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2005 JEEP Grand Cherokee OEM Service and Repair Workshop Manual

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Testing with a Mopar Scope

1. Attach the small 60 amp clamp around the jumper wire. DO NOT use the 1000 amp clamp. It is not accurate enough to measure an IOD draw.

2. Observe the scope reading. The IOD draw should not exceed 30 milliamperes (0.030 ampere). If the current draw exceeds 30 mA, isolate each circuit using the fuse and circuit breaker remove-and-replace process. The scope reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required, checking for a wiring short, incorrect switch adjustment, or a faulty component as the cause.

Testing with a Multi-meter

1. Set an electronic digital multi-meter to its highest amperage scale. Connect the multi-meter to the battery negative cable terminal clamp and the negative battery terminal, but not on the jumper connection.

2. The multi-meter leads must be securely clamped to the battery negative cable terminal clamp and the negative battery terminal, but not the jumper wire.

3. Remove the jumper wire without breaking the digital multi-meter connection.

4. The high amperage IOD reading on the multi-meter should be very low or nonexistent, depending upon the electrical equipment in the vehicle. If the amperage reading remains high, remove and replace each fuse or circuit breaker in the Body Control Module (BCM) and Power Distribution Center (PDC), one at a time until the amperage reading becomes very low, or nonexistent. Refer to the appropriate wiring information for complete BCM and PDC, circuit breaker, and circuit identification. This will isolate each circuit and identify the circuit that is the source of the high amperage IOD.

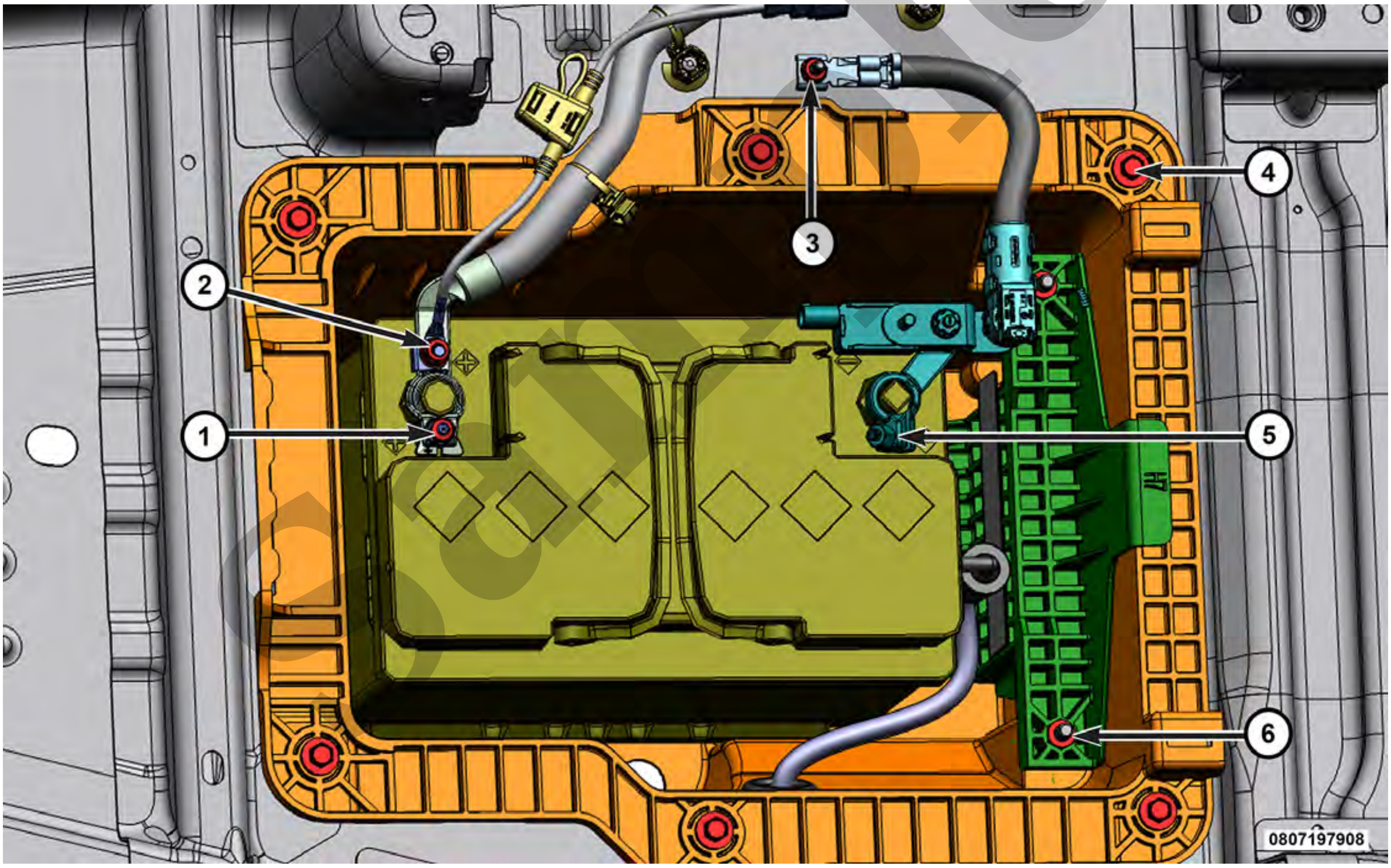
5. Change to the lowest amperage reading and observe the multi-meter reading. The low-amperage IOD should not exceed 30 milliamperes (0.030 ampere). If the current draw exceeds 30 mA, isolate each circuit using the fuse and circuit breaker remove and replace process. The multi-meter reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required, checking for a wiring short, incorrect switch adjustment, or a faulty component as the cause.

