

2013 STEERING

Power Steering - Cruze

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Intermediate Steering Shaft Bolt	34	25 lb ft
Power Steering Assist Motor Bolt	8 (1)	71 lb in (1)
Stabilizer Shaft Link Nut (1)	65	48 lb ft
Steering Gear Bolt	110 + 150 degrees to 165 degrees (1)	81 lb ft + 150 degrees to 165 degrees (1)
Steering Gear Valve Solenoid Bolt	8	71 lb in
Steering Linkage Inner Tie Rod	105	77 lb ft
Steering Linkage Inner Tie Rod Nut	60	44 lb ft
Steering Linkage Outer Tie Rod Nut	35 (1)	26 lb ft (1)
Steering Wheel Bolt	30	23 lb ft
1 = Use NEW Fastener.		

SCHEMATIC WIRING DIAGRAMS

POWER STEERING WIRING SCHEMATICS

NJ1

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

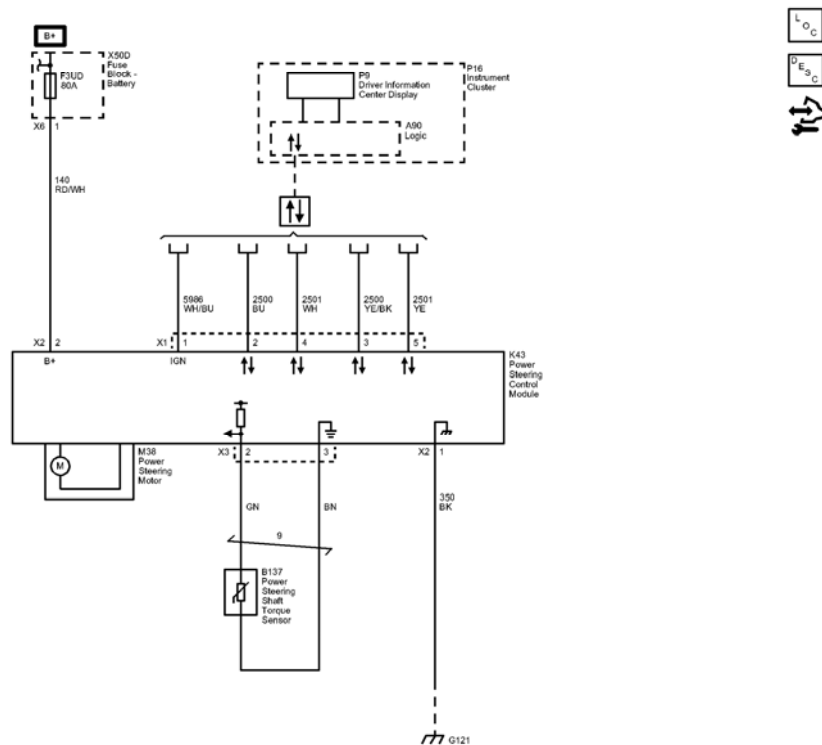


Fig. 1: Power Steering (NJ1) Wiring Schematics
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
140	Battery Positive Voltage
140 RD/WH	140 RD/WH
CAV_2	2
CONN_X2	X2
CAV_1	1
CONN_X6	X6
SD	Serial Data
Data_Communication_Schematics_REF	Data Communication Schematics
5986	Serial Data Communication Enable
5986_WH/BU	5986 WH/BU
CAV_1	1
CONN_X1	X1
2500	High Speed GMLAN Serial Data (+) (1)
2500_BU	2500 BU

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

CAV_2	2
2501	High Speed GMLAN Serial Data (-) (1)
2501 WH	2501 WH
CAV_4	4
2500_YE/BK	2500 YE/BK
CAV_3	3
2501_YE	2501 YE
CAV_5	5
_GN	GN
CAV_2	2
CONN_X3	X3
_BN	BN
CAV_3	3
350	Ground
350_BK	350 BK
CAV_1	1
CONN_X2	X2
G121	G121
F3UD	F3UD 80A
TWIST 9	9
X50D	
K43	
M38	
B137	(NJ1)
P16	
A90	Logic
P9	

DIAGNOSTIC INFORMATION AND PROCEDURES**DIAGNOSTIC CODE INDEX****DIAGNOSTIC CODE INDEX**

DTC	Description
<u>DTC C005B (NJ1)</u>	DTC C005B 00 Power Steering Softstops Learn
<u>DTC C0176</u>	DTC C0176 54 Control Module Temperature Sensor High Temperature
<u>DTC C044A (NJ1)</u>	DTC C044A 71 Steering System Engine Speed Signal Circuit Invalid Data
<u>DTC C0456 (NJ1)</u>	DTC C0456 4B Steering Position Sensor Calibration not Learned

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

<u>DTC C0460 (NJ1)</u>	DTC C0460 00 Steering Wheel Angle Sensor Malfunction DTC C0460 4B Steering Wheel Angle Sensor Calibration Not Learned
<u>DTC C0475 (NJ1)</u>	DTC C0475 00 Electric Steering Motor Circuit Malfunction DTC C0475 59 Electric Steering Motor Circuit Protection Time-Out
<u>DTC C047A (NJ1)</u>	DTC C047A Electric Steering Motor Position Sensor Circuit Malfunction
<u>DTC C0544 (NJ1)</u>	DTC C0544 5A Steering Wheel Angle Sensor Signal Not Plausible
<u>DTC C0545 (NJ1)</u>	DTC C0545 Steering Wheel Torque Sensor Malfunction
<u>DTC C055C (NJ1)</u>	DTC C055C 00 Steering Gear Performance Malfunction DTC C055C 64 Steering Gear Performance Slip Detected
<u>DTC C0565 (NJ1)</u>	DTC C0565 5A Vehicle Identification Number Not Plausible
<u>DTC C0569 (NJ1)</u>	DTC C0569 3A System Configuration Incorrect Component Installed
<u>DTC C056E (NJ1)</u>	DTC C056E 41 Electronic Control Unit Hardware Not Programmed DTC C056E 4B Electronic Control Unit Hardware Calibration Not Learned
<u>DTC C0710 (NJ1)</u>	DTC C0710 71 Steering Position Signal Invalid Data

DTC C005B (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C005B 00

Power Steering Softstops Learn

Circuit/System Description

If the power steering power pack is replaced, the calibration needs to be learned to the new power steering

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

power pack. The power steering control module will set a DTC, if the required parameters are not learned.

Conditions for Running the DTC

Ignition Switch in OFF, ACCESSORY or ON position, power steering control module in communication mode.

Conditions for Setting the DTC

The soft endstop is not learned by the new power steering control module.

Action Taken When the DTC Sets

DTC C005B is stored in memory.

Conditions for Clearing the DTC

The software endstops need to be learned to the new power steering control module using a scan tool, performing the Configuration/Reset functions Power Steering Softstops Reset and Power Steering Softstops Learn.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

1. Ignition ON.
2. Verify DTC C005B is not set.
 - **If DTC C005B is set**

Program the K43 Power Steering Control Module.

- **If DTC C005B is not set**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Power Steering Assist Motor Replacement**
- **Control Module References** for Power Steering Control Module programming and setup.

DTC C0176

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0176 54

Control Module Temperature Sensor High Temperature

Circuit/System Description

The power steering control module monitors the temperature of the Power Steering System. The power steering control module uses voltage, current levels and input from an internal temperature sensor to calculate an estimated system temperature. If the power steering control module detects a high system temperature event is occurring, the amount of assist is decreased to reduce system temperature, in effort to prevent thermal damage to the power steering components.

Conditions for Running the DTC

- Ignition ON, engine Running.
- Power steering system voltage is 9-16 volts.
- Repetitive steering input applied.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

Conditions for Setting the DTC

The power steering control module detects a high system temperature.

Action Taken When the DTC Sets

- DTC C0176 54 is stored in memory.
- Steering assist is reduced.

Conditions for Clearing the DTC

- A current DTC will clear on the next malfunction-free ignition cycle.
- A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Diagnostic Aids

- DTC C0176 54 does not indicate that a malfunction has occurred. Rather that the power steering control module had to limit current to the power steering motor to avoid thermal damage to the power steering system components. Discuss with the customer about driving conditions when the steering assist was reduced.
- Ensure that no steering components down stream of the power steering column assembly, such as ball joints, tie rod ends, universal joints, or the steering gear assembly, are mechanically binding.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information**Circuit/System Verification**

1. Verify that the DTC sets outside of the conditions for running and setting. Since most occurrences of this DTC are caused by excessive driver inputs, review with the customer the conditions under which the DTC set. Operate the vehicle within the conditions that the customer experienced, avoiding excessive inputs, and verify the DTC does not reset.
 - **If the DTC did not set outside of the conditions for running and setting**
 1. Ignition ON.
 2. Verify that no steering components down stream of the power steering column assembly are mechanically binding. Refer to **Steering Effort Hard or Too Easy in One or Both Directions**
 - If steering components are mechanically binding, replace the mechanically binding steering components.
 - If no steering components are mechanically binding
 3. Replace the Steering Gear.
 - **If the DTC set outside of the conditions for running and setting**
2. All OK. The power steering is operating as designed.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Control Module References** for power steering control module replacement, programming and setup.

DTC C044A (NJ1)**Diagnostic Instructions**

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor**DTC C044A 71**

Steering System Engine Speed Signal Circuit Invalid Data

Circuit/System Description

The power steering control module receives the engine speed signal from the engine control module.

Conditions for Running the DTC

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

The ignition is ON.

Conditions for Setting the DTC

The power steering control module detects a invalid engine speed signal on the CAN Bus.

Action Taken When the DTC Sets

- DTC C044A is stored in memory.
- The driver information center displays the SERVICE POWER STEERING warning message.

Conditions for Clearing the DTC

- A current DTC will clear on the next malfunction-free ignition cycle.
- A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Verify that DTC C044A 71 is not set.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

- If the DTC is set, replace the K43 Power Steering Control Module.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Steering Gear Replacement**
- **Power Steering Assist Motor Replacement** for power steering control module replacement
- **Control Module References** for power steering control module replacement, programming and setup

DTC C0456 (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0456 4B

Steering Position Sensor Calibration not Learned

Circuit/System Description

If the power steering control module is replaced, the calibration needs to be learned to the new power steering control module using a scan tool.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The calibration is not learned to the new power steering control module.

Action Taken When the DTC Sets

- DTC C0456 is stored in memory.
- The driver information center displays the SERVICE POWER STEERING warning message.
- No steering assist.

Conditions for Clearing the DTC

The scan tool function Steering Angle Sensor Centering procedure must be completed successfully.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. With a scan tool, verify that DTC C0456 4B is not set.
 - If the DTC is set, calibrate the steering position sensor and verify the DTC does not reset. Refer to Power Steering Control Module Calibration.
2. If the DTC resets, replace the steering gear.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Steering Gear Replacement
- Power Steering Assist Motor Replacement for power steering control module replacement
- Control Module References for power steering control module programming and setup

DTC C0460 (NJ1)

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0460 00

Steering Wheel Angle Sensor Malfunction

DTC C0460 4B

Steering Wheel Angle Sensor Calibration Not Learned

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition circuit	U0126, C0710 71	U0126, C0710 71	-	C0710 5A
Ground	-	U0126, C0710 71	-	-

Circuit/System Description

The steering wheel angle sensor receives a 12 V reference from the electronic brake control module. The electronic brake control module receives serial data message inputs from the steering angle sensor identifying the position and direction of the steering wheel rotation. The module utilizes this signal to calculate the driver intended driving direction.

Conditions for Running the DTC

The condition for running the DTC will not occur until the initialization phase has been completed. The initialization of the electronic brake control module occurs when the following conditions have been met:

- Ignition voltage is greater than 8 V.
- The initialization happens once each ignition cycle when the vehicle speed is greater than 20 km/h (12 MPH) and the vehicle is driven in a straight line without the brake pedal being applied.

Conditions for Setting the DTC

DTC C0460 00

- Steering angle signal is not valid.
- Steering angle signal line is open.
- Angle signal cycle time is out of range.
- Angle signal duty is out of range.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

DTC C0460 4B

Steering sensor zero position is not set.

Action Taken When the DTC Sets

- DTC C0460 is stored in memory.
- No steering assist.

Conditions for Clearing the DTC

A current DTC will clear on the next malfunction-free ignition cycle.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Steering Wheel Angle parameter value constant change from -550 to +550° as the steering wheel is turned through its entire range from left to right.
 - If the parameter does not change

Refer to Circuit/System Testing Below.

- **If the parameter changes**

3. All OK.

DTC C0460 4B

1. Ignition ON.
2. Verify that DTC C0460 4B is not set.

- **If DTC C0460 4B is set**

Perform the **Steering Angle Sensor Centering** .

- **If DTC C0460 4B is not set**

3. Ignition OFF and all vehicle systems OFF. It may take up to 2 min for all vehicle systems to power down. Disconnect the harness connector at the B99 Steering Wheel Angle Sensor.
4. Test for less than 10 ohms between the ground circuit terminal 6 and ground.

- **If 10 ohms or greater**

1. Ignition OFF.
 2. Test for less than 2 ohms in the ground circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, repair the open/high resistance in the ground connection.
- **If less than 10 ohms**

5. Ignition ON.

6. Verify that a test lamp illuminates between the ignition circuit terminal 5 and ground.

- **If the test lamp does not illuminate**

1. Ignition OFF, disconnect the harness connector at the K17 Electronic Brake Control Module.
2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance.
3. Test for less than 2 ohms in the ignition circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K17 Electronic Brake Control Module.

- **If the test lamp illuminates**

7. Replace the B99 Steering Wheel Angle Sensor and verify the DTC does not reset.
8. Verify the DTC does not set while operating the vehicle under the Conditions for Running the DTC.

- **If the DTC sets**

Replace the module that the DTC sets.

- **If DTC does not set**

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

9. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Power Steering Assist Motor Replacement**
- **Control Module References** for Control Module replacement, programming and setup.

DTC C0475 (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC C0475 00

Electric Steering Motor Circuit Malfunction

DTC C0475 59

Electric Steering Motor Circuit Protection Time-Out

Circuit/System Description

C0475 00

The power steering control module continuously monitors the voltage and current levels being commanded to the 3-phase steering assist motor. The power steering control module compares the desired and actual current levels to detect malfunctions in the internal power steering assist motor circuits.

