DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
C1587-16	POWER STEERING MOTOR INVERTER POWER SUPPLY - CIRCUIT VOLTAGE BELOW THRESHOLD
C1587-17	POWER STEERING MOTOR INVERTER POWER SUPPLY - CIRCUIT VOLTAGE ABOVE THRESHOLD
C15A4-00	POWER STEERING ASSIST INHIBITED-VEHICLE SPEED TOO HIGH
C211B-00	IGNITION RUN/START INPUT
C211B-11	IGNITION RUN/START INPUT - CIRCUIT SHORT TO GROUND
C211B-12	IGNITION RUN/START INPUT - CIRCUIT SHORT TO BATTERY
C2128-00	ECU RESET/RECOVERY OCCURED
C2129-16	BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD
C2129-17	BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD
C212A-16	SYSTEM VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD
C212A-17	SYSTEM VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD
C212A-84	SYSTEM VOLTAGE - SIGNAL BELOW ALLOWABLE RANGE
C212A-85	SYSTEM VOLTAGE - SIGNAL ABOVE ALLOWABLE RANGE
C2206-00	VEHICLE CONFIGURATION MISMATCH
C220D-00	ELECTRICAL POWERED HYDRAULIC STEERING MODULE INTERNAL
C2210-00	ECU OVERTEMPERATURE
C221F-00	ECU NOT INITIALIZED
U0002-00	CAN C BUS OFF PERFORMANCE
U0100-00	LOST COMMUNICATION WITH ECM/PCM
U0100-00	LOST COMMUNICATION WITH ECM/PCM
U0121-00	LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE
U0126-00	LOST COMMUNICATION WITH STEERING ANGLE SENSOR
U0140-00	LOST COMMUNICATION WITH BODY CONTROL MODULE
U0155-00	LOST COMMUNICATION WITH CLUSTER-CCN
U0401-00	IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM
U0415-00	IMPLAUSIBLE DATA RECEIVED FROM ABS
U0428-00	IMPLAUSIBLE DATA RECEIVED FROM STEERING ANGLE SENSOR MODULE
U1601-00	ECU APPLICATION SOFTWARE CODE 1 MISSING OR CORRUPTED
U160B-00	ECU BOOT SOFTWARE 1 MISSING OR CORRUPTED

DIAGNOSIS AND TESTING

C1587-16-POWER STEERING MOTOR INVERTER POWER SUPPLY - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete ELECTRO HYDRAULIC POWER STEERING EHPS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCs.

SET CONDITION

- The Electro-Hydraulic Power Steering (EHPS) Module detects that the voltage is under 10 volts and can not operate the motor safely.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM VOLTAGE LOW
FUSES
RUN/START RELAY
IGNITION RUN/START CONTROL CIRCUIT OPEN OR HIGH RESISTANCE
FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

NOTE: This DTC must be active for the results of this test to be valid.

1. Perform any Service Bulletins that may apply.
2. Turn the ignition on.
3. With the scan tool, read DTCs and record on the repair order.
4. With the scan tool, read and record Environmental Data.

5. With the scan tool, erase EHPS DTCs.

1. Park the vehicle on level ground.
2. Start the engine.
3. Tun the steering wheel from stop to stop.
4. With the scan tool, read EHPS DTCs.

Is the DTC active?

Yes

- Go To 2

No

- Test complete, the condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**

2. **CHECK FOR PCM OR RELATED CHARGING DTCS**

1. Refer to the recorded DTCs.

Are there any PCM or related Charging DTCs active or pending?

Yes

- Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

No

- Go To 3

3. **CHECK THE N6 (125A) AND F34 (10A) FUSES**

1. Turn the ignition on.
2. Using a 12-volt test light connected to ground, check the Fuses N6 (125A) and F34 (10A) for power.

Are the fuses good?

Yes

- Go To 4

No

- If the related fuse(s) are open, check the EHPS Module Power circuits for a short to ground.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

4. **CHECK THE (F941) IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**

1. Disconnect the EHPS C2 harness connector to isolate the 12.0 volt supply circuit.
2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the EHPS C2 harness connector (A). **Note:** refer to the diagram below.

3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

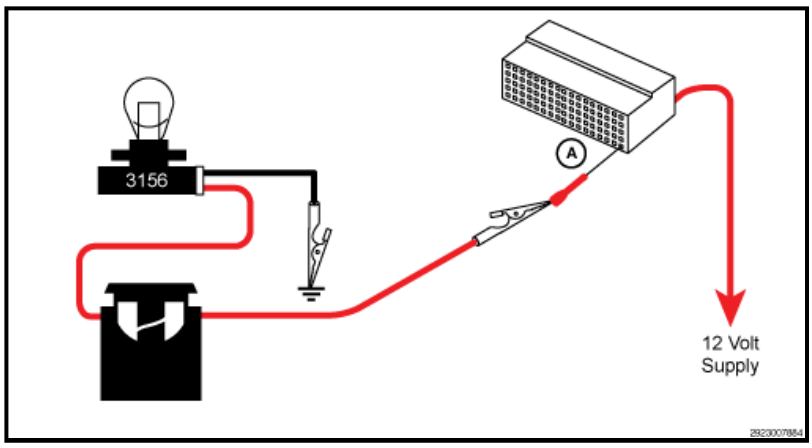
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 5

No

- Repair the (F941) Ignition RUN/START Control Output circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

5. **CHECK THE (A10) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the EHPS C1 harness connector to isolate the 12.0 volt supply circuit.
    2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the EHPS C1 harness connector (A). **Note:** refer to the diagram below.
    3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
    4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
    5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

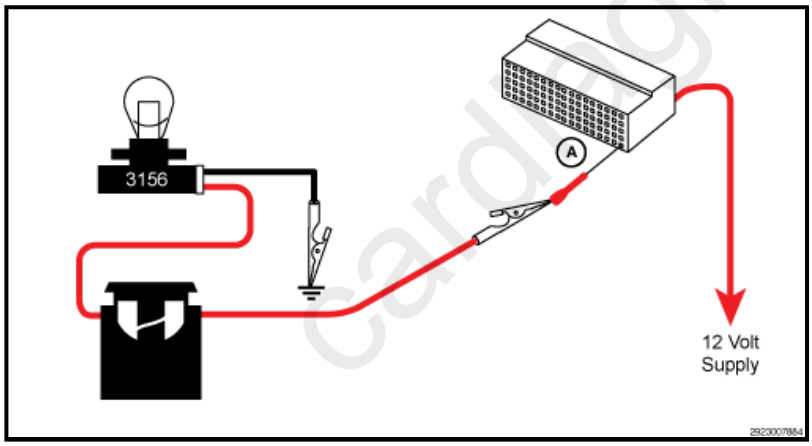
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 6

No

- Repair the (A10) Fused B(+) circuit for an open or high resistance.

- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

6. **CHECK THE (Z908) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the EHPS C1 harness connector to isolate the ground circuit.
    2. Connect the positive lead of the load test tool to the positive side of the Battery.
    3. Connect the negative lead of the load test tool to the ground circuit at the EHPS C1 harness connector (A). **Note:** refer to the diagram below.
    4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

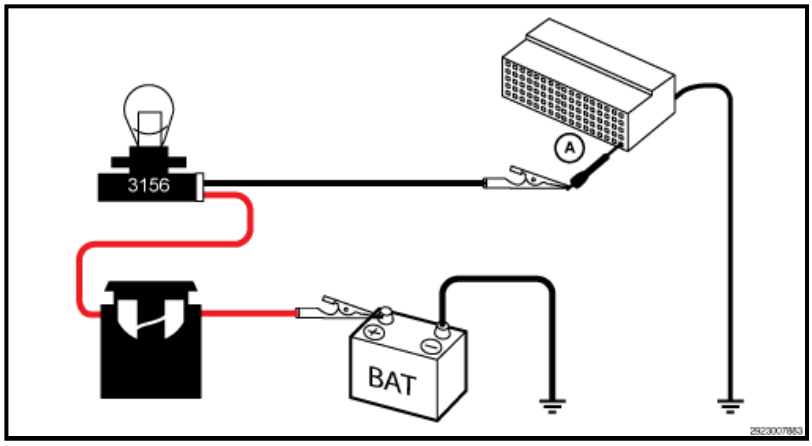
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 7

No

- Repair the (Z908) Ground circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

7. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect the EHPS Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

        Repair any conditions that are found.