Torque Specifications

TORQUE SPECIFICATIONS

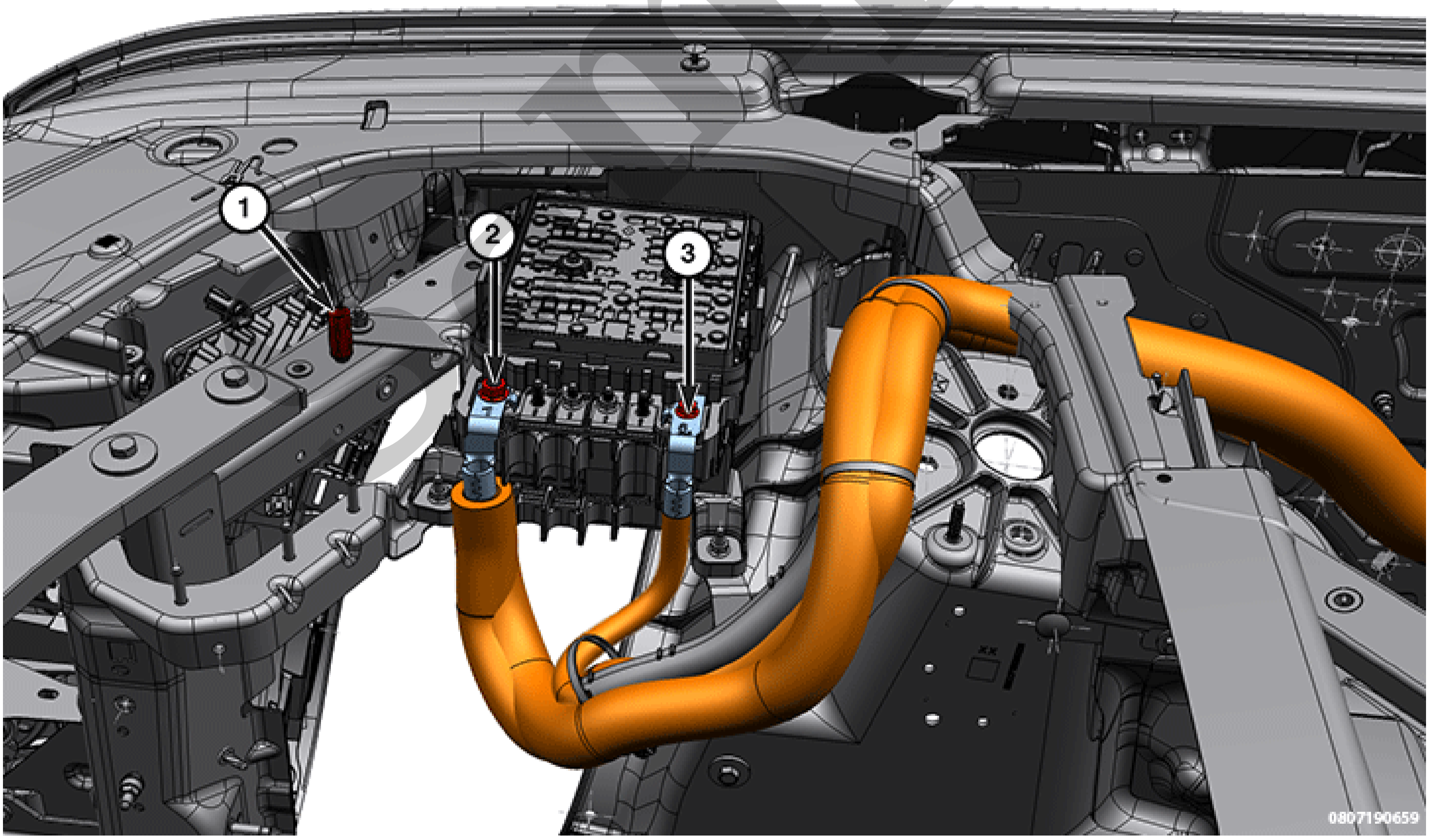
TORQUE SPECIFICATIONS - BATTERY SYSTEM

MAIN BATTERY

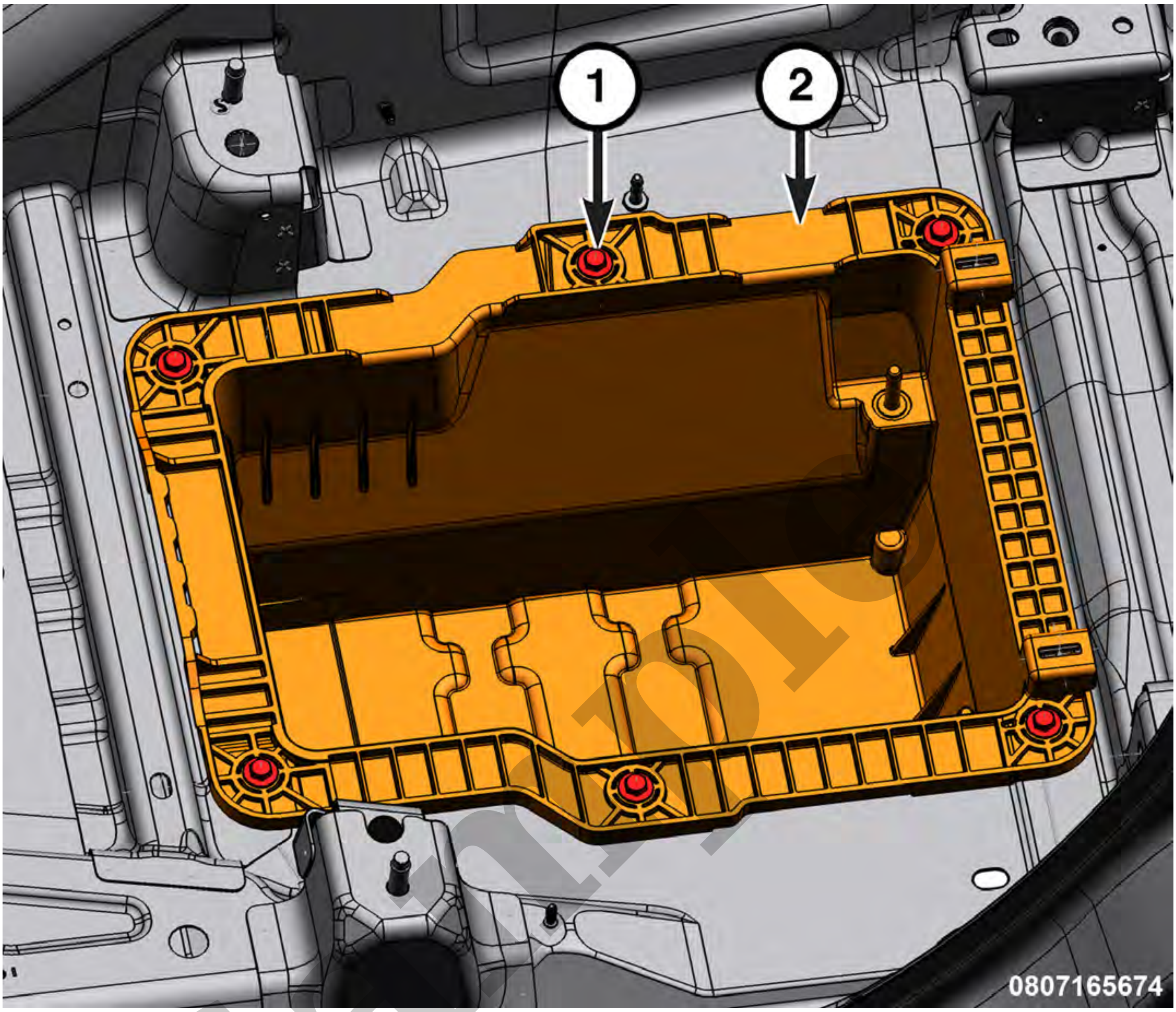


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Battery Positive Clamp to Positive Post	**7 N·m (63 In. Lbs.)**	–
2	Battery Positive Cable End Nut	**7 N·m (63 In. Lbs.)**	–

2	AUX Battery M6 Double Torx Stud	**7 N·m (63 In. Lbs.)**	–
3	Battery Positive B(+) at Power Distribution Center (PDC) M8 Nut	**15 N·m (11 Ft. Lbs.)**	–
4	Battery Negative Cable to Body	**10 N·m (89 In. Lbs.)**	–
5	AUX Battery M6 Nut to Battery Cable	**5 N·m (44 In. Lbs.)**	–
5	Intelligent Battery Sensor (IBS) Sensor to Negative Post - ADAS Equipped Vehicles	**6 N·m (53 In. Lbs.)**	–
–	Battery Tray Bolts	**10 N·m (89 In. Lbs.)**	–



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT



1 - Battery Tray Bolts	
2 - Battery Tray	

4. Remove the battery tray bolts that secure the battery tray to the floor and remove the battery tray.