C0475 59

The power steering control module continuously monitors the thermal cycle counter of the steering gear. If the thermal cycle counter exceeds the maximum allowable limit, the steering gear has reached the end of its predetermined lifecycle and must be replaced.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

C0475 00

The power steering control module detects a short to ground, short to voltage, or an open/high resistance on any of the internal power steering assist motor circuits.

C0475 59

The power steering control module detects the thermal cycle counter has exceeded the maximum allowable limit indicating that the whole steering gear system must be replaced.

Action Taken When the DTC Sets

- The DTC is stored in memory.
- The driver information center displays the SERVICE POWER STEERING warning message.
- No steering assist.

Conditions for Clearing the DTC

C0475 00

- A current DTC will clear on the next malfunction free ignition cycle.
- A history DTC will clear after 40 consecutive malfunction free ignition cycles.

C0475 59

This DTC cannot be cleared. The power steering system must be replaced.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Verify that DTC C0475 is not set.
 - **If the DTC is set**

Replace the K43 Power Steering Control Module.

- **If the DTC is not set**
2. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Control Module References** for power steering control module replacement, programming and setup.

DTC C047A (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C047A

Electric Steering Motor Position Sensor Circuit Malfunction

Circuit/System Description

The power steering control module continuously monitors the motor position sensor voltage signals. The voltage signals of the motor position sensor and the digital torque sensor index current signal are both processed by the power steering control module to detect and calculate the steering wheel angle.

Conditions for Running the DTC

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

The ignition is ON.

Conditions for Setting the DTC

The power steering control module detects a short to ground, short to voltage, or an open/high resistance on any of the internal motor position sensor circuits.

Action Taken When the DTC Sets

- No steering assist.
- The driver information center displays the SERVICE POWER STEERING warning message.

Conditions for Clearing the DTC

- A current DTC will clear on the next malfunction-free ignition cycle.
- A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

2. Verify that DTC C047A is not set.
 - **If the DTC is set**
 1. Perform the **Steering Angle Sensor Centering**
 2. Verify the DTC does not reset.
 - If the DTC resets, replace the K43 Power Steering Control Module.
 - If the DTC does not reset
 3. All OK.
 - **If the DTC is not set**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Control Module References** for power steering control module replacement, programming and setup.

DTC C0544 (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0544 5A

Steering Wheel Angle Sensor Signal Not Plausible

Circuit/System Description

The power steering control module continuously monitors the steering wheel angle sensor. The steering wheel angle sensor indicates the direction in which the driver intends to go.

The power steering control module has a center detection algorithm that compares the reading of the steering angle sensor to the direction based on other vehicle sensors that the vehicle is travelling to determine if the steering angle reading is plausible.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

The power steering control module detects a not plausible signal from the steering wheel angle sensor.

The power steering control module detected that the steering angle sensor reading and the direction of the vehicle exceeds 329 degrees.

Action Taken When the DTC Sets

- DTC C0544 is stored in memory.
- The driver information center displays the SERVICE POWER STEERING warning message.

Conditions for Clearing the DTC

A history DTC will clear after 40 consecutive malfunction free ignition cycles.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON.
2. Verify that no other DTCs are set except for C0544.
 - If any other DTCs are set

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

- If no other DTCs are set

NOTE: Wheel misalignment can cause incorrect Steering Wheel Angle parameter reading.

3. With a scan tool, verify that the Steering Wheel Angle parameter is zero degrees or near zero degrees with the front tire/wheels in the straight ahead position.
 - If the Steering Wheel Angle parameter is not zero degrees or near zero degrees
 1. Perform the Power Steering Control Module Calibration. Refer to **Power Steering Control Module Calibration**
 2. Verify that DTC C0544 is not set.
 - If the DTC is set, replace the K43 power steering control module.
 - If the DTC is not set
 3. All OK.
 - If the Steering Wheel Angle parameter is zero degrees or near zero degrees
4. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Power Steering Assist Motor Replacement** for power steering control module replacement
- **Control Module References** for power steering control module replacement, programming and setup.

DTC C0545 (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0545

Steering Wheel Torque Sensor Malfunction

Circuit/System Description

The power steering control module continuously monitors the digital torque sensor's torque and index current signals. As the steering wheel is turned and torsional twist 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

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

module to calculate the steering torque.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The power steering control module detects a short to ground, short to voltage, or an open/high resistance on any of the torque sensor circuits.

Action Taken When the DTC Sets

- DTC C0545 is stored in memory.
- The driver information center displays the SERVICE POWER STEERING warning message.
- No steering assist.

Conditions for Clearing the DTC

- A current DTC will clear on the next malfunction-free ignition cycle.
- A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information**Circuit/System Verification**

1. Ignition ON.
2. Verify that DTC C0545 is not set.
 - **If the DTC is set**

Replace the steering gear containing the torque sensor.

- **If the DTC is not set**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Control Module References** for power steering control module replacement, programming and setup.

DTC C055C (NJ1)**Diagnostic Instructions**

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor**DTC C055C 00**

Steering Gear Performance Malfunction

DTC C055C 64

Steering Gear Performance Slip Detected

Circuit/System Description

The power steering control module continuously verifies the mechanical friction of the steering gear. If the friction is too high the clutch between motor and rack slips and the internal angle is not longer valid.

Conditions for Running the DTC

Ignition ON.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

Conditions for Setting the DTC

The DTC is set when the mechanical friction of the steering gear is too high.

Action Taken When the DTC Sets

- DTC C055C is stored in memory.
- No steering assist.

Conditions for Clearing the DTC

A history DTC will clear after 40 consecutive malfunction free ignition cycles.

Diagnostic Aids

Ensure that no steering components down stream of the power steering column assembly, such as ball joints, tie rod ends, universal joints, or the steering gear assembly, are mechanically binding.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

2. Verify that DTC C055C is not set.
 - **If the DTC is set**
 - 1. Verify that no steering components down stream of the power steering column assembly are mechanically binding. Refer to **Steering Effort Hard or Too Easy in One or Both Directions**
 - If steering components are mechanically binding, replace the mechanically binding steering components.
 - If no steering components are mechanically binding, replace the Steering Gear.
 - **If the DTC is not set**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Control Module References** for Power Steering Control Module replacement, programming and setup.

DTC C0565 (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0565 5A

Vehicle Identification Number Not Plausible

Circuit/System Description

The vehicle identification number (VIN) is programmed into the power steering control module during initial programming of the module.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

The power steering control module is not properly programmed.

Action Taken When the DTC Sets

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

- DTC C0565 is stored in memory.
- The driver information center displays the SERVICE POWER STEERING warning message.

Conditions for Clearing the DTC

- A current DTC will clear on the next malfunction-free ignition cycle.
- A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Diagnostic Aids

A newly replaced power steering control module can set one or more DTC on its initial ignition ON cycle.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify that DTC C0565 is not present.
 - **If the DTC is present**
 1. Program the K43 Power Steering Control Module
 2. Verify the DTC does not reset.
 - If the DTC resets, replace the K43 Power Steering Control Module.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

- If the DTC does not reset
- 3. All OK.
- **If the DTC is not present**
- 2. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Control Module References** for power steering control module replacement, programming and setup.

DTC C0569 (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0569 3A

System Configuration Incorrect Component Installed

Circuit/System Description

The power steering control module continuously monitors the thermal cycle counter of the steering gear. If the power steering control module is replaced, the thermal cycle counter value needs to be transferred from the existing power steering control module over to the new power steering control module using the SPS Electric Power Steering Setup Procedure.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The thermal cycle counter value does not meet the system requirement.

Action Taken When the DTC Sets

- DTC C0569 is stored in memory.
- The driver information center displays the SERVICE POWER STEERING warning message.
- No Steering assist.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

Conditions for Clearing the DTC

- A current DTC will clear on the next malfunction free ignition cycle.
- A history DTC will clear after 40 consecutive malfunction free ignition cycles.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC C0569 3A is not set.
 - **If the DTC is present**
 1. Program the K43 Power Steering Control Module
 2. Verify the DTC does not reset.
 - If the DTC resets, replace the K43 Power Steering Control Module.
 - If the DTC does not reset
 - 3. All OK.
3. All OK.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Control Module References** for power steering control module replacement, programming and setup.

DTC C056E (NJ1)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provide an overview of each diagnostic category.

DTC Descriptors

DTC C056E 41

Electronic Control Unit Hardware Not Programmed

DTC C056E 4B

Electronic Control Unit Hardware Calibration Not Learned

Circuit/System Description

After replacement of the power steering control module, the power steering control module must be configured with the proper tuning profile using the service programming system (SPS).

After replacement of the power steering control module, power steering motor, or steering gear, the steering position/torque sensor calibration procedure must be performed.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

DTC C056E 41

This DTC will set if the operational software or calibration code (tuning parameter value) does not save in Flash.

DTC C056E 4B

This DTC will set if the power steering control module, motor or torque sensor has not been calibrated using the

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

steering position / torque sensor calibration procedure.

Actions Taken When DTC Sets

- DTC is stored in memory.
- Steering assist is set to a default level.

Conditions for Clearing the DTC

DTC C056E 41

A current or history DTC will clear after the power steering control module has been configured with the proper tuning profile.

DTC C056E 4B

A current or history DTC will clear after the steering position/torque sensor calibration procedure has been performed.

Reference Information

Schematic Reference

Power Steering Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

DTC C056E 41

1. Ignition ON.
2. Verify that DTC C056E 41 is not set.
 - **If the DTC C056E 41 is set**
 1. Program the K43 Power Steering Control Module.
 2. Verify the DTC does not set.
 - If the DTC sets, replace the Steering Gear.
 - If the DTC does not set
 3. All OK.
 - **If the DTC C056E 41 is not set**
3. All OK.

DTC C056E 4B

1. Ignition ON.
2. Verify that DTC C056E 4B is not set.
 - **If the DTC C056E 4B is set**
 1. Calibrate the K43 Power Steering Control Module.
 2. Verify the DTC does not set.
 - If the DTC sets, replace the Steering Gear.
 - If the DTC does not set
 3. All OK.
 - **If the DTC C056E 4B is not set**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Steering Gear Replacement**
- **Control Module References** for Power Steering Control Module replacement, programming and setup.

DTC C0710 (NJ1)**Diagnostic Instructions**

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0710 71

Steering Position Signal Invalid Data

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
CAN Bus High Serial Data	U0073, U0100, U0101, U0125, U0126, U0140	U0073, U0100, U0101, U0125, U0126, U0140	U0073, U0100, U0101, U0125, U0126, U0140	C0710 5A, C0710 71
CAN Bus Low Serial Data	U0073, U0100, U0101, U0125, U0126, U0140	U0073, U0100, U0101, U0125, U0126, U0140	U0073, U0100, U0101, U0125, U0126, U0140	C0710 5A, C0710 71

Circuit/System Description

The power steering control module monitors the steering angle sensor signal via the GMLAN serial data circuit. The power steering control module utilizes this signal to determine a center point for Active Return and Soft End Stops. Upon detecting an invalid steering angle sensor signal, the power steering control module will disable Active Return and Soft End Stops, then set a DTC.

NOTE: To most drivers the loss of Active Return and Soft End Stops may not be noticeable as there is no visual indicator activated on the instrument cluster or driver information display.

There is no diagnosable cause with the power steering control module when this DTC is set, DO NOT REPLACE POWER STEERING CONTROL MODULE OR STEERING GEAR DUE TO THIS DTC.

For diagnosis of an invalid steering angle sensor signal, refer to **DTC C0710** also diagnosis in Antilock Brake System.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

The power steering control module has received on of the following serial data messages listed below from the external steering angle sensor.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

- Steering angle range is exceeded
- Steering angle sensor is not calibrated
- Steering angle sensor is initialized
- Steering angle sensor message: Roll Counter is INVALID
- Steering angle sensor message: Present Bit is FALSE (not common)
- Steering angle sensor message: Error Flag is set to TRUE

Action Taken When the DTC Sets

- The electronic brake control module disables the stability control for the duration of the ignition cycle.
- Active Return and Software End Stops are deactivated.

Conditions for Clearing the DTC

- A current DTC clears when the diagnostic runs and passes.
- When the steering angle sensor signal becomes valid, the fault will set to History and can be cleared with a scan tool.

Diagnostic Aids

The car should not pull in either direction causing the steering wheel to be OFF center while driving straight ahead on a level surface.

Reference Information

Schematic Reference

Antilock Brake System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

ABS Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. With a scan tool, verify that DTC C0710 71 is not set.
 - **If DTC C0710 71 is set**

Refer to **DTC C0710** in Antilock Brake System Diagnostic Information and Procedures.

- **If DTC C0710 71 is not set**
3. All OK.

SYMPTOMS - POWER STEERING SYSTEM

Review the system description and operation in order to familiarize yourself with the system functions. Refer to **Power Steering System Description and Operation (Hydraulic Power Steering)**, **Power Steering System Description and Operation (Electronic Power Steering)**.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the power steering system.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **Whine or Growl Noise from the Power Steering System**
- **Increase in Effort While Turning Steering Wheel**
- **Poor Return of Steering Wheel**
- **Steering Wheel Surges/Jerks While Turning**
- **Steering Wheel Kickback**
- **Steering Effort Hard or Too Easy in One or Both Directions**

WHINE OR GROWL NOISE FROM THE POWER STEERING SYSTEM

Whine or Growl Noise from the Power Steering System

Step	Action	Yes	No
1	Did you review the Power Steering System Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Power Steering System</u>
2	Verify that a whine or growl noise is present. Is the steering gear quiet?	System OK	Go to Step 3

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

3	Perform the Diagnostic System Check - Vehicle. Refer to <u>Diagnostic System Check - Vehicle</u> Are any codes present?	Go to <u>Diagnostic Trouble Code (DTC) List - Vehicle</u>	Go to Step 4
4	Inspect the power steering gear fasteners for looseness. Is the steering gear loose?	Go to Step 13	Go to Step 5
5	Inspect the power steering gear for loose or worn bushings. Are the steering gear bushings loose or worn?	Go to Step 14	Go to Step 6
6	Verify that steering column dash outer seal is in position. Is the steering column dash outer seal damaged or out of position?	Go to Step 15	Go to Step 7
7	Verify that steering column dash inner seal is in position. Is the steering column dash inner seal damaged or out of position?	Go to Step 16	Go to Step 8
8	Inspect the power steering motor for a whine or growl noise using the CH-39570 chassis ear. Is the noise present at the power steering motor?	Go to Step 19	Go to Step 9
9	Inspect the power steering gear for a whine or growl noise using the CH-39570 chassis ear. Is the noise present at the power steering gear?	Go to Step 20	Go to Step 10
10	Disconnect the outer tie rods, refer to <u>Steering Linkage Outer Tie Rod Replacement</u> , and individually turn the steering knuckle assembly right to left. Is a whine or growl noise present?	Go to Step 11	Go to Step 12
11	Disconnect the lower ball joint from the steering knuckle, refer to <u>Lower Control Arm Replacement</u> , and rotate the steering knuckle and strut. Is a whine or growl noise present?	Go to Step 17	Go to Step 18
	NOTE: Position the wheels straight ahead. Do NOT rotate the steering wheel more than one complete revolution from center for this procedure.		