    5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C1587-17-POWER STEERING MOTOR INVERTER POWER SUPPLY - CIRCUIT VOLTAGE ABOVE THRESHOLD

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- The Electro-Hydraulic Power Steering (EHPS) Module detects voltage over 16 volts.

DEFAULT ACTION

- EHPS indicator light illuminated.

- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM VOLTAGE HIGH
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Perform any Service Bulletins that may apply.
   2. Turn the ignition on.
   3. With the scan tool, read DTCs and record on the repair order.
   4. With the scan tool, read and record Environmental Data.
   5. With the scan tool, erase EHPS DTCs.
   1. Park the vehicle on level ground.
   2. Start the engine.
   3. Tun the steering wheel from stop to stop.
   4. With the scan tool, read EHPS DTCs.

   Is the DTC active?

   Yes

   - Go To 2

   No

   - Test complete, the condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
   - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **CHECK FOR PCM OR RELATED CHARGING DTCS**
   1. Refer to the recorded DTCs.

   Are there any PCM or related Charging DTCs active or pending?

   Yes

   - Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

   No

   - Go To 3

3. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect the EHPS Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

        Repair any conditions that are found.

    5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
    6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
    7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
    8. With the scan tool, erase DTCs.
    9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
    10. With the scan tool, read EHPS Module DTCs.

        Did the DTC return?

        Yes

        - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
        - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

        No

        - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
        - Test complete.

C15A4-00-POWER STEERING ASSIST INHIBITED-VEHICLE SPEED TOO HIGH

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power

steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCs.

SET CONDITION

- The Electro-Hydraulic Power Steering (EHPS) Module detects that the voltage is under 10 volts and can not operate the motor safely.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE OR COMMUNICATION DTCS
ELECTRO-HYDRAULIC POWER STEERING (EHPS) PUMP
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

NOTE: This DTC must be active for the results of this test to be valid.

1. Perform any Service Bulletins that may apply.
2. Turn the ignition on.
3. With the scan tool, read DTCs and record on the repair order.
4. With the scan tool, read and record Environmental Data.
5. With the scan tool, erase EHPS DTCs.
1. Park the vehicle on level ground.
2. Start the engine.
3. Tun the steering wheel from stop to stop.
4. With the scan tool, read EHPS DTCs.

Is the DTC active?

Yes

- Go To 2

No

- Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.

2. **CHECK FOR ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE OR COMMUNICATION RELATED DTCS**
   1. Refer to the recorded DTCs.

      Are there any EHPS Module or Communication related DTCs active?

      Yes

      - Perform the appropriate diagnostic procedures before continuing with this test. Refer to **ANTILOCK BRAKE SYSTEM (ABS) - DIAGNOSTIC CODE INDEX** .

      No

      - Go To 3
3. **EHPS PUMP MOTOR**
   1. Turn the steering wheel left and right.

      Is there power steering assist?

      Yes

      - Go To 4

      No

      - Replace the Electro-Hydraulic Power Steering (EHPS) Pump in accordance with the Service Information. Refer to **PUMP, REMOVAL AND INSTALLATION** .
      - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
4. **POWER STEERING SYSTEM**
   1. Inspect the Power Steering System for mechanical problems.

      Were any problems found?

      Yes

      - Repair as necessary.
      - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

      No

      - Go To 5
5. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module harness connectors.

2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
    - Proper connector installation.
    - Damaged connector locks.
    - Corrosion.
    - Other signs of water intrusion.
    - Weather seal damage (if equipped).
    - Bent terminals.
    - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
    - Terminals that have been pushed back into the connector cavity.
    - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

    Repair any conditions that are found.
5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C211B-00-IGNITION RUN/START INPUT

For a complete ELECTRO HYDRAULIC POWER STEERING EHPS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power

steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCs.

SET CONDITION

- No ignition voltage sensed at the Electro-Hydraulic Power Steering (EHPS) Module while the vehicle is running.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
IGNITION (RUN-START) CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
IGNITION (RUN-START) CONTROL OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

NOTE: This DTC must be active for the results of this test to be valid.

1. Perform any Service Bulletins that may apply.
2. Turn the ignition on.
3. With the scan tool, read DTCs and record on the repair order.
4. With the scan tool, read and record Environmental Data.
5. With the scan tool, erase EHPS DTCs.
1. Park the vehicle on level ground.
2. Start the engine.
3. Tun the steering wheel from stop to stop.
4. With the scan tool, read EHPS DTCs.

Is the DTC active?

Yes

- Go To 2

No

- Test complete, the condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **ISOLATE AND CHECK THE (F941) IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR A SHORT TO GROUND**
    1. Remove Fuse 34 from Front Power Distribution Center (PDC).
    2. The ignition must be off when checking a circuit for continuity to ground.
    3. Isolate the (F941) Ignition RUN/START Control Output circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
    4. Connect the negative lead of the DVOM to a known good ground.
    5. With the positive lead of the DVOM, probe the circuit being tested at the EHPS C1 harness connector and check for continuity between the circuit and ground.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the circuit being tested?

Yes

- Repair the (F941) Ignition RUN/START Control Output circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

No

- Go To 3

3. **CHECK THE (F941) IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
    2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
    3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
    4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.

5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

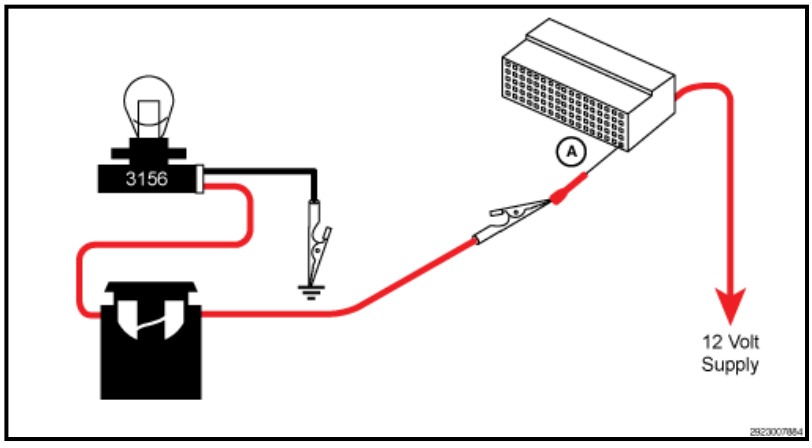
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any**

possible damage to the ECU terminals.

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 4

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

4. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).
      - Bent terminals.
      - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
      - Terminals that have been pushed back into the connector cavity.
      - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

      Repair any conditions that are found.
   5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
   6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
   7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
   8. With the scan tool, erase DTCs.
   9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
   10. With the scan tool, read EHPS Module DTCs.

       Did the DTC return?

       Yes

       - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .

- Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

No

- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
- Test complete.

C211B-11-IGNITION RUN/START INPUT - CIRCUIT SHORT TO GROUND

For a complete ELECTRO HYDRAULIC POWER STEERING EHPS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- The ignition signal at the Electro-Hydraulic Power Steering (EHPS) Module harness connector is less than 2.5 Volts while the vehicle is running.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
IGNITION RUN/START CONTROL OUTPUT CIRCUIT SHORTED TO GROUND
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **VERIFY THE DTC IS ACTIVE**

NOTE: **This DTC must be active for the results of this test to be valid.**

1. Perform any Service Bulletins that may apply.
2. Turn the ignition on.
3. With the scan tool, read DTCs and record on the repair order.
4. With the scan tool, read and record Environmental Data.
5. With the scan tool, erase EHPS DTCs.
1. Cycle the ignition from off to on.
2. With the scan tool, read EHPS DTCs.

Is the DTC active at this time?

Yes

- Go To 2

No

- Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **ISOLATE AND CHECK THE (F941) IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR A SHORT TO GROUND**
1. Remove Fuse 34 from Front Power Distribution Center (PDC).
2. The ignition must be off when checking a circuit for continuity to ground.
3. Isolate the (F941) Ignition RUN/START Control Output circuit by disconnecting the Electronic Control Unit (ECU) and every component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
4. Connect the negative lead of the DVOM to a known good ground.
5. With the positive lead of the DVOM, probe the circuit being tested at the component harness connector and check for continuity between the circuit and ground.

NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **There should be no continuity between ground and the circuit being tested.**

Is there continuity between ground and the (F941) Ignition RUN/START Control Output circuit being tested?

Yes

- Repair the (F941) Ignition RUN/START Control Output circuit for a short to ground. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

No

- Go To 3

3. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect the EHPS Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

        Repair any conditions that are found.