5. Remove the left front wheel splash shield (Refer to 23 - Body/Exterior/SHIELD, Splash/Removal and Installation).
6. Remove the two bolts that secure the bottom of the battery tray.
7. Remove battery tray from the vehicle.

INSTALLATION

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

DESCRIPTION	SPECIFICATION	COMMENT
Second Row Seat to Floor Bolts - Front	**52 N-m (38 Ft. Lbs.)**	—
Second Row Seat to Floor Bolts - Rear	**52 N-m (38 Ft. Lbs.)**	—
Second Row Seat to Floor Nuts	**50 N-m (37 Ft. Lbs.)**	—

Refer To List:

List 1

- 23 - Body / Seats, Front / SEAT, Front / Removal and Installation
- 23 - Body / Seats, Second Row / SEAT, Second Row / Removal and Installation
- 23 - Body / Seats, Third Row / SEAT, Third Row / Removal and Installation

The Intelligent Battery Sensor (IBS) communicates with the BCM through a LIN bus circuit. The BCM collects information relating to battery state of charge, temperature and electrical loads on the battery from the IBS. This information is broadcast over the bus networks to other modules, including the Powertrain Control Module (PCM) which uses this information to control and monitor the charging system.

FUNCTIONAL DESCRIPTION - INTELLIGENT BATTERY SENSOR (IBS)

An Intelligent Battery Sensor (IBS) is an electrical shunt with a microprocessor that is mounted in-line with the negative battery cable. The IBS monitors the battery voltage as well as current flow into and out of the battery. The IBS has a built-in thermistor that calculates the battery temperature. The microprocessor uses this data to calculate battery State of Charge (SOC), battery internal resistance, charge received, electrical demand, and time in service. This information is reported through the LIN Bus circuit to the Body Control Module (BCM). The BCM broadcasts the information to the Powertrain Control Module (PCM) over the CAN Bus.

