components affecting this calibration include the steering wheel, steering shaft, rack and pinnion ASM and tie rod ends. The rack angle sensor reading when doing the "zero" of the sensor needs to be within 15 degrees, if above the allowed 15 degrees there is a component out of adjustment or damaged. Faults: Source: ABSSTABILITY U0126 : Steering angle sensor out of range U0428 : Invalid Data Received From Steering Angle Sensor Module Source: Power Steering Module C0055 : Steering Wheel Position Sensor "Signal D" These codes are typical of an uncalibrated SAS, follow the below procedure to start diagnosis: Diagnostic : The first step when experiencing a SAS error code is open up DW 1 and attempt to see what reading you get out of the "RACK ANGLE" data of the SAS. It is normal to see "error" under the SAS reading when not calibrated or not within the 15 degree. With the wheels straight are you reading 0 (+/-15) Degrees? if yes , proceed to calibrating the SAS to "zero" and unit will calibrate. With the wheels straight are you reading 0 (+/-15) Degrees? If No, we need to find out what is causing the tolerance stack to rise up above the allowed calibration data. 1. Steering wheel splines: MY20+ models have a master spline on the steering wheel. Some steering wheels were incorrectly installed at the factory, or had work done and were not correctly reinstalled in the field. See attachment "Steering wheel damage". In this case, you will notice also the Rack angle was reading 37.4 out of spec for the "SAS calibration". 2. Front end damage/Rack damage : Inspect tie rod ends and steering rack for any bent, or loose components. This can cause values to fall out of spec. 3. SAS Faulty: If you are still not able to see a reading from the "rack angle" on DW1. Inspect the connections at the steering rack, the SAS on MY20+ is located on the rack ASM itself, it has a small jumper harness coming from the sensor the main EPS/Rack controller. At this time it is not available separately and rack replacement would be needed. Make sure to start an ask Polaris case prior to rack replacement.