    5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
    6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
    7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
    8. With the scan tool, erase DTCs.
    9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
    10. With the scan tool, read EHPS Module DTCs.

        Did the DTC return?

        Yes

        - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
        - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

        No

        - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
        - Test complete.

C211B-12-IGNITION RUN/START INPUT - CIRCUIT SHORT TO BATTERY

For a complete ELECTRO HYDRAULIC POWER STEERING EHPS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- The Electro-Hydraulic Power Steering (EHPS) Module receives ignition signal while ignition is off.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
IGNITION RUN/START CONTROL OUTPUT CIRCUIT SHORTED TO BATTERY
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

NOTE: This DTC must be active for the results of this test to be valid.

1. Perform any Service Bulletins that may apply.
2. Turn the ignition on.
3. With the scan tool, read DTCs and record on the repair order.
4. With the scan tool, read and record Environmental Data.
5. With the scan tool, erase EHPS DTCs.
1. Cycle the ignition from off to on.
2. With the scan tool, read EHPS DTCs.

Is the DTC active?

Yes

- Go To 2

No

- Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **ISOLATE AND CHECK THE (F941) IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE**
    1. Turn the ignition off.
    2. Disconnect the EHPS C2 harness connector at the EHPS Module. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
    3. Using a DVOM, measure the voltage of the (F941) Ignition RUN/START Control Output circuit being tested at the EHPS C2 harness connector.

    Is there any voltage present?

    Yes

    - Repair the (F941) Ignition RUN/START Control Output circuit for a short to voltage. Use the wiring diagram as a guide to trace the circuit and look for any in-line connectors to help isolate the location of the short.
    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Go To 3
3. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect the EHPS Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

    Repair any conditions that are found.

5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C2128-00-ECU RESET/RECOVERY OCCURED

For a complete ELECTRO HYDRAULIC POWER STEERING EHPS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Once, at each ignition cycle.
- No under voltage DTCs.

SET CONDITION

- The ignition is turned on, the Electro-Hydraulic Power Steering (EHPS) Module checks to see if the last shutdown occurred correctly. If it did not, this DTC will be set active for the remainder of the current key cycle. The EHPS Pump will run normally even if this DTC is active.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).

POSSIBLE CAUSES

Possible Causes
(A951) FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
(Z908) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: Make sure the 12-volt battery is fully charged before proceeding.

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Perform any Service Bulletins that may apply.
   2. Turn the ignition on.
   3. With the scan tool, read DTCs and record on the repair order.
   4. With the scan tool, read and record Environmental Data.
   5. With the scan tool, erase EHPS DTCs.
   1. Park the vehicle on level ground.
   2. Start the engine.
   3. Tun the steering wheel from stop to stop.
   4. With the scan tool, read EHPS DTCs.

   Is the DTC active?

   Yes

   - Go To 2

   No

   - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
   - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
2. **CHECK THE (A10) FUSED B(+) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
   1. Disconnect the EHPS C1 harness connector to isolate the 12.0 volt supply circuit.

2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the EHPS C1 harness connector (A). **Note:** refer to the diagram below.
3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

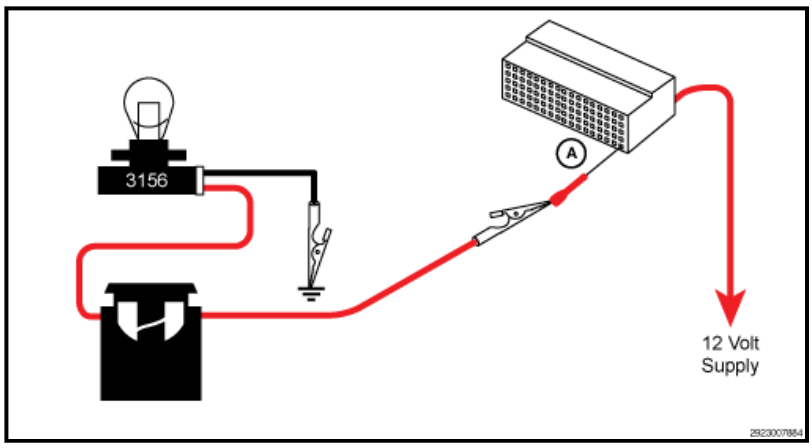
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 3

No

- Repair the (A951) Fused B(+) circuit for an open or high resistance.
- Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

3. **CHECK THE (Z908) GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the EHPS C1 harness connector to isolate the ground circuit.
    2. Connect the positive lead of the load test tool to the positive side of the Battery.
    3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
    4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

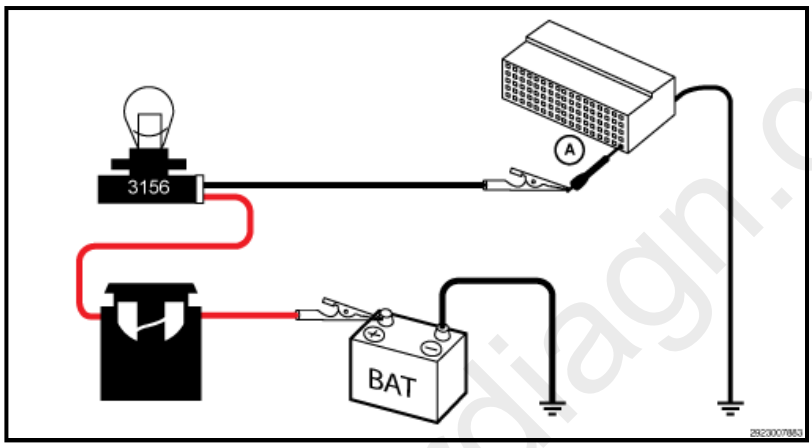
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 4

No

- Repair the (Z908) Ground circuit for an open or high resistance.
- Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

4. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
    - Proper connector installation.
    - Damaged connector locks.
    - Corrosion.
    - Other signs of water intrusion.
    - Weather seal damage (if equipped).
    - Bent terminals.
    - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
    - Terminals that have been pushed back into the connector cavity.
    - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

    Repair any conditions that are found.

5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C2129-16-BATTERY VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete ELECTRO HYDRAULIC POWER STEERING EHPS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Module monitors the battery voltage level at the EHPS supply voltage terminal for the following failure conditions:

- System Voltage Excessively Low
- System Voltage Low

If the EHPS supply voltage is below the System Voltage Low or the Excessively Low threshold, the EHPS will not supply power to the steering gear motor. A Diagnostic Trouble Code (DTC) is set when one of the diagnostic voltage thresholds is reached for a calibrated amount of time.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- System voltage between 10.0 and 16.0 volts.

SET CONDITION

- Electro-Hydraulic Power Steering (EHPS) Module supply voltage below 10.0 volts for longer than 15 seconds.

DEFAULT ACTION

- EHPS Module supply voltage below 10.0 volts:
  - Power Steering assist reduced.
- EHPS Module supply voltage below 9.0 volts:
  - No Power Steering assist.

POSSIBLE CAUSES

Possible Causes
FUSED IGNITION OPEN OR HIGH RESISTANCE
FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: Make sure the battery is fully charged.

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Park the vehicle on level ground.
   2. Perform any Service Bulletins that may apply.
   3. Turn the ignition on.
   4. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
   5. With the scan tool, read DTCs and record on the repair order.
   6. With the scan tool, erase all DTCs.
   7. Start the engine and run for two minutes.
   8. Turn the steering wheel from stop to stop.
   9. With the scan tool, read the EHPS DTCs.

   Did the DTC return?

Yes

- Go To 2

No

- The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension and repair as necessary. If no problems are found, test complete.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **ISOLATE AND CHECK THE (F941) IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the EHPS Module C2 harness connector to isolate the (F941) Ignition RUN/START Control Output circuit.
    2. Connect the positive lead of the load test tool to the (F941) Ignition RUN/START Control Output circuit at the EHPS Module C1 harness connector (A). **Note:** refer to the diagram below.
    3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
    4. Make sure that the circuit being tested is being powered on. If the ((F941) Ignition RUN/START Control Output circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
    5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

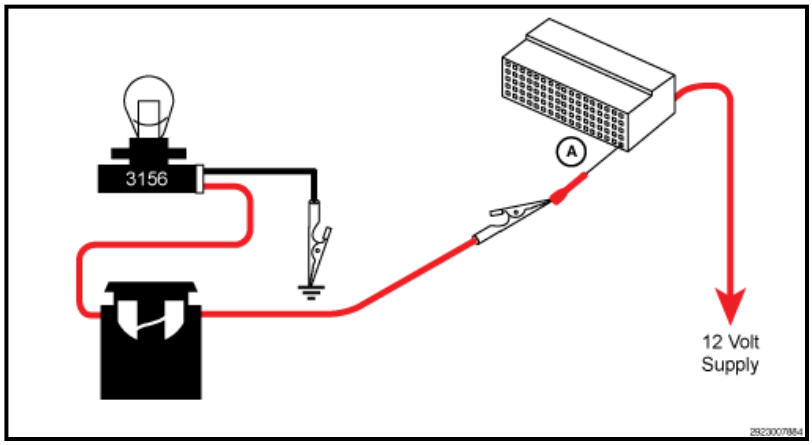
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 3

No

- Repair the (F941) Ignition RUN/START Control Output circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST** .