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

12	Disconnect the intermediate shaft from the steering column, refer to <u>Intermediate Steering Shaft Replacement</u> . 1. Note the position of the steering wheel and rotate the steering wheel ONE revolution in both directions. 2. Rotate the steering wheel back to the original position. Is a whine or growl noise present?	Go to <u>Symptoms - Power Steering System</u>	Go to Step 20
13	Replace the power steering gear fasteners. Refer to <u>Steering Gear Replacement</u>. Did you complete the repair?	Go to Step 21	-
14	Replace the power steering gear bushings. Refer to <u>Steering Gear Bushing Replacement</u>. Did you complete the repair?	Go to Step 21	-
15	Reposition or replace the steering column dash outer seal. Did you complete the repair?	Go to Step 21	-
16	Reposition or replace the steering column dash inner seal. Did you complete the repair?	Go to Step 21	-
17	Replace the strut top mount. Refer to <u>Strut, Strut Component, or Spring Replacement</u> . Did you complete the repair?	Go to Step 21	-
18	Replace the front lower control arm. Refer to <u>Lower Control Arm Replacement</u> . Did you complete the repair?	Go to Step 21	-
19	Replace the electronic power steering assist motor control. Refer to <u>Power Steering Assist Motor Replacement</u>. Did you complete the repair?	Go to Step 21	-
20	Replace the power steering gear. Refer to <u>Steering Gear Replacement</u>. Did you complete the repair?	Go to Step 21	-
21	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

INCREASE IN EFFORT WHILE TURNING STEERING WHEEL

Increase in Effort While Turning Steering Wheel

Step	Action	Yes	No
1	Did you review the Power Steering System Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Power Steering System Description and Operation (Hydraulic Power Steering)</u> , <u>Power Steering System Description and Operation (Electronic Power Steering)</u>
2	Verify that there is an increase in effort while turning is present. Does the system operate normally?	System OK	Go to Step 3
3	Check for the following conditions: • Incorrect tire inflation-Refer to <u>Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label</u> . • Improper tire size Did you find and correct the condition?	Go to Step 10	Go to Step 4
4	1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Check for a binding or worn steering linkage outer tie rod. Is the tie rod binding or worn?	Go to Step 7	Go to Step 5
5	Check for a worn or binding intermediate steering shaft. Is the intermediate steering shaft worn or binding?	Go to Step 8	Go to Step 6
6	Check for a worn or binding steering gear. Is the steering gear worn or binding?	Go to Step 9	System OK
7	Replace the steering linkage outer tie rod. Refer to <u>Steering Linkage Outer Tie Rod Replacement</u> . Did you complete the repair?	Go to Step 10	-
8	Replace the intermediate steering shaft. Refer to <u>Intermediate Steering Shaft Replacement</u> . Did you complete the repair?	Go to Step 10	-
	Replace the steering gear. Refer to <u>Steering</u>		

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

9	<u>Gear Replacement.</u> Did you complete the repair?	Go to Step 10	-
10	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

POOR RETURN OF STEERING WHEEL

Poor Return of Steering Wheel

Step	Action	Yes	No
DEFINITION: After completing a turn, extra steering input is required for the steering wheel to return to center.			
1	Did you review the General Description and perform the necessary inspections?	Go to Step 2	Go to <u>Power Steering System Description and Operation (Hydraulic Power Steering), Power Steering System Description and Operation (Electronic Power Steering)</u>
2	Verify that poor return of the steering wheel is present. Does the system operate normally?	System OK	Go to Step 3
3	1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Lubricate the tie rod ends and ball joints, if applicable. 3. Inspect the suspension system for worn or damaged components. 4. Repair as necessary. Did you find and correct the condition?	Go to Step 12	Go to Step 4
4	1. Rotate the steering wheel ONE revolution in both directions. 2. Rotate the steering wheel back to the original position. Was the steering wheel abnormally difficult to rotate in either direction?	Go to Step 5	Go to Step 10
	NOTE: Position the wheels straight ahead. Do NOT rotate the steering wheel more than one complete revolution from center.		

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

5	1. Disconnect the intermediate shaft from the steering column. 2. Note the position of the steering wheel and rotate the steering wheel ONE revolution in both directions. 3. Rotate the steering wheel back to the original position. Was the steering wheel abnormally difficult to rotate in either direction?	Go to Step 11	Go to Step 6
6	Inspect the intermediate shaft for stiff or loose joints. Repair or replace as necessary. Did you find and complete the repair?	Go to Step 12	Go to Step 7
7	1. Remove the front tire and wheel assemblies. Refer to <u>Tire and Wheel Removal and Installation</u> . 2. Disconnect both outer tie rod ends from the steering knuckles. 3. Use your hands in order to move the tie rod end studs. 4. If abnormally difficult to move, replace the tie rod end. Did you find and complete the repair?	Go to Step 12	Go to Step 8
8	1. Use your hands to rotate the steering knuckle inboard and outboard in order to inspect for a binding strut bearings, ball joints, or axle. 2. Repair or replace any abnormally stiff or loose components. Did you find and complete the repair?	Go to Step 12	Go to Step 9
9	Inspect for binding in the steering gear. If a binding is present repair or replace the steering gear. Did you find and complete the repair?	Go to Step 12	Go to Step 10
10	Inspect the wheel alignment and adjust as necessary. Refer to <u>Wheel Alignment Measurement</u> . Did you find and complete the repair?	Go to Step 12	-
11	Inspect the steering column for a binding. If a binding is present, repair or replace the steering column as necessary. Did you find and complete the repair?	Go to Step 12	-

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

12	Operate the system in order to verify the repair. Did you correct the condition?	System OK	-
----	---	-----------	---

STEERING WHEEL SURGES/JERKS WHILE TURNING

Steering Wheel Surges/Jerks While Turning

Step	Action	Yes	No
1	Did you review the <u>Symptoms - Power Steering System</u> and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Power Steering System</u>
2	Verify that the steering wheel surges or jerks while turning. Does the steering wheel surge or jerk while turning?	Go to Step 3	System OK
3	Inspect the front suspension for worn or binding components. Did you find and correct the condition?	Go to Step 15	Go to Step 4
4	1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Inspect the steering linkage outer tie rod for wear or a binding condition. Is the steering linkage outer tie rod worn or binding?	Go to Step 10	Go to Step 5
5	Inspect the intermediate shaft for wear or a binding condition. Is the intermediate shaft worn or binding?	Go to Step 11	Go to Step 6
6	Inspect the steering gear for wear or a binding condition. Is the steering gear worn or binding?	Go to Step 12	Go to Step 7
7	Inspect the steering column for wear or a binding condition. Is the steering column worn or binding?	Go to Step 13	Go to Step 8
8	Inspect the power steering assist motor for an indication of excessive heat. Does the power steering assist motor appear to be overheated?	Go to Step 9	Go to Step 14
9	NOTE: Do not perform excessive parking lot maneuvers during testing. Excessive parking lot maneuvers can cause the power steering motor to heat up.		

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

	Allow the power steering motor to cool and retest the system. Did you correct the condition?	Go to Step 15	Go to Step 14
10	Replace the steering linkage outer tie rod. Refer to <u>Steering Linkage Outer Tie Rod Replacement</u> . Did you complete the repair?	Go to Step 15	System OK
11	Replace the intermediate shaft. Refer to <u>Intermediate Steering Shaft Replacement</u> . Did you complete the repair?	Go to Step 15	-
12	Replace the steering gear. Refer to <u>Steering Gear Replacement</u> . Did you complete the repair?	Go to Step 15	-
13	Replace the steering column. Refer to <u>Steering Column Replacement</u> . Did you complete the repair?	Go to Step 15	-
14	Replace the power steering assist motor. Refer to <u>Power Steering Assist Motor Replacement</u> . Did you complete the repair?	Go to Step 15	-
15	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

STEERING WHEEL KICKBACK

Steering Wheel Kickback

Condition	Action
The steering column mounting bolts are loose.	Tighten the pivot bolt and the mounting bolts to specification. Refer to <u>Fastener Tightening Specifications</u>
The steering gear is loosely mounted.	Tighten the steering gear mounting bolts to specification. Refer to <u>Fastener Tightening Specifications</u>
The tie rod ends are loose or damaged.	If necessary, inspect for damage and replace the tie rod ends. Refer to <u>Steering Linkage Outer Tie Rod Replacement</u> .

STEERING EFFORT HARD OR TOO EASY IN ONE OR BOTH DIRECTIONS

Steering Effort Hard or Too Easy in One or Both Directions

Condition	Action
The battery power is low.	Confirm proper battery voltage.
The intermediate shaft dash seal is binding.	Adjust the dash seal, or replace the intermediate shaft

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

	assembly if necessary.
The intermediate shaft joints are loose or worn.	Inspect the joints and the pinch bolts for damage, and replace the intermediate shaft if necessary. Refer to <u>Intermediate Steering Shaft Replacement</u> .
The steering gear is binding.	If necessary, inspect and replace the steering gear. Refer to <u>Steering Gear Replacement</u> .
The upper steering shaft is bent.	If necessary, replace the steering column. Refer to <u>Steering Column Replacement</u> .
The assist mechanism hub gear is misaligned or damaged.	Replace the steering column. Refer to <u>Steering Column Replacement</u> .
The sensor wire is damaged.	Replace the steering column. Refer to <u>Steering Column Replacement</u> .
The controller is malfunctioning.	Confirm the DTC. If necessary, replace the motor/module assembly. Refer to <u>Power Steering Assist Motor Replacement</u> .
The motor shaft is binding.	Confirm the DTC. If necessary, replace the motor/module assembly. Refer to <u>Power Steering Assist Motor Replacement</u> .

REPAIR INSTRUCTIONS

STEERING LINKAGE INNER TIE ROD INSPECTION

Special Tools

GE-8001 Dial Indicator Set

For equivalent regional tools, refer to **Special Tools**.

NOTE: This inspection procedure does not supersede local government required inspections that have more stringent requirements.

1. Turn the ignition key to the ON position with the engine OFF.

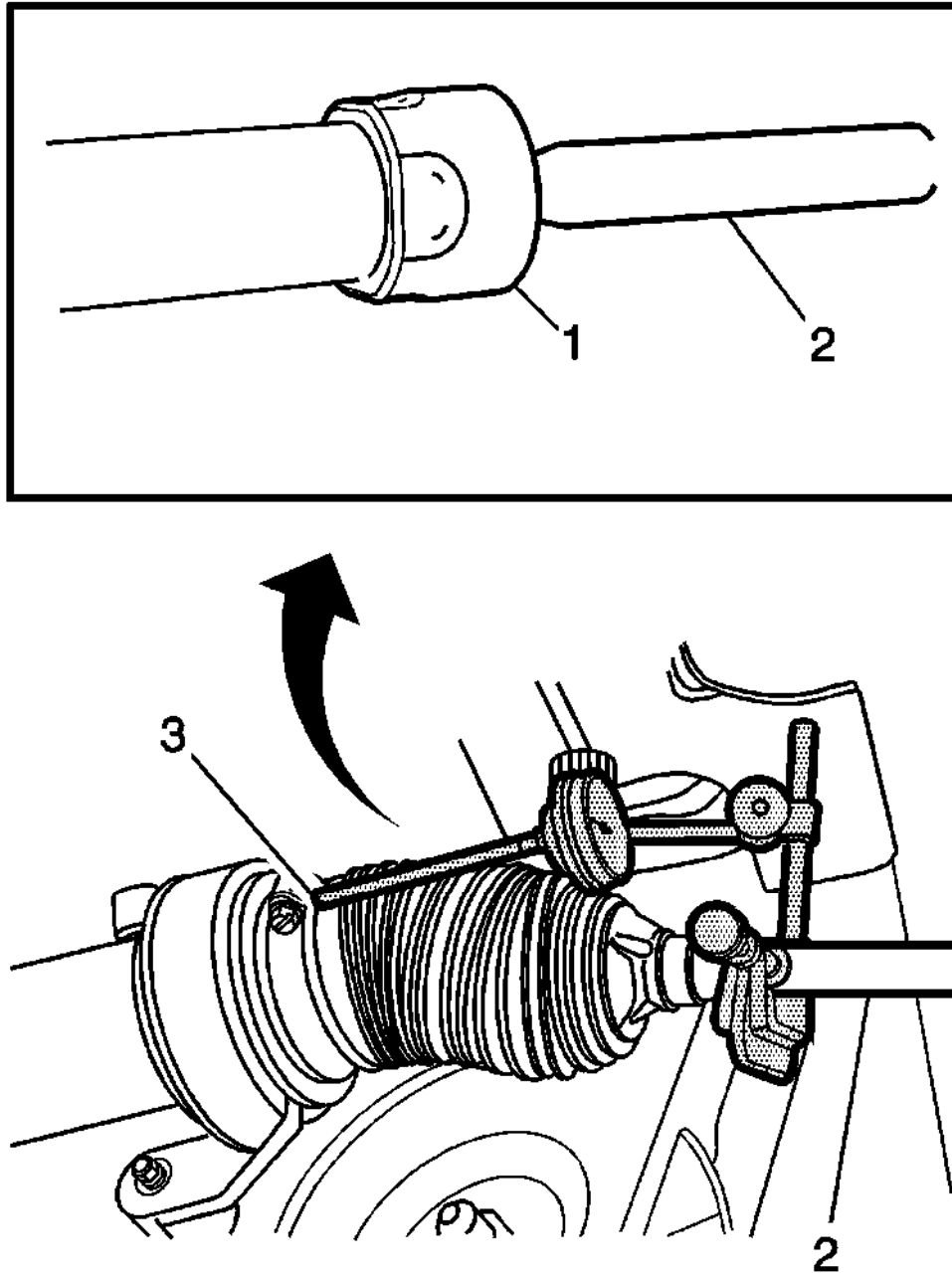


Fig. 2: Measuring Lash Between Inner Tie Rod & Steering Gear Housing
Courtesy of GENERAL MOTORS COMPANY

2. With the aid of an assistant, turn the steering wheel to the full stop position and hold the steering wheel in

that position until the test is complete. Part of the steering linkage inner tie rod (2) being tested should be inside the steering gear housing. The inner tie rod housing (1) being tested should be inside the steering gear housing and seated against the steering stop.

