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2020+ Slingshot Steering Angle Sensors



This article contains some of the theory of operation with the Steering Angle Sensors (SAS) on Slingshot models. It highlights the operation of the MY20+ models as well as some issues we have been seeing and some of the challenges in diagnostics.

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 pinion assembly and tie rod ends.

Faults

These are codes that pertain to the Steering Angle Sensor. If any of these codes populate, follow the steps in the diagnostics section below.

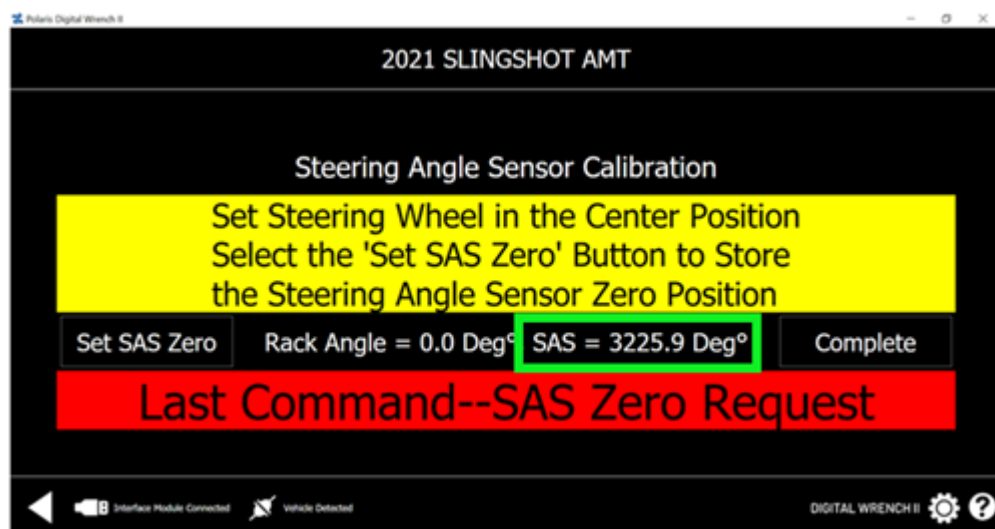
Fault Code	Definition
C0051	Received Steering Angle Sensor received error or not plausible
C0052	SAS reading is the incorrect turn direction
C0055	SAS not plausible compared to vehicle accelerometer
C105A	Steering Angle Sensor not calibrated
C1062	Steering Angle Sensor out of range
C11D7	Error with the internal Steering Angle Sensor
U0126	SAS Message not seen or seen too frequently from EPS
U0428	SAS message inconsistent or out of range from EPS module
U1114	SAS message not seen or inconsistent from EPS module
U1115	SAS counter from EPS not seen or incorrect
U1116	SAS checksum from EPS incorrect

Diagnostics

The first step when experiencing an SAS error code is to open Digital Wrench II (DWII) and attempt to see what reading you have under "Rack Angle" on the Steering Angle Sensor calibration page. The Rack Angle sensor should never read outside of +/- 15 Deg° with the steering wheel straight. If it does, there is an issue that needs to be resolved before moving to the zeroing of the sensor (Set SAS Zero). Some of the root causes can be seen below.

In the situations where the SAS was calibrated with the Rack Angle Sensor above or below the allowed 15 Deg°, you will have to recalibrate the SAS in 15-degree increments back to "true zero." DWII will only allow corrections of 15-degree increments.

Note: If the SAS reading is showing 3225.9, DWII will require you to back out of the calibration screen and erase all controller fault codes before starting the zeroing procedure.



Root Causes

Steering Wheel Splines

The steering wheel has a master spline on the steering shaft. If installed incorrectly, the Rack Angle will read outside the accepted +/- 15 Deg° window.

The image below shows steering wheel damage.



Example: Due to the damage to the steering wheel splines, the Rack Angle is reading 19.3 Deg° and is out of spec for the "SAS calibration."



Once the steering wheel is repositioned in the master spline, move the steering wheel so that the SAS reading is zero. You will have to turn the steering wheel towards the center position in 15-degree increments, resetting the value each time until the steering wheel is straight.

** Digital wrench will only allow corrections of 15-degree increments.

Note: Always cycle ignition power after clearing fault codes or setting the "SAS Zero" into its final position.

Front End Damage/Rack Damage

Inspect tie rod ends and the steering rack for any bent or loose components. Bent or loose components can cause values to fall out of spec.

SAS Faulty

If you are still not able to see a reading from the "Rack Angle" on DWII inspect the connections at the steering rack. The SAS on MY20+ is located on the rack assembly itself. It has a small jumper harness coming from the sensor on the main EPS/Rack controller. At this time the small jumper harness is not available separately and rack replacement would be needed. Make sure to start an ask Polaris Case prior to rack replacement.

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