3. **ISOLATE AND CHECK THE (A10) FUSED (B+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the EHPS Module C1 harness connector to isolate the (A10) Fused (B+) circuit.
    2. Connect the positive lead of the load test tool to the (A10) Fused (B+) circuit at the EHPS Module C1 harness connector (A). **Note:** refer to the diagram below.
    3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
    4. Make sure that the circuit being tested is being powered on. If the (A10) Fused (B+) circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
    5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing**

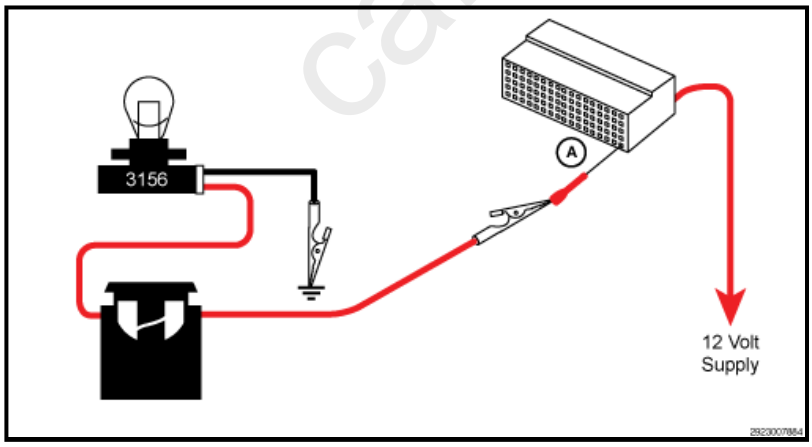
circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 4

No

- Repair the (A10) Fused (B+) circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

4. **ISOLATE AND CHECK THE (Z908) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the EHPS Module C1 harness connector to isolate the ground circuit.
    2. Connect the positive lead of the load test tool to the positive side of the Battery.
    3. Connect the negative lead of the load test tool to the Ground circuit at the EHPS Module C1 harness connector (A). **Note:** refer to the diagram below.
    4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

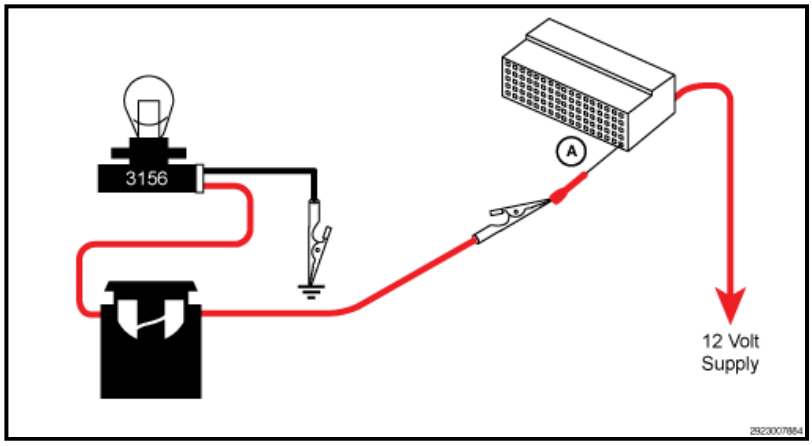
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 5

No

- Repair the (Z908) Ground circuit for an open circuit or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

5. **CHECK THE EHPS MODULE RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module C1 and C2 harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).
      - Bent terminals.
      - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
      - Terminals that have been pushed back into the connector cavity.
      - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

      Repair any conditions that are found.

   5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.

6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C2129-17-BATTERY VOLTAGE-CIRCUIT VOLTAGE ABOVE THRESHOLD

THEORY OF OPERATION

The Electric Hydraulic Power Steering (EHPS) Module monitors the battery voltage level at the EHPS supply voltage terminal for the following failure conditions:

- System Voltage High

If the EHPS supply voltage is above the System Voltage High threshold, the EHPS will not supply power to the steering gear motor. A Diagnostic Trouble Code (DTC) is set when one of the diagnostic voltage thresholds is reached for a calibrated amount of time.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- Electro-Hydraulic Power Steering (EHPS) Module detects the battery voltage has increased above 16.5 volts for more than 1 second.

DEFAULT ACTION

- EHPS is disabled.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM DTCS PRESENT ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Turn the ignition on.
   2. With the scan tool, read DTCs and record on vehicle work order.
   3. With the scan tool, erase DTCs.
   4. Start the engine.
   5. With the scan tool, read EPS DTCs.

   Is the DTC active?

   Yes

   - Go To 2

   No

   - Test complete, the condition or conditions that originally set this DTC are not present at this time.
   - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **CHECK FOR POWERTRAIN CONTROL MODULE (PCM) OR CHARGING SYSTEM RELATED DTCS**
   1. Turn the ignition on.
   2. With the scan tool, read DTCs in the PCM.

   Are there any PCM or Charging System related DTCs present?

   Yes

   - Perform the appropriate Charging System DTC diagnostic procedures before continuing with this test. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

   No

   - Go To 3

3. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).

- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C212A-16-SYSTEM VOLTAGE - CIRCUIT VOLTAGE BELOW THRESHOLD

For a complete ELECTRO HYDRAULIC POWER STEERING EHPS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Module monitors the battery voltage level at the EHPS supply voltage terminal for the following failure conditions:

- System Voltage Excessively Low
- System Voltage Low

If the EHPS supply voltage is below the System Voltage Low or the Excessively Low threshold, the EHPS will not supply power to the steering gear motor. A Diagnostic Trouble Code (DTC) is set when one of the diagnostic voltage thresholds is reached for a calibrated amount of time.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

- System voltage between 10.0 and 16.0 volts.

SET CONDITION

- Electro-Hydraulic Power Steering (EHPS) Module supply voltage below 10.0 volts for longer than 15 seconds.

DEFAULT ACTION

- EHPS Module supply voltage below 10.0 volts:
  - Power Steering assist reduced.
  - EPS lamp not illuminated.
- EHPS Module supply voltage below 9.0 volts:
  - No Power Steering assist.
  - EPS lamp illuminated.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM
FUSED IGNITION CIRCUIT OPEN OR HIGH RESISTANCE
FUSED B(+) CIRCUITS OPEN OR HIGH RESISTANCE
GROUND CIRCUITS OPEN OR HIGH RESISTANCE
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding.
Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: Make sure the battery is fully charged.

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Park the vehicle on level ground.
   2. Perform any Service Bulletins that may apply.
   3. Turn the ignition on.
   4. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
   5. With the scan tool, read DTCs and record on the repair order.
   6. With the scan tool, erase all DTCs.
   7. Start the engine and run for two minutes.
   8. Turn the steering wheel from stop to stop.
   9. With the scan tool, read the EHPS DTCs.

      Did the DTC return?

      Yes

      - Go To 2

      No

- The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension and repair as necessary. If no problems are found, test complete.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **CHECK FOR POWERTRAIN CONTROL MODULE (PCM) OR COMMUNICATION RELATED DTCS**
   1. Refer to the recorded DTCs.

      Are there any PCM DTCs present?

      Yes

      - Perform the applicable diagnostic procedure(s). Refer to **ANTILOCK BRAKE SYSTEM (ABS) - DIAGNOSTIC CODE INDEX** .