3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. If there is not a good location for the **GE-8001** dial indicator pointer at the steering gear housing, install a large worm gear hose clamp (3) to the steering gear housing over the larger steering gear boot clamp and align the clamp so that the screw can be a location for the **GE-8001** dial indicator pointer.
5. Install the **GE-8001** dial indicator between the inner tie rod and the steering gear housing or the worm gear clamp in such a way as to measure the lash between the inner tie rod and the steering gear housing. The lash between the inner tie rod and the steering gear housing is equal to the lash between the inner tie rod and the inner tie rod housing because the inner tie rod housing is inside the steering gear housing during this procedure.

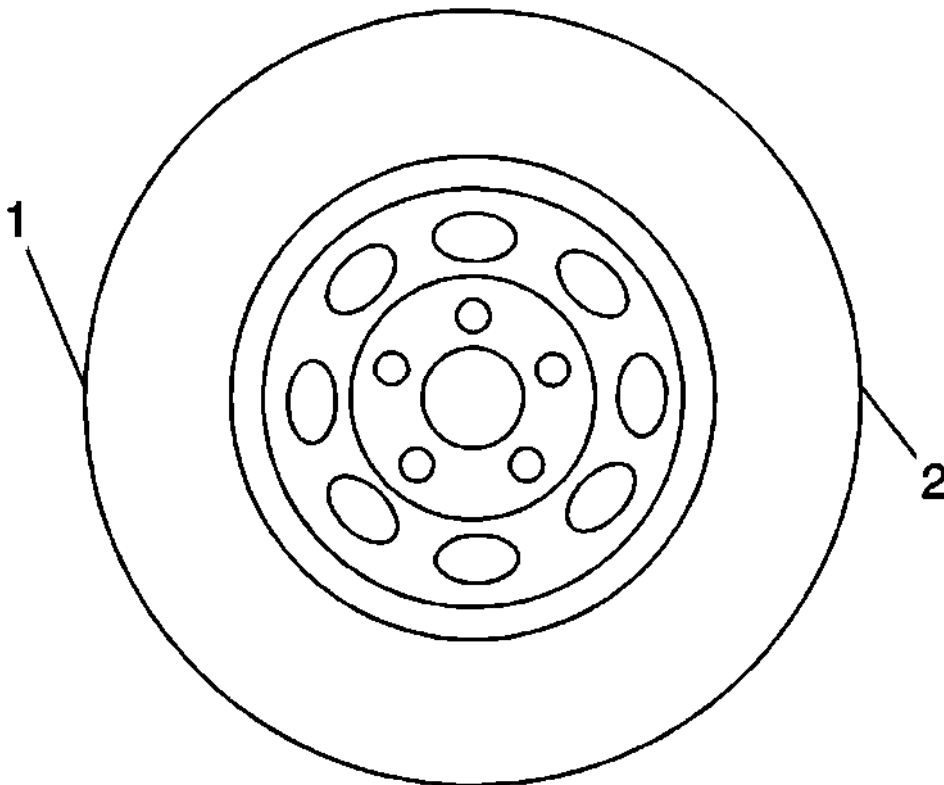


Fig. 3: Identifying Tire Grasping Positions
Courtesy of GENERAL MOTORS COMPANY

NOTE: Only move the tire enough to feel any lash between the inner tie rod and the inner tie rod housing without moving the steering gear rack.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

6. Grasping the tire at the 3 o'clock (2) and 9 o'clock (1) positions, gently push in on one side of the tire in order to remove any lash.
7. Zero the **GE-8001** dial indicator.
8. On the same side of the tire previously pushed in, gently pull out and measure the lash.
9. Record the measurement shown on the **GE-8001** dial indicator.
10. If the measured value exceeds 0.5 mm (0.02 in), replace the inner tie rod. Refer to **Steering Linkage Inner Tie Rod Replacement**.
11. Repeat the procedure for the other side.

STEERING LINKAGE OUTER TIE ROD INSPECTION

Special Tools

GE-8001 Dial Indicator Set

For equivalent regional tools, refer to **Special Tools**.

NOTE: This inspection procedure does not supersede local government required inspections that have more stringent requirements.

1. Inspect the outer tie rod seal. If the outer tie rod seal is torn, replace the outer tie rod. Refer to **Steering Linkage Outer Tie Rod Replacement**.
2. Raise the side of the vehicle being inspected with a floor jack while maintaining contact between the opposite wheel and the shop floor. Support the lower control arm with a floor jack stand as far outboard as possible and remove the floor jack. Refer to **Lifting and Jacking the Vehicle**.

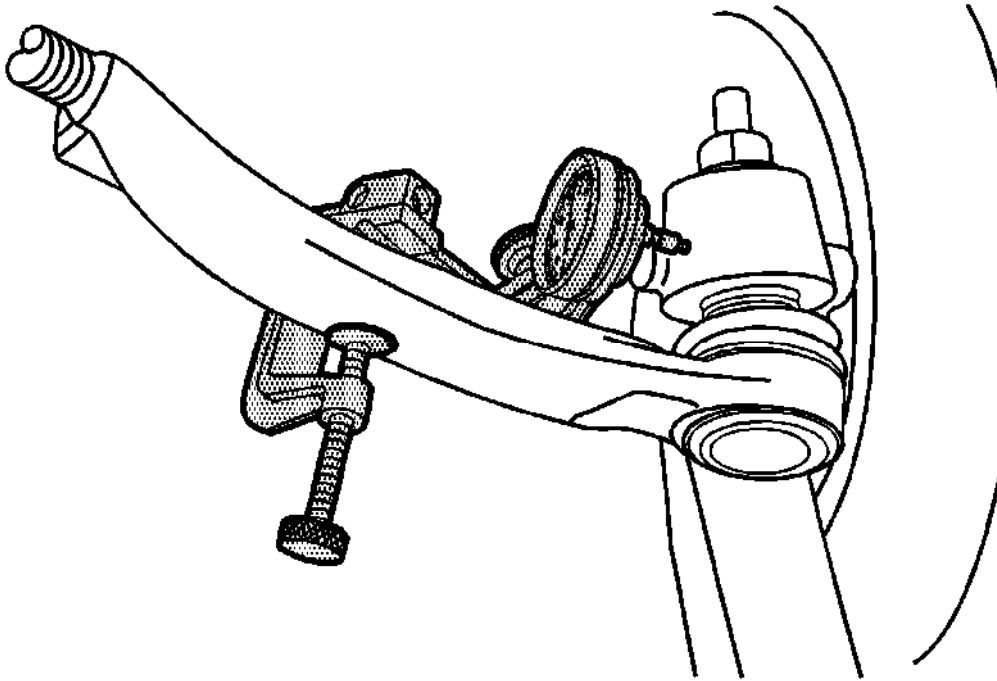


Fig. 4: Measuring Outer Tie Rod Lash

Courtesy of GENERAL MOTORS COMPANY

3. Install the **GE-8001** dial indicator between the outer tie rod and the steering knuckle as shown in the graphic. Note that the tire and wheel assembly is shown removed only for clarification of the **GE-8001** dial indicator position.

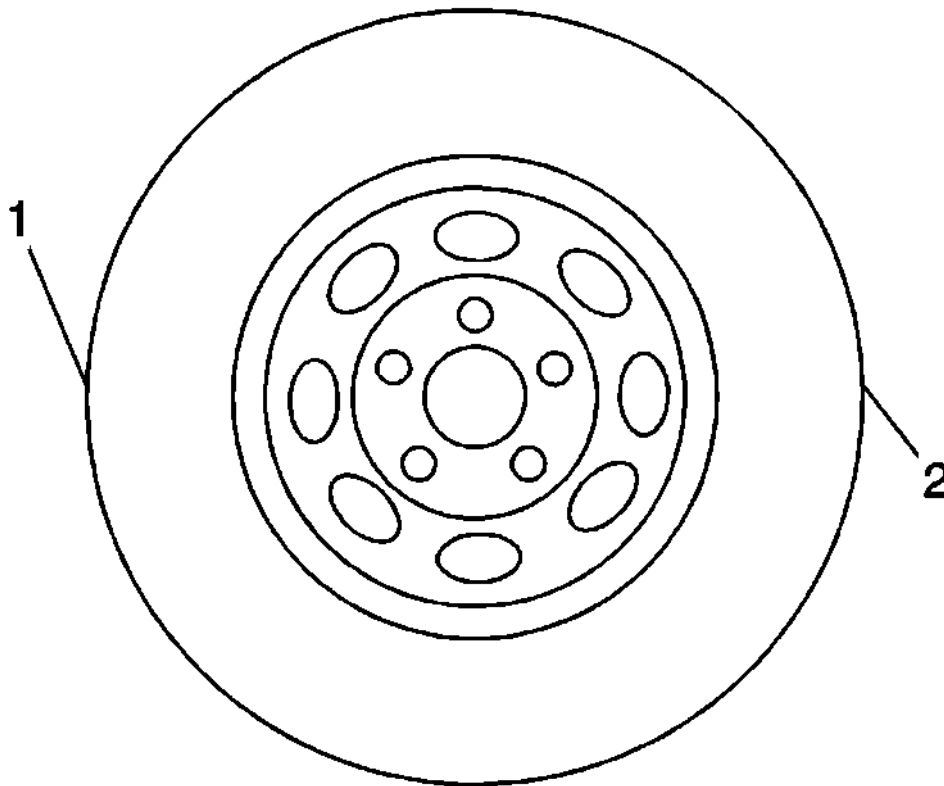


Fig. 5: Identifying Tire Grasping Positions

Courtesy of GENERAL MOTORS COMPANY

4. Grasping the tire at the 3 o'clock (2) and 9 o'clock (1) positions, gently push in on one side of the tire to remove any lash.
5. Zero the **GE-8001** dial indicator.
6. On the same side of the tire previously pushed inwards, gently pull outwards and measure the lash.
7. Record the measurement shown on the **GE-8001** dial indicator.
8. If the measured value exceeds 0.5 mm (0.02 in), replace the outer tie rod. Refer to **Steering Linkage Outer Tie Rod Replacement**.
9. Repeat the procedure for the other side.

STEERING LINKAGE OUTER TIE ROD REPLACEMENT

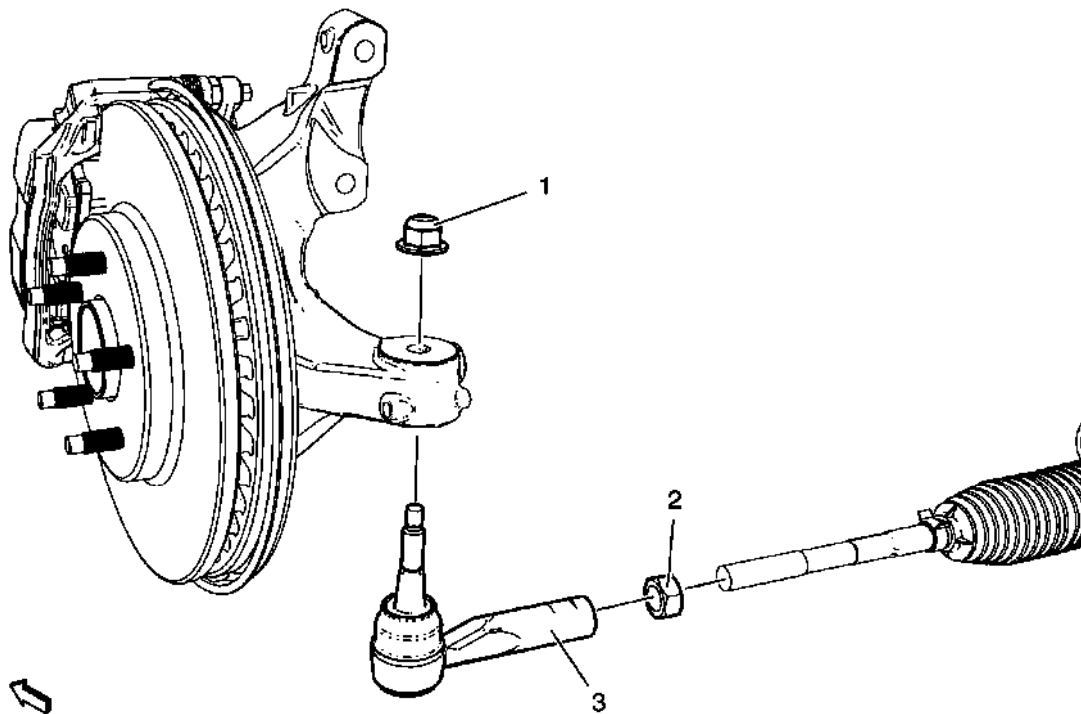


Fig. 6: Steering Linkage Outer Tie Rod And Nuts
 Courtesy of GENERAL MOTORS COMPANY

Steering Linkage Outer Tie Rod Replacement

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the front tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Steering Linkage Outer Tie Rod Nut WARNING: Refer to <u>Torque-to-Yield Fastener Warning</u> . CAUTION: Refer to <u>Fastener Caution</u> . Procedure Install NEW steering linkage outer tie rod nut. Do NOT reuse old nut. Tighten 35 N.m (26 lb ft)
	Steering Linkage Inner Tie Rod Nut

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

2	Procedure 1. Use paint in order to place match marks on the steering linkage inner tie rod nut and on the steering linkage inner tie rod. 2. During the installation, align the match marks. 3. Do not tighten the nut during the installation. Tighten the nut after adjusting the front toe. Refer to <u>Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment</u> .
3	Steering Linkage Outer Tie Rod CAUTION: Do not free the ball stud by using a pickle fork or a wedge-type tool. Damage to the seal or bushing may result. Procedure 1. Use the CH-24319-B puller in order to separate the steering linkage outer tie rod from the steering knuckle. 2. Inspect the steering linkage inner tie rod for bent or damaged threads. 3. Clean the tapered surface of the steering knuckle. 4. After the installation, measure and adjust the front toe. Refer to <u>Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment</u> . 5. Center the steering angle sensor. Refer to <u>Steering Angle Sensor Centering</u> . Special Tools CH-24319-B Steering Linkage and Tie Rod Puller For equivalent regional tools, refer to <u>Special Tools</u>.