The IBS SOC data is also used by the BCM and other modules to determine when to begin disabling certain vehicle features that draw excessive electrical loads due to a low battery SOC. The SOC threshold for starting to disable features can vary based on vehicle and engine but is typically in the 50% to 60% range.

On the dual battery Stop/Start systems, the IBS is connected to the main battery. Since the two batteries are connected to each other most of the time, the battery SOC reported by the IBS is reporting the average SOC of the two batteries. It is possible for one battery to be fully charged and the other battery discharged causing the overall SOC to be low. If the SOC is low, both batteries should be checked for proper charge and functionality before checking for an issue with the IBS.

The IBS SOC may read low when both batteries test good. The following items can contribute to, and should be considered when diagnosing a low SOC condition before replacing an IBS or battery:

- If the vehicle is jump started at the battery posts bypassing the IBS.
- If the battery is blind charged at the battery posts bypassing the IBS.
- Repeated short trip driving events not allowing enough charge time.
- The IBS accuracy is off and needs to relearn the battery SOC.

Depending on the vehicle, there could be a non-MIL DTC (P057F) set, or an EVIC message indicating a low battery state of charge limiting some features, such as ESS. In some cases, properly charging the batteries through the IBS can raise the IBS SOC enough to regain functionality and repair the issue. However, it can sometimes take two or three, 4-hour BUS off sleep cycles for an IBS to learn and update the battery SOC. The IBS can be initiated into a learning curve by completely disconnecting the IBS from the battery, and disconnecting harness connector for 20 seconds. The IBS battery feed, LIN Bus and ground circuits should be checked before reconnecting the IBS. The IBS should default to approximately 80% SOC when reconnected. However, the IBS accuracy is determined to be low until the IBS can relearn battery SOC. This occurs after an engine run cycle and a subsequent ignition off sleep cycle of between one to four hours. Some features will be disabled until the IBS SOC is updated.

FUNCTIONAL DESCRIPTION - POWER DISTRIBUTION CENTER (PDC)

5.	Integrated Dual Charging Module
6.	Charging Port

SYSTEM OPERATION - PHEV CHARGING SYSTEM

HIGH VOLTAGE BATTERY CHARGING: The High Voltage (HV) battery can be charged using the vehicle's engine or by connecting to the grid through an Electric Vehicle Supply Equipment (EVSE) Charging Cable connected to the Charging Port.

- **PLUG IN CHARGING:** When the vehicle is off and the Electric Vehicle Supply Equipment (EVSE) Charging Cable is plugged in, the Integrated Dual Charging Module (IDCM) converts the AC power from the grid into DC power used to charge the high voltage battery through the orange HV cables.
- **CHARGING FROM THE ENGINE:** During normal vehicle operation, when the HV battery voltage is below a calibrated threshold, the engine is started and the AC power from the P1 motor is delivered to the Power Inverter Module (PIM). The PIM converts the AC power into DC power used to charge the high voltage battery through the orange HV cables.

The PHEV is equipped with a battery charge indicator module mounted to the center of the instrument panel, is made up of five Light-Emitting Diode (LED) lights. The battery charge indicator module is a smart device that communicates with the PIM through a LIN bus circuit. It displays the current state of charge for the HV battery pack. Each bar indicates 20% state of charge. The battery charge indicator module will not illuminate any of the charge indicator lights unless the vehicle is connected to an Electric Vehicle Supply Equipment (EVSE) plug from a charge station or outlet. The charge level indicators will also inform the customer if an error has occurred in the charging system by blinking each end LED.

The isolation sense points (VA and VB in the diagram) will measure 2.5 volts reference value when the top and bottom switches are open. When the top switch is closed and the bottom switch is open, the isolation VA sense voltage will shift from the 2.5-volt and when the bottom switch is closed and top switch is open, the isolation VB sense voltage will shift from the 2.5-volt. These two shifted values of isolation sense voltages (difference between the corresponding isolation sense voltage and the 2.5-volts) are used to calculate the isolation resistance.