      No

      - Go To 3
3. **ISOLATE AND CHECK THE (F941) IGNITION RUN/START CONTROL OUTPUT CIRCUIT FOR AN OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
   1. Disconnect the EHPS Module C2 harness connector to isolate the (F941) Ignition RUN/START Control Output circuit.
   2. Connect the positive lead of the load test tool to the (F941) Ignition RUN/START Control Output circuit at the EHPS Module C1 harness connector (A). **Note:** refer to the diagram below.
   3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
   4. Make sure that the circuit being tested is being powered on. If the ((F941) Ignition RUN/START Control Output circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
   5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

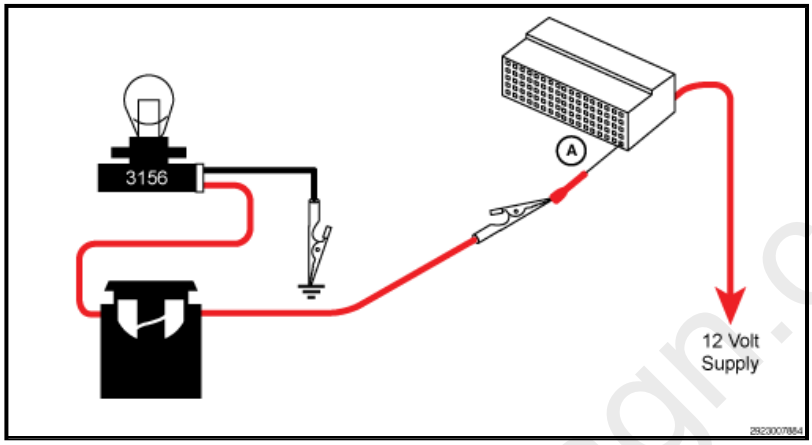
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 4

No

- Repair the (F941) Ignition RUN/START Control Output circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

4. **ISOLATE AND CHECK THE (A10) FUSED (B+) CIRCUIT FOR AN OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
   1. Disconnect the EHPS Module C1 harness connector to isolate the (A10) Fused (B+) circuit.
   2. Connect the positive lead of the load test tool to the (A10) Fused (B+) circuit at the EHPS Module C1 harness connector (A). **Note:** refer to the diagram below.
   3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.

4. Make sure that the circuit being tested is being powered on. If the (A10) Fused (B+) circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

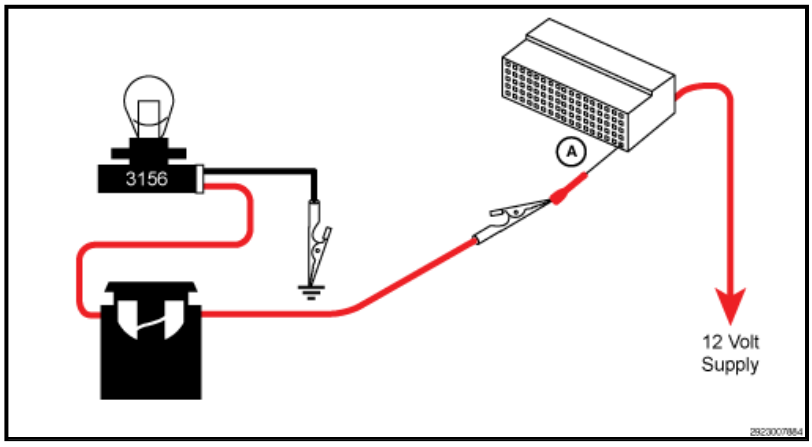
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 5

No

- Repair the (A10) Fused (B+) circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

5. **ISOLATE AND CHECK THE (Z908) GROUND CIRCUIT FOR AN OPEN/HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the EHPS Module C1 harness connector to isolate the ground circuit.
    2. Connect the positive lead of the load test tool to the positive side of the Battery.
    3. Connect the negative lead of the load test tool to the Ground circuit at the EHPS Module C1 harness connector (A). **Note:** refer to the diagram below.
    4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

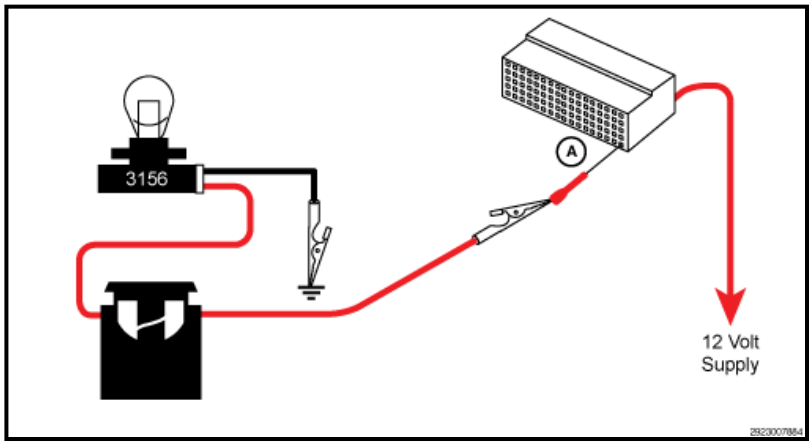
NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 6

No

- Repair the (Z908) Ground circuit for an open circuit or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

6. **CHECK THE EHPS MODULE RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module C1 and C2 harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).
      - Bent terminals.
      - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).

- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C212A-17-SYSTEM VOLTAGE - CIRCUIT VOLTAGE ABOVE THRESHOLD

THEORY OF OPERATION

The Electric Hydraulic Power Steering (EHPS) Module monitors the battery voltage level at the EHPS supply voltage terminal for the following failure conditions:

- System Voltage High

If the EHPS supply voltage is above the System Voltage High threshold, the EHPS will not supply power to the steering gear motor. A Diagnostic Trouble Code (DTC) is set when one of the diagnostic voltage thresholds is reached for a calibrated amount of time.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.

SET CONDITION

- Electro-Hydraulic Power Steering (EHPS) Module detects the battery voltage has increased above 16.5 volts for more than 1 second.

DEFAULT ACTION

- EHPS is disabled.

POSSIBLE CAUSES

Possible Causes
CHARGING SYSTEM DTCS PRESENT ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Turn the ignition on.
   2. With the scan tool, read DTCs and record on vehicle work order.
   3. With the scan tool, erase DTCs.
   4. Start the engine.
   5. With the scan tool, read EPS DTCs.

   Is the DTC active?

   Yes

   - Go To 2

   No

   - Test complete, the condition or conditions that originally set this DTC are not present at this time.
   - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **CHECK FOR POWERTRAIN CONTROL MODULE (PCM) OR CHARGING SYSTEM RELATED DTCS**
   1. Turn the ignition on.
   2. With the scan tool, read DTCs in the PCM.

   Are there any PCM or Charging System related DTCs present?

   Yes

   - Perform the appropriate Charging System DTC diagnostic procedures before continuing with this test. Refer to **DIAGNOSIS AND TESTING** , or **DIAGNOSIS AND TESTING** .

   No

   - Go To 3

3. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.

- Damaged connector locks.
- Corrosion.
- Other signs of water intrusion.
- Weather seal damage (if equipped).
- Bent terminals.
- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C212A-84-SYSTEM VOLTAGE - SIGNAL BELOW ALLOWABLE RANGE

For a complete ELECTRO HYDRAULIC POWER STEERING EHPS SYSTEM wiring diagram, **refer to the appropriate wiring information** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result,

steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Once, at each ignition cycle.
- No under voltage DTCs.

SET CONDITION

- The Electro-Hydraulic Power Steering (EHPS) Module receives a low charging system voltage message over the CAN C bus or detects voltage under 10 volts.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM) OR RELATED CHARGING SYSTEM DTCS
FUSED B(+) CIRCUIT OPEN OR HIGH RESISTANCE
GROUND CIRCUIT OPEN OR HIGH RESISTANCE
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Perform any Service Bulletins that may apply.
   2. Turn the ignition on.
   3. With the scan tool, read DTCs and record on the repair order.
   4. With the scan tool, read and record Environmental Data.
   5. With the scan tool, erase EHPS DTCs.
   1. Park the vehicle on level ground.
   2. Start the engine.
   3. Tun the steering wheel from stop to stop.
   4. With the scan tool, read EHPS DTCs.

   Is the DTC active?

   Yes

   - Go To 2

   No

   - Test complete, the condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and

connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.

- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **CHECK FOR PCM OR RELATED CHARGING DTCS**
   1. Refer to the recorded DTCs.

      Are there any PCM or related Charging DTCs active or pending?