STEERING GEAR BOOT REPLACEMENT

Special Tools

CH-22610 Keystone Clamp Pliers

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the steering linkage outer tie rod. Refer to **Steering Linkage Outer Tie Rod Replacement**.
3. Remove the steering linkage inner tie rod nut.

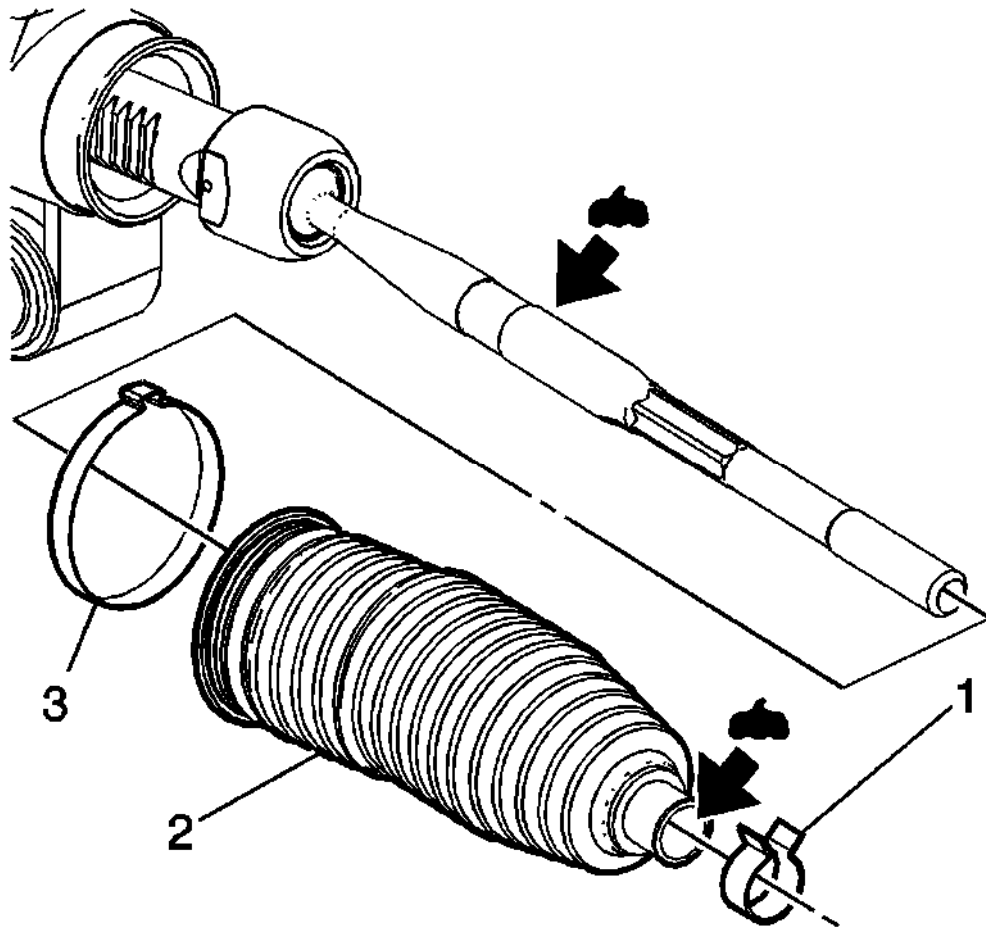


Fig. 7: Steering Gear Boot Components

Courtesy of GENERAL MOTORS COMPANY

4. Remove the outer boot clamp (1).

Discard the clamp.

5. Cut the inner boot clamp (3).

Discard the clamp.

6. Remove the steering gear boot (2).

7. Clean the steering linkage inner tie rod and the steering gear boot contact area of any lubricant or debris.

Installation Procedure

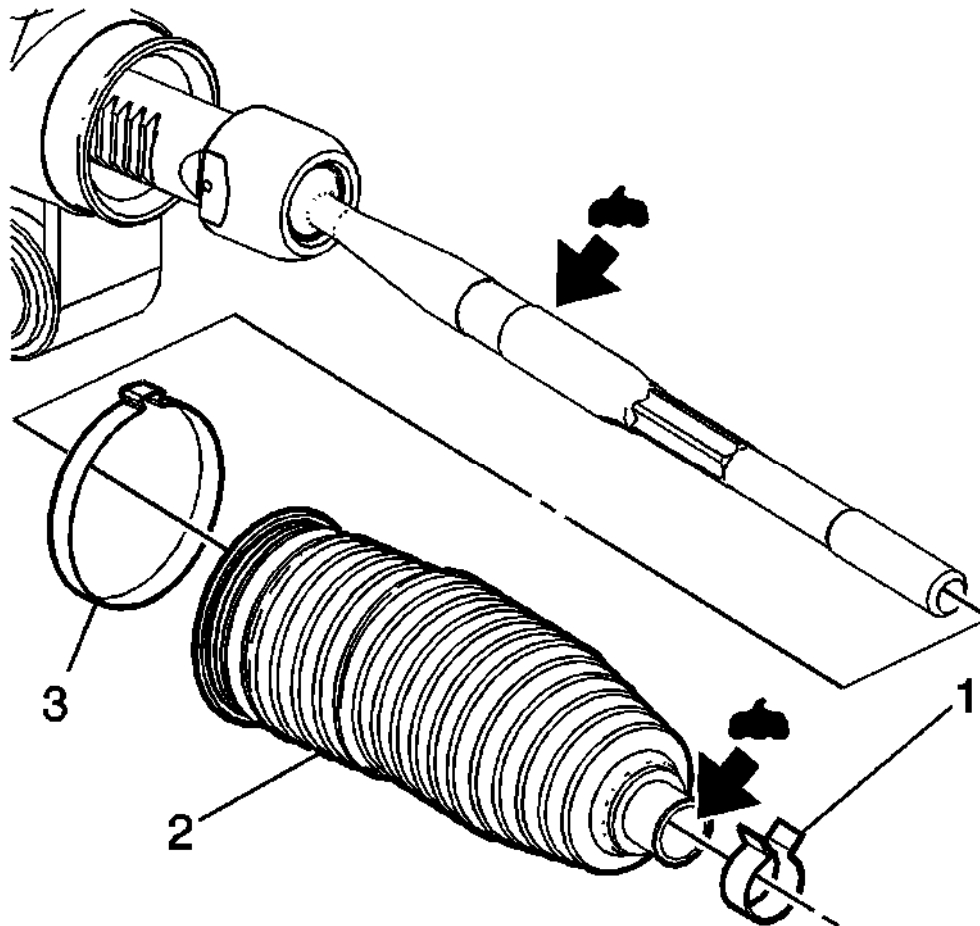


Fig. 8: Steering Gear Boot Components

Courtesy of GENERAL MOTORS COMPANY

NOTE: The steering linkage inner tie rod and the steering gear boot must be free of moisture and debris.

1. Apply lubricant to both ends of the steering gear boot (2).

NOTE: Ensure the larger end of the steering gear boot is firmly seated in the correct location on the steering gear.

2. Install the steering gear boot with the NEW inner boot clamp (3) loosely attached.

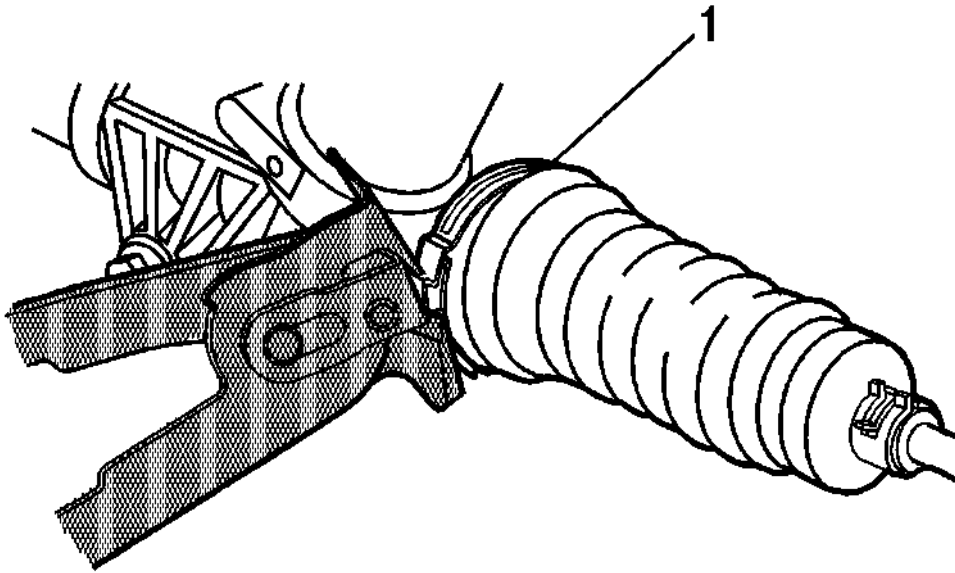


Fig. 9: Larger Steering Gear Boot Clamp

Courtesy of GENERAL MOTORS COMPANY

3. Use the **CH-22610** pliers in order to install the NEW inner boot clamp (1).

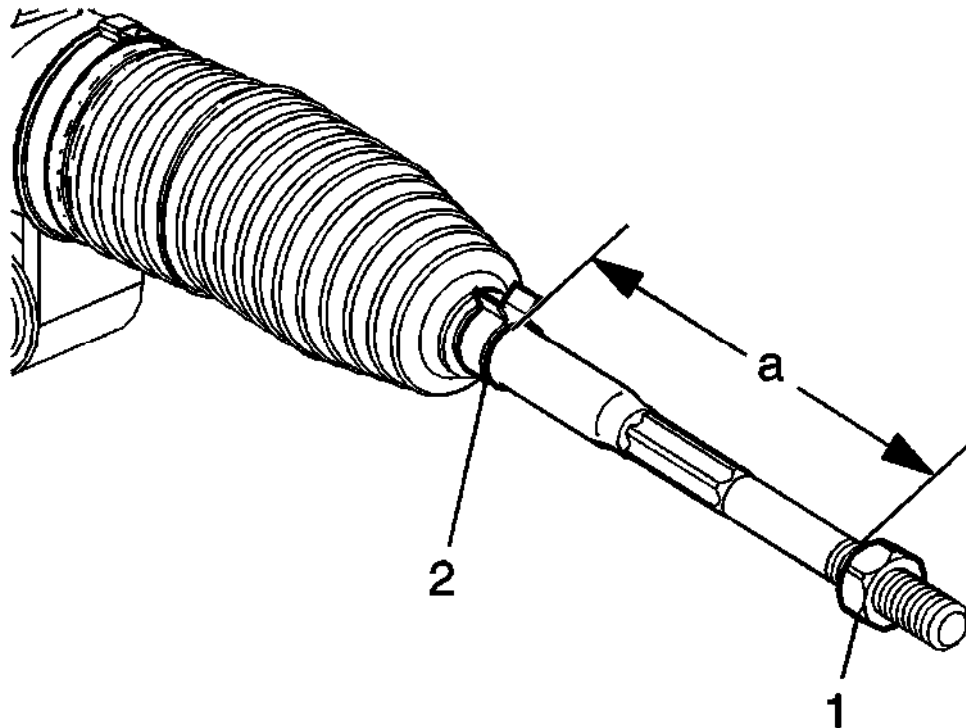


Fig. 10: Identifying Distance Between Inner Tie Rod Nut & Outer Boot Clamp
Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure the small end of the steering gear boot is firmly seated in the correct location on the steering linkage inner tie rod.

4. Install the NEW outer boot clamp (2).
5. Install the steering linkage inner tie rod nut (1).
6. Install the steering linkage outer tie rod. Refer to Steering Linkage Outer Tie Rod Replacement.
7. Measure and adjust the front toe. Refer to Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment.
8. Lower the vehicle.

STEERING GEAR REPLACEMENT

Special Tools

EN-45059 Angle Meter

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Disconnect the battery. Refer to **Battery Negative Cable Disconnection and Connection** .

CAUTION: With wheels of the vehicle facing straight ahead, secure the steering wheel utilizing steering column anti-rotation pin, steering column lock, or a strap to prevent rotation. Locking of the steering column will prevent damage and a possible malfunction of the SIR system. The steering wheel must be secured in position before disconnecting the following components:

- The steering column
- The intermediate shaft(s)
- The steering gear

After disconnecting these components, do not rotate the steering wheel or move the front tires and wheels. Failure to follow this procedure may cause the SIR coil assembly to become un-centered and cause possible damage to the SIR coil. If you think the SIR coil has become un-centered, refer to your specific SIR coil's centering procedure to re-center SIR Coil.

2. Turn the front wheels to the straight forward position and secure the steering wheel from moving.
3. Disconnect the intermediate steering shaft from the steering gear. Refer to **Intermediate Steering Shaft Replacement** .
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
5. Perform the following steps in order to gain access to the steering gear. Refer to **Drivetrain and Front Suspension Frame Replacement** .
 1. Remove the front tire and wheel assemblies.
 2. Remove the exhaust front pipe.
 3. Remove the front compartment splash shield.
 4. Remove the engine shield, if equipped.
 5. Remove the front compartment insulator, if equipped.
 6. Disconnect the 2 steering linkage outer tie rods from the 2 steering knuckles.
 7. Disconnect the 2 stabilizer shaft links.
 8. Remove the transmission mount bracket bolts.
 9. Support the drivetrain and front suspension frame.
 10. Remove the rear frame bolts.
 11. Remove the frame reinforcement bolts and the frame reinforcements.
 12. Lower the drivetrain and front suspension frame 55 mm (2 in).

