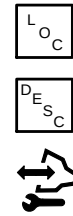
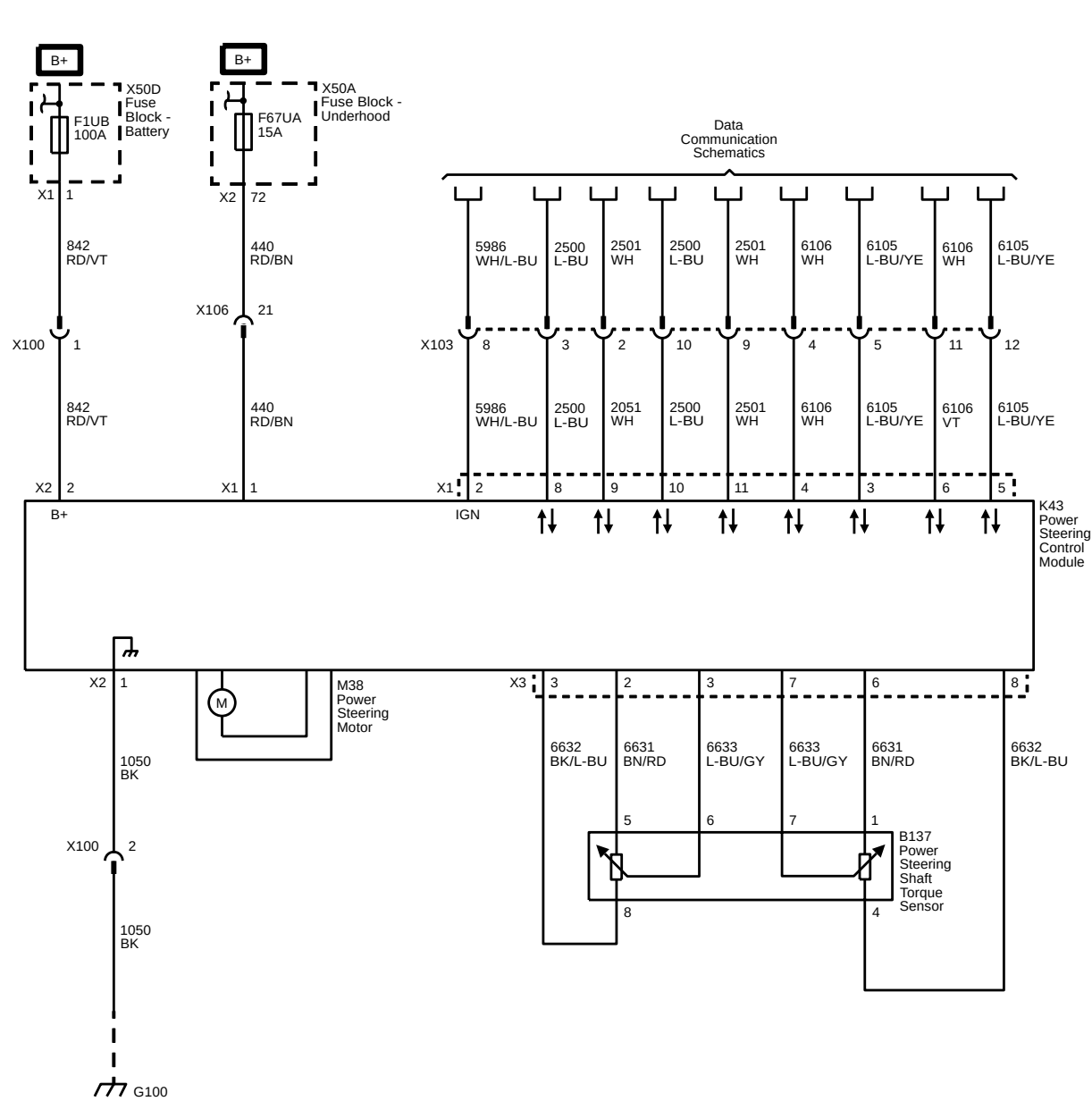


Electric Power Steering



Description and Operation

Power Steering System Description and Operation

The belt driven electronic power steering system consists of the following components:

- The integrated electromechanical power steering unit, containing the power steering control module, its sensors, the power steering motor, a belt drive and a ball nut mechanism.
- The steering gear (rack and pinion)

The power steering control module is part of the power steering assist motor assembly and is replaceable as a complete unit independent of the steering gear assembly. The steering wheel torque and angle sensor is integrated with the steering gear pinion and is serviced as part of the steering gear.

The belt driven electric power steering system reduces the amount of effort needed to steer the vehicle utilizing the power steering control module to control the power steering motor to maneuver the steering gear. The power steering control module also uses a combination of the torque sensor, motor rotational sensor, battery voltage circuit and serial data circuit to perform the system functions. At low speeds more assist is provided for easy turning during parking maneuvers. At higher speeds less assist is provided for improved road feel and directional stability.

The power steering control module continuously monitors the digital torque sensor's torque and index current signals. As the steering wheel is turned and torque is applied to the steering shaft, the steering input and output shafts are monitored via the torque signal circuit and then processed by the power steering control module to calculate the steering torque. The voltage signals of the motor position sensor and the digital torque sensor's index current signal are both processed by the power steering control module to detect and calculate the steering wheel angle.

The power steering control module responds to the change in the digital torque sensor signals as well as the motor rotational sensor's voltage signals by commanding current to the power steering motor. The power steering control module controls the motor drive circuit to drive the alternating current motor. The power steering control module and motor assembly is attached to the base of the steering gear housing and applies power assist directly to the rack with a belt drive and a ball nut mechanism to maneuver the rack laterally depending on the direction the steering wheel is turned.

The power steering control module has advanced software features referred to as Active Pull Compensation and Smooth Road Shake Compensation.

Active Pull Compensation constantly measures steering wheel torque being applied by the driver to maintain the vehicle's path. When the software detects extra effort being used, the steering assist motor adds torque in the proper direction to prevent the driver from having to make corrections to keep the vehicle on course. The torque assistance reduces driver fatigue and effort and makes steering easier. The software automatically resets itself to compensate for changing road conditions or the vehicle turning on curves. This software feature will compensate for a specific range of lead/pull up to its maximum limit within a set of parameters. The feature can be disabled during diagnostics for appropriate root cause of a complaint vehicle.

Smooth Road Shake Compensation reduces steering wheel rotational vibration caused by an imbalance from the front tire/wheel assemblies. The rotational vibration transmitted to the steering wheel is referred to as Smooth Road Shake and is a phenomenon that occurs only at highway speeds and on smooth roads. The power steering control module employs active controls to sense and reduce the periodic torque component applied to the steering wheel caused by the wheel imbalance force. This software feature will compensate for a specific range of imbalance. If the imbalance is above a certain level, the power steering control module will disable the smooth road shake compensation software feature.

The power steering control module has the ability to calculate an internal system temperature to protect the power steering system from potential damage. To reduce a high system temperature, the power steering control module will reduce the amount of current commanded to the power steering motor, which reduces the amount of steering assist and will set DTC C0176.

The power steering control module has the ability to detect malfunctions within the electric power steering system. Any malfunction detected that disables steering assist will cause the SERVICE POWER STEERING or STEERING ASSIST IS REDUCED DRIVE WITH CARE message to be displayed on the driver information center.

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