      Yes

      - Perform the applicable diagnostic procedure(s). Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

      No

      - Go To 3
3. **CHECK THE (A951) FUSED B(+) CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
   1. Disconnect the component harness connector to isolate the 12.0 volt supply circuit.
   2. Connect the positive lead of the load test tool to the 12.0 volt supply circuit at the component harness connector (A). **Note:** refer to the diagram below.
   3. Connect the negative lead of the load test tool to the ground circuit of the Battery or a good chassis ground.
   4. Make sure that the circuit being tested is being powered on. If the 12.0 volt circuit being tested is an ignition feed for example, the ignition must be on. If testing an output from a relay, verify that the relay is energized and on.
   5. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .**

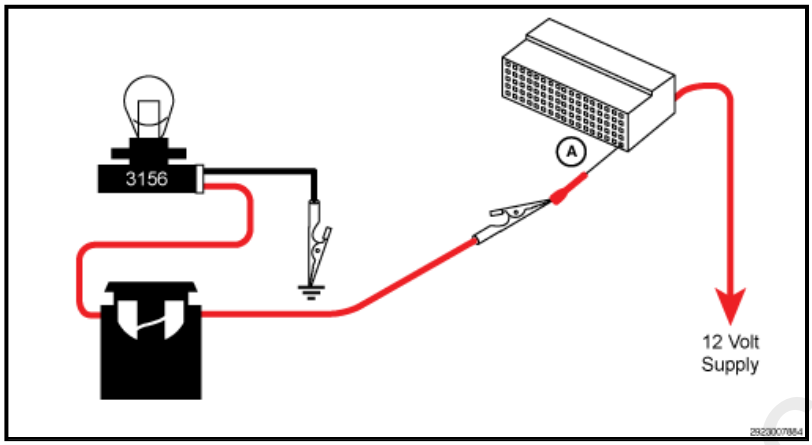
NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test? To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**

- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To the appropriate information

No

- Repair the 12.0 volt circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

4. **CHECK THE (Z907) GROUND CIRCUIT FOR HIGH RESISTANCE BY LOAD TESTING THE CIRCUIT**
    1. Disconnect the component harness connector to isolate the ground circuit.
    2. Connect the positive lead of the load test tool to the positive side of the Battery.
    3. Connect the negative lead of the load test tool to the ground circuit at the component harness connector (A). **Note:** refer to the diagram below.
    4. The bulb on the load test tool should be illuminated and bright if there is no resistance in the circuitry.

NOTE: **Why load test a circuit? A load test is used to determine if a circuit is capable of carrying the amperage needed to perform properly. The 3156 bulb in the load tool illustrated, is a simple but effective method of testing**

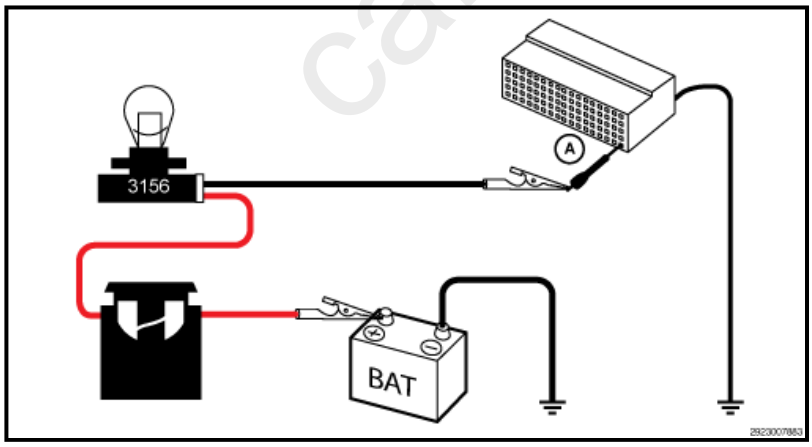
circuit functionality. A 3156 Bulb has approximately 6.0 Ohms of resistance when the bulb is powered and draws approximately 2.0 amps of current. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .

NOTE: **A 12-volt test light can be substituted for the load test tool, but only if the test light draws enough current to effectively load test the circuit. Many high impedance test lights draw very little amperage (less than 0.1 amps) and are not reliable to load test a circuit. To perform a proper load test of a circuit, the tool being used should draw more than approximately 0.75 amps.**

NOTE: **Why perform a Voltage Drop Test: To verify with certainty there is not any resistance in the circuit being tested, perform a simple voltage drop test across the 3156 bulb of the load test tool. To do so perform the following:**

- **1. Connect the leads of a DVOM to the alligator clips on the load test tool while the load test tool is connected in series with the circuit.**
- **2. Compare the voltage drop across the bulb to the voltage reading across the Battery terminals.**
- **3. The voltage dropped across the bulb should be equal to the voltage reading across the Battery terminals if there is no resistance in the circuit being tested.**

Example: 2.0 Ohms of resistance in the circuit being tested will cause the voltage measurement across the bulb to be 25% less than when compared to Battery voltage. The reason for this is that the 2.0 Ohms in the circuit makes up 25% of the total circuit resistance of 8.0 Ohms. Read the CIRCUIT LOAD TESTING PROCEDURE for information on building a simple load test tool and for additional load testing information and alternative methods of load testing or voltage drop testing a circuit. Refer to CIRCUIT LOAD TESTING PROCEDURES .



NOTE: **When probing a circuit at an Electronic Control Unit (ECU) harness connector, always use an appropriate back probing tool to prevent any possible damage to the ECU terminals.**

NOTE: **Compare the brightness of the bulb in the load test tool to that of a direct connection to Battery.**

Is the load test bulb illuminated and bright?

Yes

- Go To 5

No

- Repair the ground circuit for an open or high resistance.
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

5. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).
      - Bent terminals.
      - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
      - Terminals that have been pushed back into the connector cavity.
      - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

      Repair any conditions that are found.
   5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
   6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
   7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
   8. With the scan tool, erase DTCs.
   9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
   10. With the scan tool, read EHPS Module DTCs.

       Did the DTC return?

       Yes

       - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
       - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

       No

       - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

- Test complete.

C212A-85-SYSTEM VOLTAGE - SIGNAL ABOVE ALLOWABLE RANGE

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Once, at each ignition cycle.
- No under voltage DTCs.

SET CONDITION

- The Electro-Hydraulic Power Steering (EHPS) Module receives a high charging system voltage message over the CAN C bus or detects voltage over 16 volts.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).

POSSIBLE CAUSES

Possible Causes
POWERTRAIN CONTROL MODULE (PCM) OR RELATED CHARGING SYSTEM DTCS
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

NOTE: **This DTC must be active for the results of this test to be valid.**

1. Perform any Service Bulletins that may apply.
2. Turn the ignition on.
3. With the scan tool, read DTCs and record on the repair order.
4. With the scan tool, read and record Environmental Data.
5. With the scan tool, erase EHPS DTCs.
1. Cycle the ignition from off to on.
2. With the scan tool, read EHPS DTCs.

Is the DTC active?

Yes

- Go To 2

No

- Test complete, the condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
- Perform the BODY VERIFICATION TEST. Refer to **BODY VERIFICATION TEST** .

2. **CHECK FOR PCM OR RELATED CHARGING SYSTEM DTCS**
   1. Refer to the recorded DTCs.

      Are there any PCM or related Charging System DTCs ?

      Yes

      - Perform the Charging System diagnostic procedure. Refer to **DIAGNOSIS AND TESTING** , or **DIAGNOSIS AND TESTING** .

      No

      - Go To 3

3. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).
      - Bent terminals.
      - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
      - Terminals that have been pushed back into the connector cavity.
      - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

      Repair any conditions that are found.

   5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
   6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
   7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
   8. With the scan tool, erase DTCs.

9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C2206-00-VEHICLE CONFIGURATION MISMATCH

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Once, at each ignition cycle.
- No under voltage DTCs.

SET CONDITION

- This DTC will set if the vehicle type is not identified or incorrectly identified in the Electro-Hydraulic Power Steering (EHPS) Module.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).

POSSIBLE CAUSES

Possible Causes
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE BODY CONTROL MODULE (BCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Perform any Service Bulletins that may apply.
   2. Turn the ignition on.
   3. With the scan tool, read DTCs and record on the repair order.
   4. With the scan tool, read and record Environmental Data.
   5. With the scan tool, erase EHPS DTCs.
   1. Cycle the ignition from off to on.
   2. With the scan tool, read EHPS DTCs.

   Is the DTC active?

   Yes

   - Go To 2

   No

   - Test complete, the condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
   - Perform the BODY VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **CHECK FOR POWERTRAIN CONTROL MODULE (PCM) OR COMMUNICATION RELATED DTCS**

   1. Refer to the recorded DTCs.

   Are there any PCM or Communication related DTCs active?