CAUTION: Electrostatic discharge (ESD) can damage many solid-state electrical components. ESD susceptible components may or may not be labeled with the ESD symbol. Handle all electrical components carefully. Use the following precautions in order to avoid ESD damage:

- Touch a metal ground point in order to remove your body's static charge before servicing any electronic component; especially after sliding across the vehicle seat.
- Do not touch exposed terminals. Terminals may connect to circuits susceptible the ESD damage.
- Do not allow tools to contact exposed terminals when servicing connectors.
- Do not remove components from their protective packaging until required to do so.
- Avoid the following actions unless required by the diagnostic procedure:
 - Jumpering or grounding of the components or connectors.
 - Connecting test equipment probes to components or connectors. Connect the ground lead first when using test probes.
- Ground the protective packaging of any component before opening. Do not rest solid-state components on metal workbenches, or on top of TVs, radios, or other electrical devices.

NOTE: Connector latches are difficult to access

6. Disconnect the electrical connectors. Refer to **FEP Connectors (Steering Gear)** .

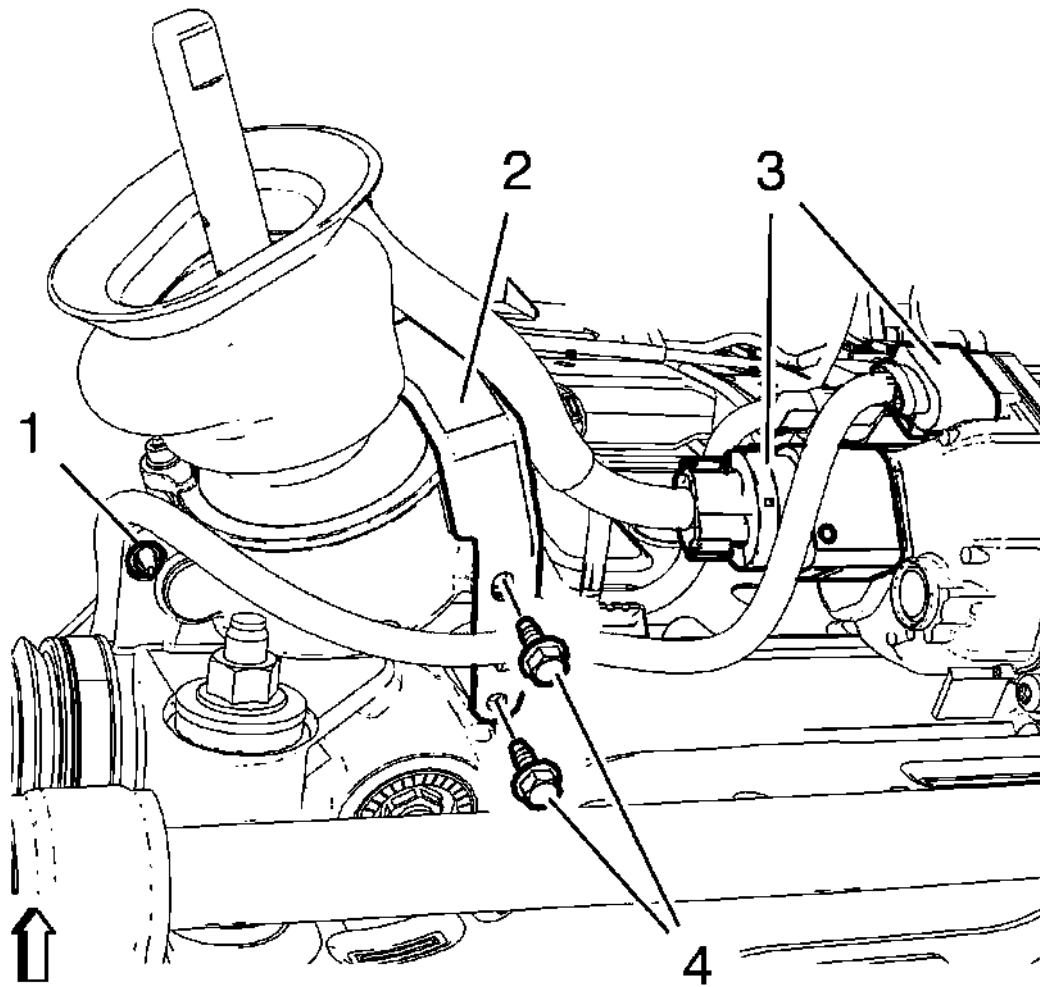


Fig. 11: Transmission Wiring Harness, Plugs, Bracket & Bolts

Courtesy of GENERAL MOTORS COMPANY

7. Use a suitable tool in order to carefully disconnect the 2 wiring harness plugs (3) from the steering gear.
8. Remove the 2 wiring harness bracket bolts (4).
9. Remove the bracket (2).
10. Disconnect the wiring harness retainer (1) from the steering gear.

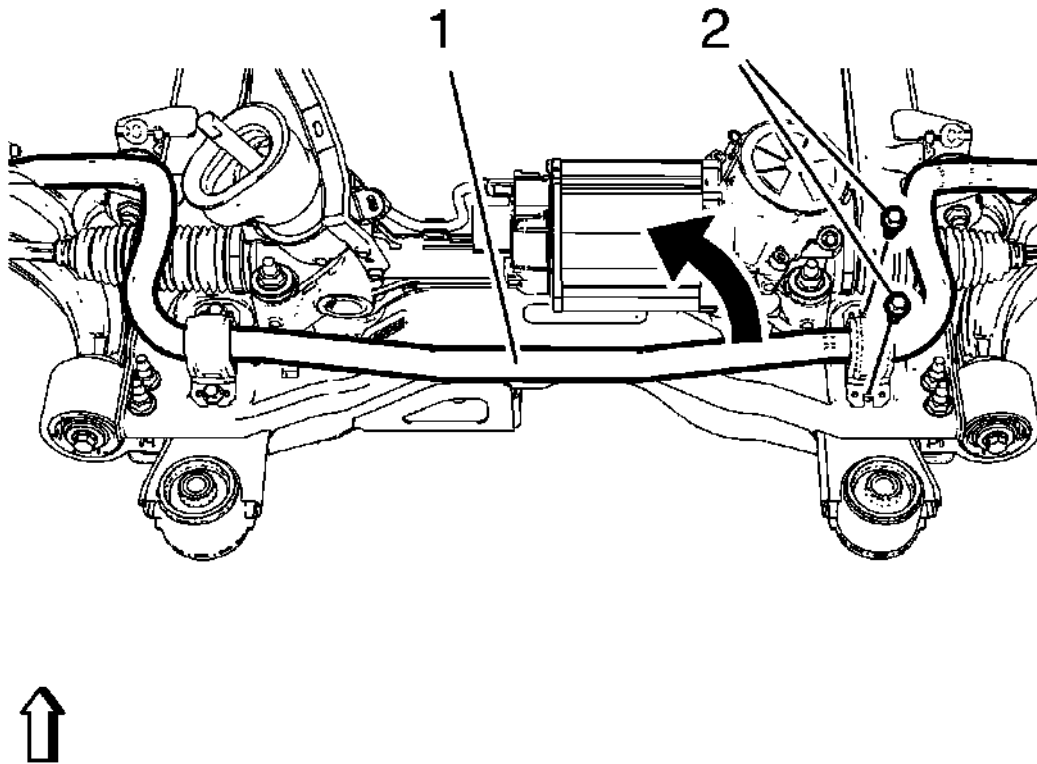


Fig. 12: Stabilizer Shaft And Insulator Clamp Bolts
Courtesy of GENERAL MOTORS COMPANY

11. Remove and DISCARD the 2 right stabilizer shaft insulator clamp bolts (2).
12. Reposition the stabilizer shaft (1) in order to gain clearance for the steering gear.

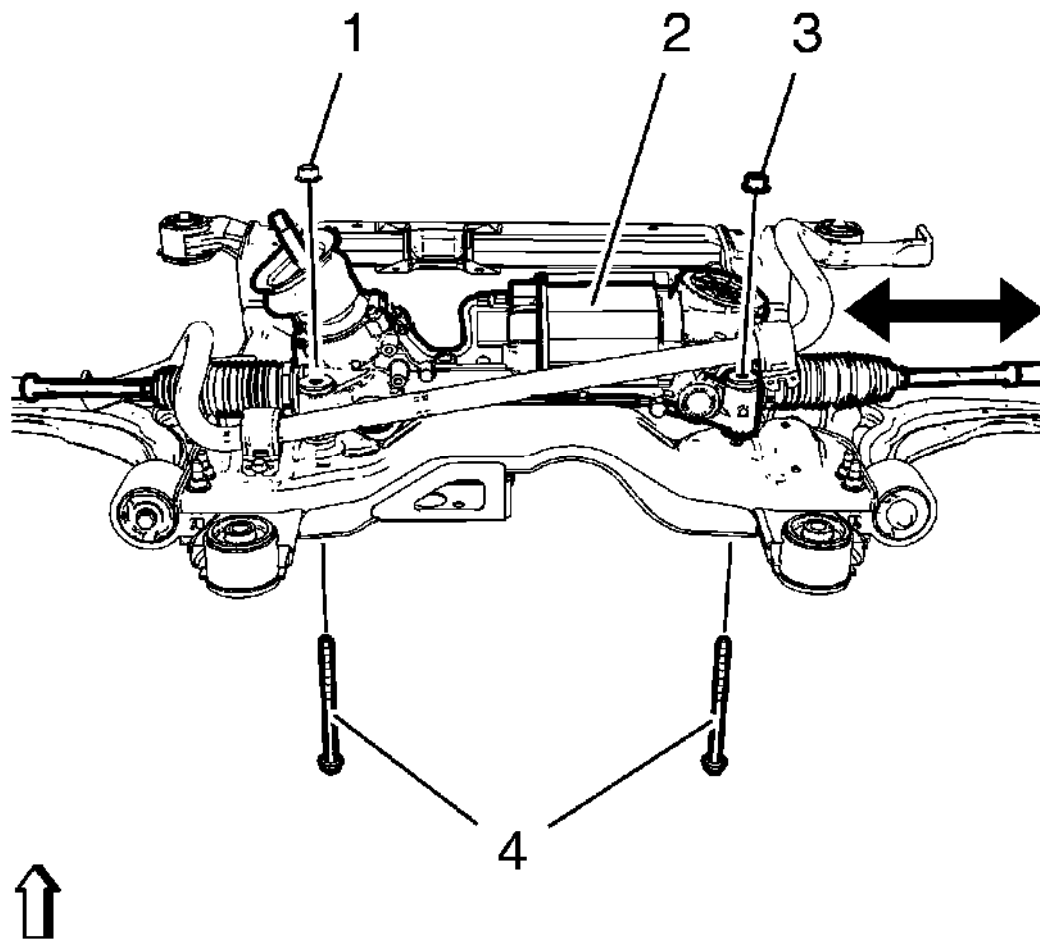


Fig. 13: Steering Gear, Bolts And Nuts
Courtesy of GENERAL MOTORS COMPANY

13. Remove and DISCARD the 2 steering gear bolts (4) and the nuts (1, 3) from front suspension frame.
14. Carefully remove the steering gear (2) through the right front wheel house.

Installation Procedure

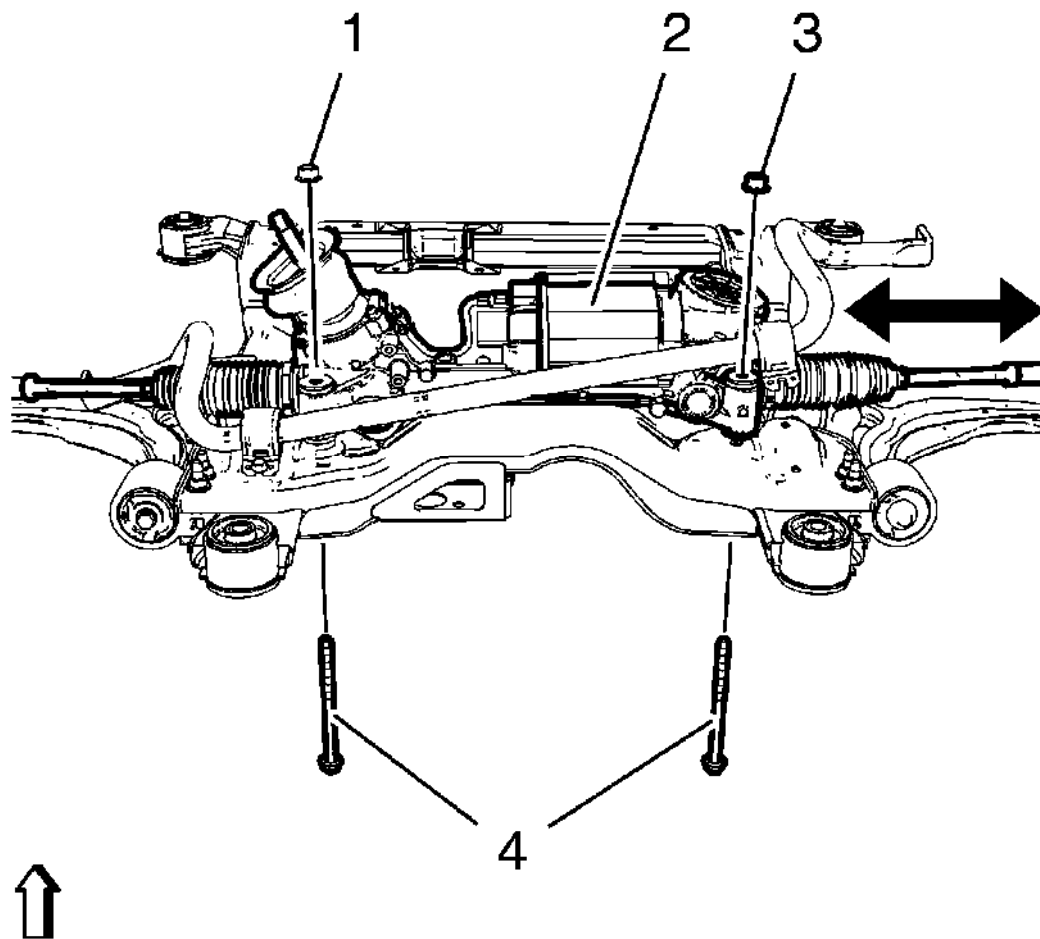


Fig. 14: Steering Gear, Bolts And Nuts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Ensure that the steering column dash seal is installed properly onto steering gear rack pinion housing. The sealing lip **MUST** rest on lower steering column cover surface evenly. To ease installation of the seal, apply liquid soap to the sealing lip. After installation, verify that the seal lip does not protrude into the vehicle's interior. Improper installation could result in poor sealing performance and water intrusion into the vehicle.