If the contactors are open, the isolation resistance calculated will be the internal battery isolation resistance and if the contactors are closed, the isolation resistance calculated will be the external vehicle isolation resistance.

The isolation sensor diagnostic monitors the isolation detection circuit performance, while the system isolation diagnostic monitors the vehicle isolation resistance. Battery side isolation diagnostic monitors the battery pack internal isolation resistance, to be within the normal operating ranges. When the measurements reach or exceed any of the limits, the diagnostics will be considered failing. The diagnostics run continuously after power up, as long as the enable conditions are met. The diagnostics only need to run and fail once per trip, in order to fail the test.

The purpose of the isolation sensor circuit diagnostic is to detect the isolation circuit performance faults, while the isolation diagnostics purpose is to detect the loss of isolation for both the vehicle and the internal battery pack.

P0AA7: Hybrid Battery Voltage Isolation Sensor Circuit - This diagnostic performs the isolation resistance measurement circuit check.

P0AA6: Hybrid Battery Voltage System Isolation Fault - This diagnostic performs the vehicle side isolation resistance check and detects a fault when the isolation resistance on the vehicle side is less than a calibrated threshold.

P1E1B: Hybrid/EV Battery Side Voltage System Isolation - This diagnostic performs the Battery side isolation resistance check. The fault is detected and set when the isolation resistance on the battery side is less than a calibrated threshold.

FUNCTIONAL DESCRIPTION - VEHICLE CHARGING PORT

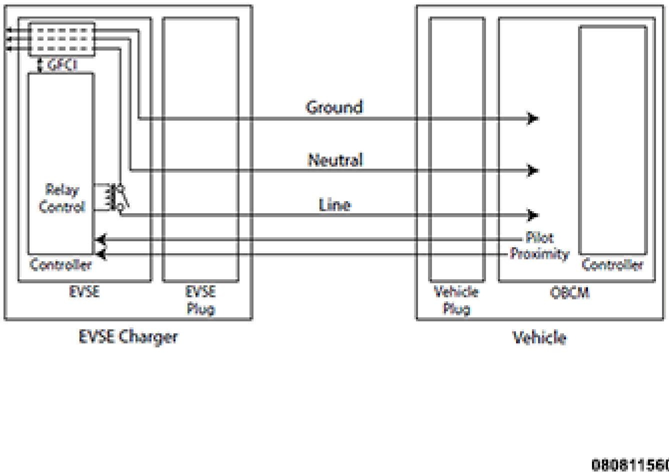
The Plug-in Hybrid Electric Vehicle (PHEV) System is equipped with plug-in charging capabilities. This allows the high voltage Battery to charge when the Electric Vehicle Supply Equipment (EVSE) Charging Cable is plugged into the vehicle's Society of Automotive Engineers (SAE) J1772 Charge Port. The SAE J1772 Charge Port is connected to the IDCM through a dedicated five circuit wire harness. The SAE J1772 Charge Port supplies AC power to the IDCM, which converts the AC power into DC power. The IDCM supplies the DC power to the High Voltage Battery Pack Control Module (BPCM) to maintain a proper State Of Charge (SOC) for the high voltage battery.

FUNCTIONAL DESCRIPTION - ELECTRIC 3 PHASE MOTORS

MOTOR DESCRIPTION:

proximity and the pilot pins will disconnect before the high voltage AC terminals.

J1772 AC Schematic



The charging system is designed to be safe. The circuitry of the system ensures that there is not AC voltage present on the vehicle and charger connection unless the charger is safely plugged in. In addition, when the button to disengage the charger is depressed, the EVSE charger removes power in order to prevent arcing if the vehicle is still charging.

The EVSE charging station has the ability to turn the AC voltage on or off.

The AC current is used by the IDCM as an input and converts the AC to HV DC as an output for the HV battery pack.

NOTE

In the event that there is a ground fault (there is an appreciable difference between the amount of current going into the charger than coming out) the EVSE will open the voltage supply to the vehicle.

Ground Circuit Operation