   Yes

   - Perform the appropriate diagnostic procedures before continuing with this test. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

   No

   - Go To 3

3. **CHECK RELATED HARNESS CONNECTIONS**

   1. Disconnect the EHPS Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.

4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
    - Proper connector installation.
    - Damaged connector locks.
    - Corrosion.
    - Other signs of water intrusion.
    - Weather seal damage (if equipped).
    - Bent terminals.
    - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
    - Terminals that have been pushed back into the connector cavity.
    - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

    Repair any conditions that are found.

5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C220D-00-ELECTRICAL POWERED HYDRAULIC STEERING MODULE INTERNAL

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the

EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCs.

SET CONDITION

- If the Electro-Hydraulic Power Steering (EPS) Module detects an internal fault, this DTC will set. Most of internal faults that can set this DTC will result in the EPS Pump not operating for the remainder of the current key cycle.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
ELECTRO-HYDRAULIC POWER STEERING (EPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Perform any Service Bulletins that may apply.
   2. Turn the ignition on.
   3. With the scan tool, read DTCs and record on the repair order.
   4. With the scan tool, read and record Environmental Data.
   5. With the scan tool, erase EHPS DTCs.
   1. Park the vehicle on level ground.
   2. Start the engine and run for two minutes.
   3. Tun the steering wheel from stop to stop.
   4. With the scan tool, read EHPS DTCs.

   Is the DTC active?

   Yes

   - Go To 2

   No

- The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring harness and electrical connectors.
- Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

2. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect the EHPS Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

        Repair any conditions that are found.

    5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
    6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
    7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
    8. With the scan tool, erase DTCs.
    9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
    10. With the scan tool, read EHPS Module DTCs.

        Did the DTC return?

        Yes

        - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
        - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

        No

        - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
        - Test complete.

C2210-00-ECU OVERTEMPERATURE

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCs.

SET CONDITION

- The Electro-Hydraulic Power Steering (EHPS) Module detects an over temperature at the Electro-Hydraulic Power Steering (EHPS) Pump.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

NOTE: This DTC must be active for the results of this test to be valid.

1. Perform any Service Bulletins that may apply.
2. Turn the ignition on.
3. With the scan tool, read DTCs and record on the repair order.
4. With the scan tool, read and record Environmental Data.
5. With the scan tool, erase EHPS DTCs.
1. Cycle the ignition from off to on.
2. With the scan tool, read EHPS DTCs.

Did the DTC return?

Yes

- Go To 2

No

- Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.

2. **CHECK THE EHPS PUMP FOR OVER TEMPERATURE**
    1. Turn the ignition off.
    2. Let vehicle sit for 30 minutes.
    3. Turn the ignition on.
    4. With the scan tool, erase EHPS DTCs.
    5. Test drive vehicle performing parking maneuvers.
    6. Cycle the ignition switch from off to on.
    7. With the scan tool, read EHPS Module DTCs.

    Does the DTC remain active?

    Yes

    - Go To 3

    No

    - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.

3. **CHECK RELATED HARNESS CONNECTIONS**
    1. Disconnect the EHPS Module harness connectors.
    2. Disconnect all related in-line harness connections (if equipped).
    3. Disconnect the related component harness connectors.
    4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
        - Proper connector installation.
        - Damaged connector locks.
        - Corrosion.
        - Other signs of water intrusion.
        - Weather seal damage (if equipped).
        - Bent terminals.
        - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
        - Terminals that have been pushed back into the connector cavity.
        - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

    Repair any conditions that are found.

5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

    Did the DTC return?

    Yes

    - Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

    No

    - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
    - Test complete.

C221F-00-ECU NOT INITIALIZED

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle Speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- No under voltage DTCs.

SET CONDITION

- The Body Control Module (BCM) detects that the Electro-Hydraulic Power Steering (EHPS) Module has not been initialized.

DEFAULT ACTION

- EHPS indicator light illuminated.
- EHPS message displayed in Electronic Vehicle Information Center (EVIC).
- EHPS assist disabled.

POSSIBLE CAUSES

Possible Causes
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Perform any Service Bulletins that may apply.
   2. Turn the ignition on.
   3. With the scan tool, read DTCs and record on the repair order.
   4. With the scan tool, read and record Environmental Data.
   5. With the scan tool, erase EHPS DTCs.
   1. Cycle the ignition switch from off to on several times then leave the key in the run position.
   2. With the scan tool, read EHPS DTCs.

   Is the DTC active?

   Yes

   - Go To 2

   No

   - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.
2. **CHECK RELATED HARNESS CONNECTIONS**
   1. Disconnect the EHPS Module harness connectors.
   2. Disconnect all related in-line harness connections (if equipped).
   3. Disconnect the related component harness connectors.
   4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
      - Proper connector installation.
      - Damaged connector locks.
      - Corrosion.
      - Other signs of water intrusion.
      - Weather seal damage (if equipped).
      - Bent terminals.

- Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
- Terminals that have been pushed back into the connector cavity.
- Perform a terminal drag test on each connector terminal to verify proper terminal tension.

Repair any conditions that are found.

5. Connect the EHPS Module harness connectors. Be certain that the harness connectors are fully seated and the connector locks are fully engaged.
6. Connect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Connect the related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
8. With the scan tool, erase DTCs.
9. Using the recorded Event and Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
10. With the scan tool, read EHPS Module DTCs.

Did the DTC return?

Yes

- Replace the Electro-Hydraulic Power Steering (EHPS) Module in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
- Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

No

- Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.
- Test complete.

U0002-00-CAN C BUS OFF PERFORMANCE

NOTE: **This DTC may not be listed in the Body Control Module (BCM) diagnostic procedures. If this DTC is not found in the BCM diagnostic procedures, perform the comparable CAN C Bus diagnostic test, such as CAN C BUS-NO SIGNAL, CAN C BUS OFF PERFORMANCE or CAN C SIGNAL MISSING.**

Perform the comparable CAN C Bus diagnostic tests in the BCM. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

U0100-00-LOST COMMUNICATION WITH ECM/PCM

NOTE: **Perform this diagnostic procedure ONLY when the DTC status is "Active". If the DTC status is "Stored" DO NOT proceed with this diagnostic procedure. A "Stored" DTC will not affect the performance of the vehicle.**

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0100-00-LOST COMMUNICATION WITH ECM/PCM

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0121-00-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0126-00-LOST COMMUNICATION WITH STEERING ANGLE SENSOR

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0140-00-LOST COMMUNICATION WITH BODY CONTROL MODULE

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0155-00-LOST COMMUNICATION WITH CLUSTER-CCN

The COMMUNICATION DIAGNOSTIC PROCEDURE **MUST** be performed before replacing any component(s) or module(s). Perform the COMMUNICATION DIAGNOSTIC PROCEDURE. Refer to **COMMUNICATION DIAGNOSTIC PROCEDURE** .

U0401-00-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM

WHEN MONITORED

- Continuously, with the ignition on.
- One valid CAN message received at least once.
- No U0002-00-CAN C Bus Off Performance DTC present.

SET CONDITION

- When the Electro-Hydraulic Power Steering (EHPS) Pump detects an incorrect CAN C buss message from the Powertrain Control Module (PCM).

POSSIBLE CAUSES

Possible Causes
EHPS CAN C BUS DTCS
PCM DTCS
ELECTRO-HYDRAULIC POWER STEERING (EHPS) PUMP

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: This DTC must be active for the results of this test to be valid.

   1. Turn the ignition on.
   2. With the scan tool, read EHPS Module DTCs and record on the repair order.
   3. Cycle the ignition switch from off to on.

4. With the scan tool, read EHPS Module DTCs.

   Is the DTC active?

   Yes

   - Go To2

   No

   - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.

2. **CHECK IF BCM CAN C BUS DTCS ARE PRESENT**
   1. With the scan tool, read BCM DTCs.

      Are there any BCM CAN C BUS DTCs present?

      Yes

      - Perform the appropriate diagnostic procedure. Refer to **BODY CONTROL MODULE (BCM) - DIAGNOSTIC CODE INDEX** .

      No

      - Go To3

3. **CHECK IF ENGINE DTCS ARE PRESENT**
   1. With the scan tool, read PCM DTCs.

      Are there any PCM DTCs present?

      Yes

      - Perform the appropriate diagnostic procedure. Refer to **3.0L DIESEL - DIAGNOSTIC CODE INDEX** , or **3.6L (GPEC 2A) - DIAGNOSTIC CODE INDEX** .