NOTE: Ensure the wiring routing is correct.

1. Carefully install the steering gear (2) through the right front wheel house and position the steering gear on the frame.

WARNING: Refer to Torque-to-Yield Fastener Warning .

CAUTION: Refer to Fastener Caution .

2. Install the 2 NEW steering gear bolts (4) and the 2 NEW nuts (1, 3) and tighten to 110 N.m (81 lb ft).
3. Use the **EN-45059** sensor in order to tighten the steering gear bolts and nuts an additional 150 degrees to 160 degrees.

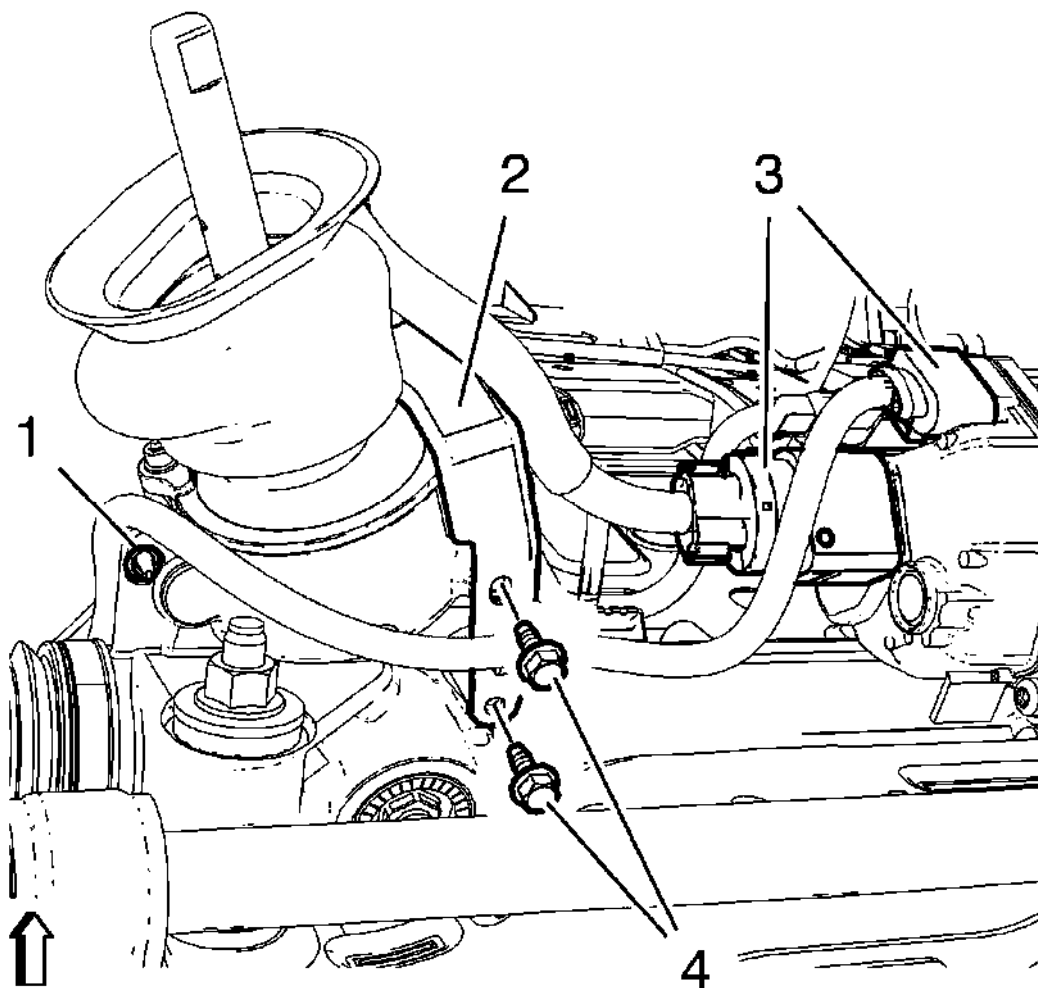


Fig. 15: Transmission Wiring Harness, Plugs, Bracket & Bolts
Courtesy of GENERAL MOTORS COMPANY

4. Install the wiring harness bracket (2).
5. Install the 2 wiring harness bracket bolts (4) and tighten to 9 N.m (80 lb in).
6. Connect the wiring harness retainer (1) to steering gear.

7. Connect the 2 wiring harness plugs (3) to the steering gear.

NOTE: Connector latches are difficult to access

8. Connect the electrical connectors. Refer to **FEP Connectors (Steering Gear)** .

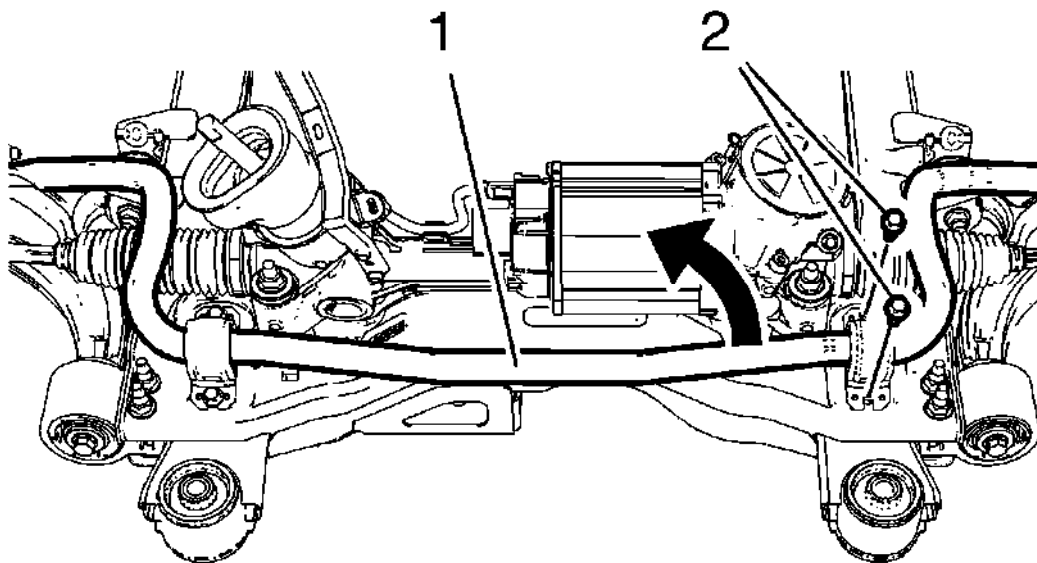


Fig. 16: Stabilizer Shaft And Insulator Clamp Bolts
Courtesy of GENERAL MOTORS COMPANY

9. Position the stabilizer shaft (1) and the bracket onto the suspension frame.
10. Install the NEW right stabilizer shaft insulator clamp bolts (2) and tighten to 22 N.m (16 lb ft).
11. Use the **EN-45059** sensor in order to tighten the NEW right stabilizer shaft insulator clamp bolts an additional 30 degrees.
12. Perform the following steps. Refer to **Drivetrain and Front Suspension Frame Replacement** .
 1. Position the drivetrain and front suspension frame in the vehicle.

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

2. Install the frame reinforcements and the frame reinforcement bolts.
3. Install the rear frame bolts.
4. Install the transmission mount bracket bolts.
5. Connect the 2 stabilizer shaft links.
6. Connect the 2 steering linkage outer tie rods to the 2 steering knuckles.
7. Install the front compartment insulator, if equipped.
8. Install the engine shield, if equipped.
9. Install the front compartment splash shield.
10. Install the exhaust front pipe.
11. Install the front tire and wheel assemblies.
13. Lower the vehicle.
14. Connect the intermediate steering shaft to the steering gear. Refer to **Intermediate Steering Shaft Replacement** .
15. Connect the battery. Refer to **Battery Negative Cable Disconnection and Connection** .
16. Measure and adjust the front toe. Refer to **Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment** .

NOTE: Capturing data from the original power steering assist motor is not necessary when replacing an entire steering gear assembly. New software will be downloaded after gear replacement.

17. Program the power steering control module. Refer to **Power Steering Control Module Programming and Setup** .
18. Center the steering angle sensor and learn the software end stops. Refer to **Power Steering Control Module Calibration**.

STEERING GEAR BUSHING REPLACEMENT

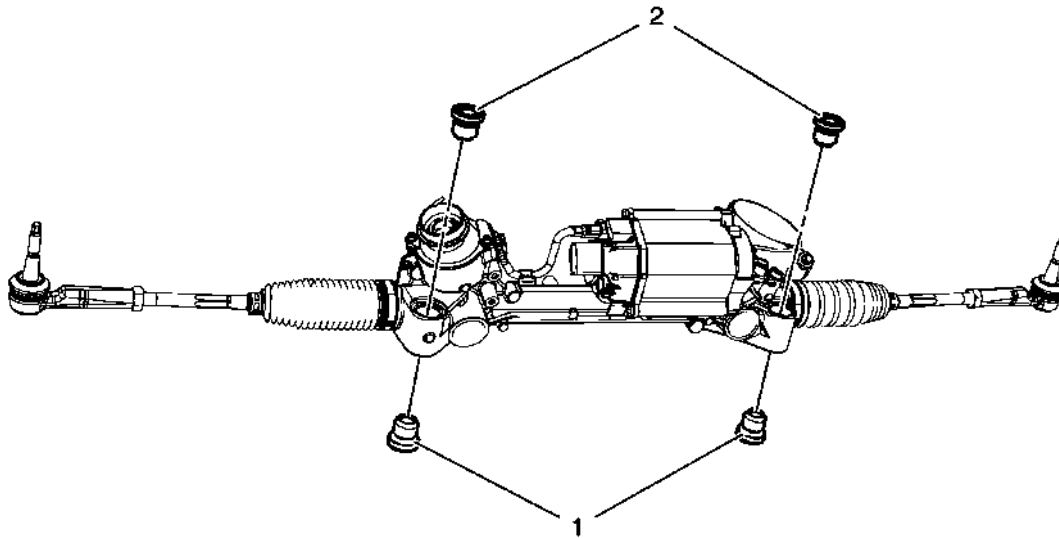


Fig. 17: Upper & Lower Steering Gear Bushings
Courtesy of GENERAL MOTORS COMPANY

Steering Gear Bushing Replacement

Callout	Component Name
Preliminary Procedures Remove electronic power steering gear. Refer to <u>Steering Gear Replacement</u> .	
1	Lower Steering Gear Bushing Procedure 1. Have an assistant hold the steering gear in place. 2. Remove and DISCARD bushing using suitable pliers. 3. Lubricate new bushing with a mild soap to assure easy installation.
2	Upper Steering Gear Bushing Procedure 1. Remove and DISCARD bushing using a suitable punch and a soft rubber mallet. 2. Remove old bushing from backside. 3. Lubricate new bushing with a mild soap to assure easy installation.

STEERING LINKAGE INNER TIE ROD REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the steering gear boot. Refer to [Steering Gear Boot Replacement](#).
3. Turn the steering wheel in order to position the steering gear rack so that only 2 rack teeth and the flat surface of the rack are visible outside the steering gear housing.

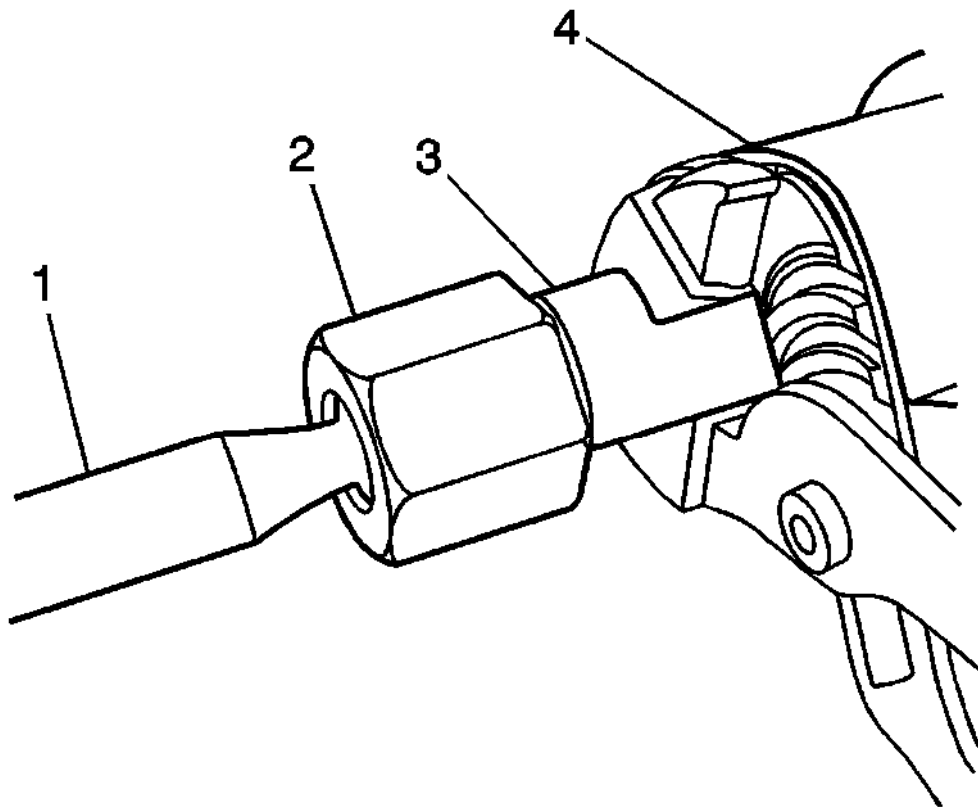


Fig. 18: Steering Linkage Inner Tie Rod
Courtesy of GENERAL MOTORS COMPANY

4. Place a soft jaw pipe wrench or soft jaw pliers on the flat surface of the steering gear rack (3) between the steering gear housing (4) and the inner tie rod housing (2).
5. Place a crows foot wrench on the flats of the inner tie rod housing.

CAUTION: Do not change the steering gear preload adjustment before moving the inner tie rod from the steering gear. Changing the steering gear

preload adjustment before moving the inner tie rod could result in damage to the pinion and the steering gear.

6. Rotate the steering linkage inner tie rod housing counterclockwise while holding the steering gear rack stationary until the steering linkage inner tie rod separates from the steering gear rack.

Installation Procedure

1. Install the steering linkage inner tie rod to the steering gear rack.

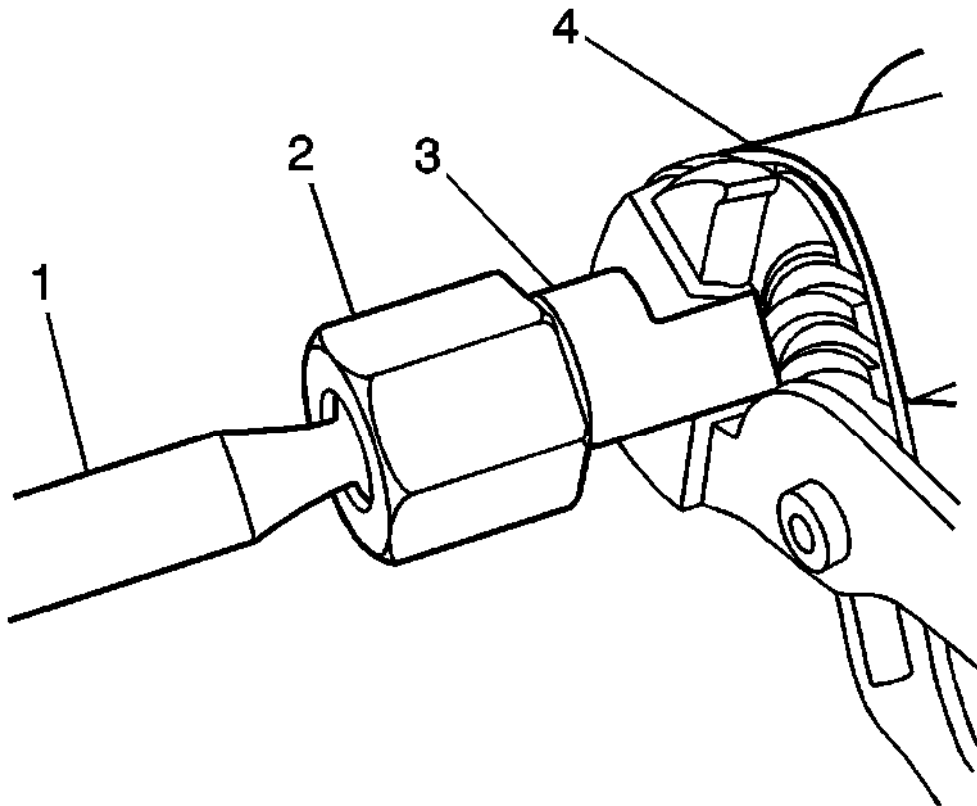


Fig. 19: Steering Linkage Inner Tie Rod
Courtesy of GENERAL MOTORS COMPANY

2. Place a soft jaw pipe wrench or soft jaw pliers on the flat surface of the steering gear rack (3) between the steering gear housing (4) and the inner tie rod housing (2).

CAUTION: Refer to Fastener Caution .

3. Place a torque wrench with a crows foot wrench attachment on the flats of the inner tie rod housing and tighten to 105 N.m (77 lb ft).
4. Install the steering gear boot. Refer to **Steering Gear Boot Replacement**.
5. Lower the vehicle.

POWER STEERING ASSIST MOTOR REPLACEMENT

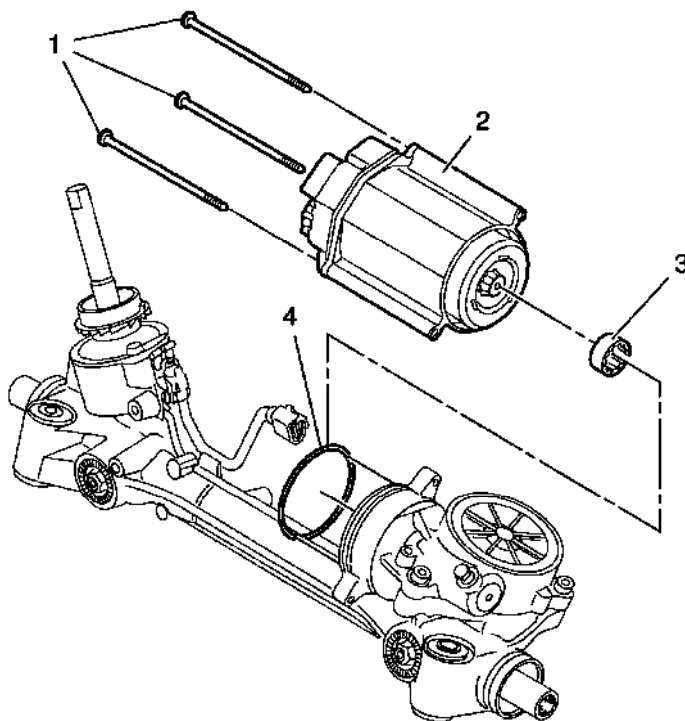


Fig. 20: Power Steering Assist Motor Components

Courtesy of GENERAL MOTORS COMPANY

Power Steering Assist Motor Replacement

Callout	Component Name
CAUTION: Electrostatic discharge (ESD) can damage many solid-state electrical components. ESD susceptible components may or may not be labeled with the ESD symbol. Handle all electrical components carefully. Use the following precautions in order to avoid ESD damage: • Touch a metal ground point in order to remove your body's static charge before servicing any electronic component; especially after sliding across the vehicle seat. • Do not touch exposed terminals. Terminals may connect to circuits susceptible the ESD damage. • Do not allow tools to contact exposed terminals when servicing connectors. • Do not remove components from their protective packaging until required to do so. • Avoid the following actions unless required by the diagnostic procedure:	

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

- Jumpering or grounding of the components or connectors.
- Connecting test equipment probes to components or connectors. Connect the ground lead first when using test probes.
- Ground the protective packaging of any component before opening. Do not rest solid-state components on metal workbenches, or on top of TVs, radios, or other electrical devices.

Preliminary Procedures

1. Capture the data from the old power steering assist motor. Refer to **Power Steering Control Module Programming and Setup** .
2. Disconnect all electrical connectors and components from engine compartment as needed.
3. Carefully disconnect electrical connectors of the electric power steering. Refer to **FEP Connectors (Steering Gear)** .

1	Power Steering Assist Motor Bolt (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . CAUTION: Refer to <u>Torque-to-Yield Fastener Caution</u> . Procedure 1. Remove the 2 upper bolts from engine compartment. 2. Remove the lowest bolt from below. Refer to <u>Lifting and Jacking the Vehicle</u> . 3. Install NEW bolts, do NOT reuse old bolts. Tighten 8 (71 lb in)
2	Power Steering Assist Motor Procedure 1. Transfer the data from the old assist motor to the new power steering assist motor. Refer to <u>Power Steering Control Module Programming and Setup</u> . 2. Calibrate the steering angle sensor and learn the softend stops. Refer to <u>Power Steering Control Module Calibration</u>.
3	Power Steering Assist Motor Drive Boot Procedure

	1. DISCARD drive boot and use NEW ONLY. 2. Install the drive boot to the assist motor armature. 3. Align the drive boot on the assist motor armature to the steering gear.
4	Power Steering Assist Motor Housing O-ring Procedure 1. DISCARD O-ring and use NEW ONLY. 2. Lubricate O-ring. 3. Place O-ring correctly in groove on motor housing.

POWER STEERING CONTROL MODULE CALIBRATION

Steering Angle Sensor Centering and Software Endstop Learning

WARNING: An inaccurate or not centered steering angle sensor could limit the operation of the electric power steering (EPS) and result in personal injury.

Centering of the steering angle sensor and software endstop learning might be required after certain service procedures are performed. Some of these procedures are as follows:

- Steering angle sensor replacement
- Steering gear replacement
- Power steering assist motor replacement
- Steering column replacement
- Steering linkage inner tie rod replacement
- Steering linkage outer tie rod replacement

NOTE: It is necessary to perform the steering angle sensor centering BEFORE the software endstop learning.

Steering Angle Sensor Centering

For electronic power steering equipped vehicles WITH electronic stability control program and EXTERNAL Steering Angle Sensor, refer to **Steering Angle Sensor Centering** .

The centering procedure of the internal steering angle sensor (w/o electronic stability program) can be completed with the following steps:

Conditions: Front axle measured and set, engine running, vehicle speed 0 km/h (0 MPH), internal steering angle sensor is activated.

1. Using the steering wheel, align the front wheels in the center forward position.

2. Using a scan tool, perform the Configuration/Reset Functions, Steering Wheel Angle Sensor Centering procedure.
3. Steer from the center position slowly 90° to the left.
4. Steer slowly back to the center position and then slowly 90° to the right.
5. Steer slowly back to the center position.
6. Perform the steering movements again.
7. Centering procedure is completed.

Software Endstop Learning

The software endstop learning procedure can be completed with the following steps:

Conditions: Front axle measured and set, vehicle speed 0 km/h (0 MPH), internal steering angle sensor is calibrated or external steering angle sensor sends a valid CAN signal.

1. Using a scan tool, perform the Configuration/Reset Functions, Power Steering Softstops Reset procedure and follow the on-screen instructions.
2. Using a scan tool, perform the Configuration/Reset Functions, Power Steering Softstops Learn procedure and follow the on-screen instructions.
3. Software endstop learning procedure is completed.

DESCRIPTION AND OPERATION

POWER STEERING SYSTEM DESCRIPTION AND OPERATION (HYDRAULIC POWER STEERING)

The hydraulic power steering pump is a constant displacement vane-type pump that provides hydraulic pressure and flow for the power steering gear. The hydraulic power steering pumps are either belt-driven or direct-drive, cam-driven.

The power steering fluid reservoir holds the power steering fluid and may be integral with the power steering pump or remotely located. The following locations are typical locations for the remote reservoir:

- Mounted to the front of the dash panel
- Mounted to the inner fender
- Mounted to a bracket on the engine

The 2 basic types of power steering gears are listed below:

- A recirculating ball system
- A rack and pinion system

In the recirculating ball system, a worm gear converts steering wheel movement to movement of a sector shaft. A pitman arm attached to the bottom of the sector shaft actually moves one tie rod and an intermediate rod

move the other tie rod.

In the rack and pinion system, the rack and the pinion are the 2 components that convert steering wheel rotation to lateral movement. The steering shaft is attached to the pinion in the steering gear. The pinion rotates with the steering wheel. Gear teeth on the pinion mesh with the gear teeth on the rack. The rotating pinion moves the rack from side to side. The lateral action of the rack pushes and pulls the tie rods in order to change the direction of the vehicle's front wheels.

The power steering pressure hose connects the power steering pump union fitting to the power steering gear and allows pressurized power steering fluid to flow from the pump to the gear.

The power steering return hose returns fluid from the power steering gear back to the power steering fluid reservoir. The power steering return line may contain an integral fin-type or line-type power steering fluid cooler.

In a typical power steering system, a pump generates hydraulic pressure, causing fluid to flow, via the pressure hose, to the steering gear valve assembly. The steering gear valve assembly regulates the incoming fluid to the right and left chambers in order to assist in right and left turns.

Turning the steering wheel activates the valve assembly, which applies greater fluid pressure and flow to one side of the steering gear piston, and lower pressure and flow to the other side of the piston. The pressure assists the movement of the gear piston. Tie rods transfer this force to the front wheels, which turn the vehicle right or left.

POWER STEERING SYSTEM DESCRIPTION AND OPERATION (ELECTRONIC POWER STEERING)

The power steering system consists of the following components:

- The power steering control module
- The power steering motor
- The power steering motor rotational sensor
- The torque sensor
- The steering gear (rack and dual pinion)

The rack and dual pinion 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 GMLAN serial data circuit to perform the system functions. The power steering control module monitors vehicle speed and engine speed from the engine control module via the GMLAN serial data circuit to determine the amount of steering assist needed to steer the vehicle. 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 uses a combination of the torque sensor, motor rotational sensor, vehicle speed, and calculated system temperature inputs to determine the amount of assist needed. The power steering control module continuously monitors the digital torque sensor's torque and index current signals. As the

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze

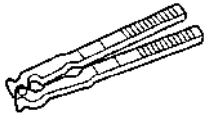
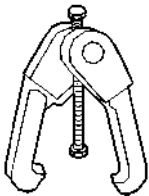
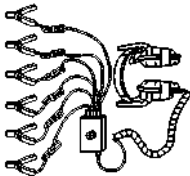
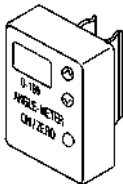
steering wheel is turned and torsional twist is applied to the steering shaft, the steering input and output shafts are monitored via the torque signal circuit and then processed by the power steering control module to calculate the steering torque. The voltage signals of the motor position sensor and 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 pulse width modulated motor drive circuit to drive the 3-phase motor. The power steering control module and motor assembly is attached to the base of the steering gear housing and assists the steering gear pinion to maneuver the rack from left to right according to turning the steering wheel.

The power steering control module has the ability to calculate an internal system temperature to protect the power steering system from damage caused by high temperature. 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. 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 message to be displayed on the driver information center.

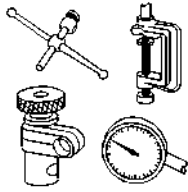
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	CH-22610 J-22610 Keystone Clamp Pliers
	CH-24319-B J-24319-B Steering Linkage and Tie Rod Puller
	CH-39570 J-39570 Chassis Ear
	EN-45059 J-45059 Angle Meter

2013 Chevrolet Cruze

2013 STEERING Power Steering - Cruze



GE-8001
J-8001
Dial Indicator Set