      No

      - Using the schematics as a guide, check the Electro-Hydraulic Power Steering Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Electro-Hydraulic Power Steering (EHPS) Pump in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
      - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

U0415-00-IMPLAUSIBLE DATA RECEIVED FROM ABS

For a complete wiring diagram, **refer to appropriate SYSTEM WIRING DIAGRAMS article** .

WHEN MONITORED

Continuously, while the system is active.

SET CONDITION

An error message has been received over the CAN C bus from the Anti-lock Brake System (ABS) Module.

POSSIBLE CAUSES

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
ANTI-LOCK BRAKE SYSTEM (ABS) MODULE
ELECTRO-HYDRAULIC POWER STEERING (EHPS) PUMP

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: **Diagnose all CAN C bus communication DTCs before continuing.**

   1. Turn the ignition on.
   2. With a scan tool, read EHPS Module DTCs.

      Is the DTC active?

      Yes

      - Go To2

      No

      - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.

2. **ABS CAN C BUSS COMMUNICATION RELATED DTCS IN OTHER MODULES**
   1. With a scan tool check for ABS communication related DTCs in other modules on the CAN C Bus.

      Are there any ABS communication related DTCs in other modules on the CAN C Bus at this time?

      Yes

      - Replace and program the Anti-lock Brake System (ABS) in accordance with the Service Information. Refer to **MODULE, ANTI-LOCK BRAKE SYSTEM (ABS), REMOVAL AND INSTALLATION** .
      - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

      No

      - Replace and program the Electro-Hydraulic Power Steering (EHPS) Pump in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
      - Perform the EHPS Verification Test. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

U0428-00-IMPLAUSIBLE DATA RECEIVED FROM STEERING ANGLE SENSOR MODULE

For a complete wiring diagram, **refer to appropriate SYSTEM WIRING DIAGRAMS article** .

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Assembly draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering

independent of the gasoline engine. The EHPS Assembly requires communication over the CAN C bus to function properly. The output flow of the EHPS Assembly is varied as a function of Steering Wheel Rate (received from SAS Module) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The pump will start to provide steering assist when a hybrid active (vehicle started) or a Vehicle Speed message greater than 5 kph (3 mph) is received on CAN C bus. If both the Vehicle Speed and Hybrid Active messages are missing at vehicle startup, the EHPS Assembly will not operate. If the Vehicle Speed message is lost during operation the EHPS Module will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Module will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS Assembly will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

Continuously, while the system is active.

SET CONDITION

An error message has been received over the bus from the Steering Angle Sensor (SAS).

POSSIBLE CAUSES

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
STEERING ANGLE SENSOR (SAS)
STEERING COLUMN CONTROL MODULE (SCCM)
ELECTRO-HYDRAULIC POWER STEERING (EHPS) MODULE

DIAGNOSTIC TEST

1. **CHECK FOR AN ACTIVE DTC**

   NOTE: Diagnose all communication DTCs before continuing.

   1. Turn the ignition on.
   2. With a scan tool, read EHPS Module DTCs.

      Is the DTC active?

      Yes

      - Go To2

      No

      - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.

2. **SAS COMMUNICATION RELATED DTCs IN OTHER MODULES**
   1. With a scan tool check for SAS communication related DTCs in other modules on the CAN C Bus.

      Are there any SAS communication related DTCs in other modules on the CAN C Bus at this time?

      Yes

- Replace the SAS in accordance with the service information. Refer to **MODULE, STEERING COLUMN CONTROL (SCCM), REMOVAL AND INSTALLATION** .
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

No

- Replace the Electro-Hydraulic Power Steering (EHPS) Assembly in accordance with service information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
- Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

U1601-00-ECU APPLICATION SOFTWARE CODE 1 MISSING OR CORRUPTED

THEORY OF OPERATION

The Electro-Hydraulic Power Steering (EHPS) Pump assembly contains a control module, brushless electric motor, and hydraulic pump integrated into a single unit. The EHPS Pump draws power from the 12-volt electrical system and provides the necessary flow and pressure to the steering gear to provide normal power steering. The EHPS Pump requires communication over the CAN C bus to function properly. The output flow of the EHPS Pump is varied as a function of Steering Wheel Rate (received from SAS) and Vehicle Speed (received from ABS Module) in order to provide the optimum flow of power steering fluid to the steering gear under all operating conditions. The EHPS Pump will start to provide steering assist when the Vehicle speed message greater than 5 km/h (3 mph) is received on CAN C bus. If the Vehicle Speed message is missing at vehicle startup, the EHPS Pump will not operate. If the Vehicle Speed message is lost during operation the EHPS pump will use a default vehicle speed of 85 km/h (59 mph) to calculate desired flow and as a result, steering effort will no longer be speed sensitive. If the Steering Wheel Position message is lost the EHPS Pump will use a default steering wheel rate of 230B° per second to calculate desired flow and as a result, steering effort may be higher on evasive steering maneuvers. The EHPS pump will resume normal operation automatically once any missing message or out of range condition noted above is restored to normal.

WHEN MONITORED

Continuously, with the ignition on.

SET CONDITION

When the Electro-Hydraulic Power Steering (EHPS) Pump detects that its software has been corrupted or is missing.

POSSIBLE CAUSES

Possible Causes
BODY CONTROL MODULE (BCM) FLASHED INCORRECTLY
ELECTRO-HYDRAULIC POWER STEERING (EHPS) PUMP

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

NOTE: **This DTC must be active for the results of this test to be valid. Check for a loose scan tool connection. Verify battery charger is installed and charge rate provides approximately 13.5 volts.**

1. Turn the ignition on.
2. With the scan tool, read the DTCs.

3. With the scan tool, follow the reprogramming procedure and flash the Electro-Hydraulic Power Steering (EHPS) Pump while maintaining voltage as noted above.
4. With the scan tool, read the EHPS Module DTCs.

   Is the DTC active?

   Yes

   - Replace and program the Electro-Hydraulic Power Steering (EHPS) Pump in accordance with the service information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
   - Perform EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

   No

   - The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring harness and connectors.
   - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

U160B-00-ECU BOOT SOFTWARE 1 MISSING OR CORRUPTED

For a complete wiring diagram, **refer to appropriate SYSTEM WIRING DIAGRAMS article** .

WHEN MONITORED

With the ignition on.

SET CONDITION

The Electro-Hydraulic Power Steering (EHPS) Pump detects an internal failure.

POSSIBLE CAUSES

Possible Causes
ELECTRO-HYDRAULIC POWER STEERING (EHPS) PUMP

DIAGNOSTIC TEST

CHECK FOR AN ACTIVE DTC

1. Turn the ignition on.
2. With a scan tool, read EHPS Module DTCs.

   Is the DTC active?

   Yes

   - Replace and program the Electro-Hydraulic Power Steering (EHPS) Pump in accordance with the Service Information. Refer to **MODULE, ELECTRO-HYDRAULIC POWER STEERING (EHPS), REMOVAL AND INSTALLATION** .
   - Perform the EHPS VERIFICATION TEST. Refer to **STANDARD PROCEDURE - EHPS VERIFICATION TEST**.

   No

   - Test complete. The condition or conditions that originally set this DTC are not present at this time. Using the appropriate wiring diagrams as a guide, check all related splices and connectors for signs

of water intrusion, corrosion, pushed out or bent terminals, and correct pin tension.

STANDARD PROCEDURE

STANDARD PROCEDURE - EHPS VERIFICATION TEST

For a complete wiring diagram, **refer to Wiring Information** .

EHPS VERIFICATION TEST

EHPS VERIFICATION TEST

1. Turn the ignition off.
2. Remove all test equipment.
3. Connect all previously disconnected components and connectors.
4. Verify all accessories are turned off and the battery is fully charged.
5. Turn the ignition on.
6. With the scan tool, record and erase all DTCs from all modules. Start the engine and allow it to run for two minutes and fully operate the system that was indicating the failure.

   NOTE: **Turn the steering wheel from stop to stop, holding at each lock position for one second.**

7. Turn the ignition off and wait five seconds. Turn the ignition on and using the scan tool, read Diagnostic Trouble Codes (DTCs) from all modules.
8. If there are no DTCs present after turning ignition on, road test the vehicle for at least five minutes.
9. With the scan tool read DTCs. If any DTCs are present, refer to the Table of Contents in the applicable information for the Diagnostic procedure and troubleshoot the new or recurring symptom.
10. If there are no DTCs present and the customer's concern can no longer be duplicated, the repair is complete.

    Are any DTCs present or is the original concern still present?

    Yes

    - Perform the appropriate diagnostic procedure.

    No

    - Repair is complete.