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2015 Jeep Grand Cherokee Service and Repair Manual

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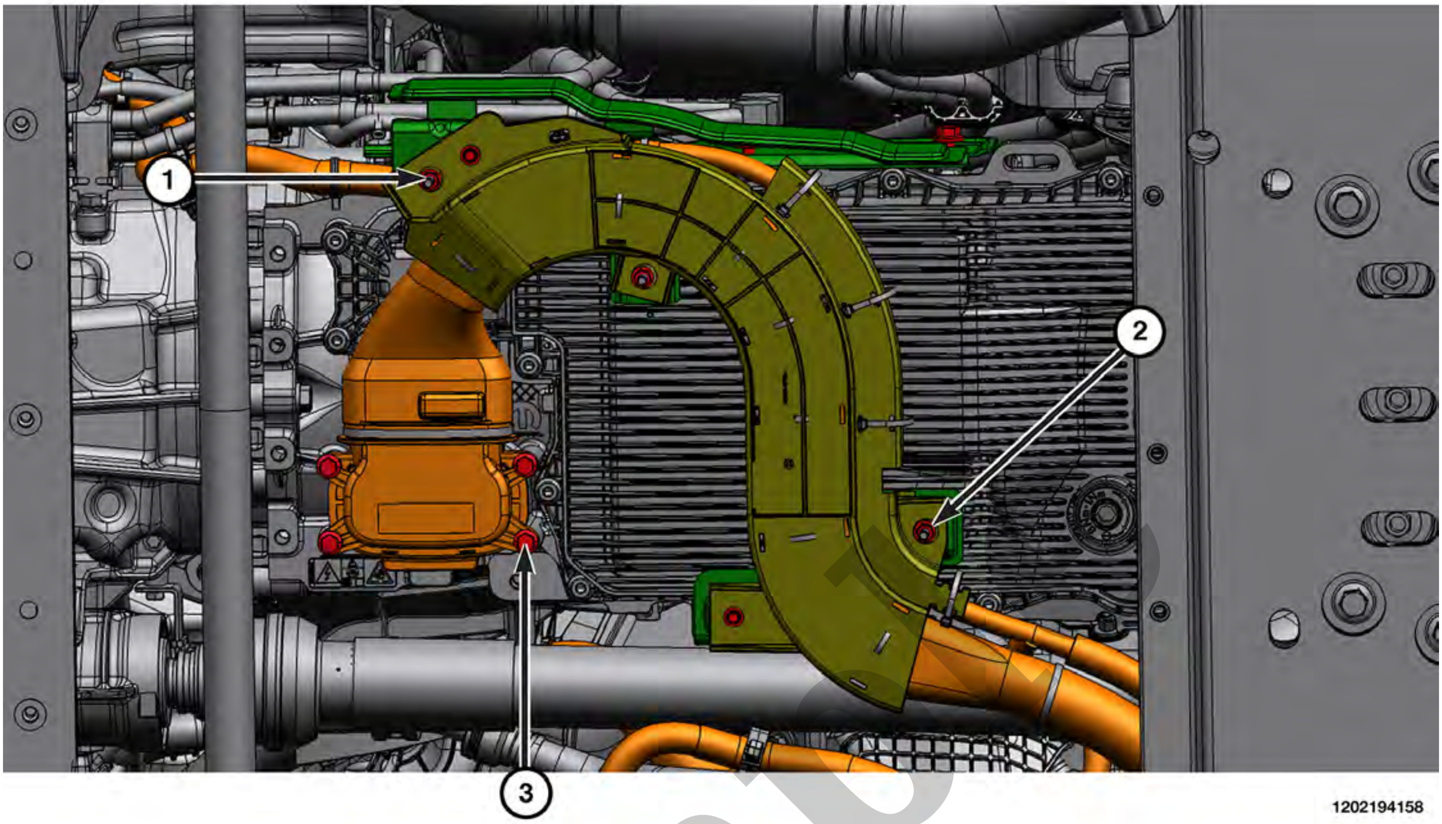


CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	High Voltage Protective Cover Bolts	**Tighten Securely**	–
2	High Voltage Trough to Transmission Pan Nuts	**12 N·m (9 Ft. Lbs.)**	–
3	High Voltage Cable to P2	**9 N·m (80 In. Lbs.)**	–

Power Inverter Module To Main Battery

POWER INVERTER MODULE TO MAIN BATTERY

REMOVAL

WARNING

Before performing any diagnostic or service procedure, you must thoroughly read and follow all applicable high voltage safety procedures. You must perform the high voltage power down procedures.

Loss of Isolation (LOI) must be performed before high voltage power up in cases where service has been performed on a high-voltage component or when diagnosing a LOI condition.

Be sure to use the proper safety equipment when working on any high voltage system or component. Failure to do so may result in serious or fatal injury.

Wait a minimum of two minutes after performing the high voltage battery disconnect procedure before attempting to access the high voltage system. Failure to do so may result in serious or fatal injury.

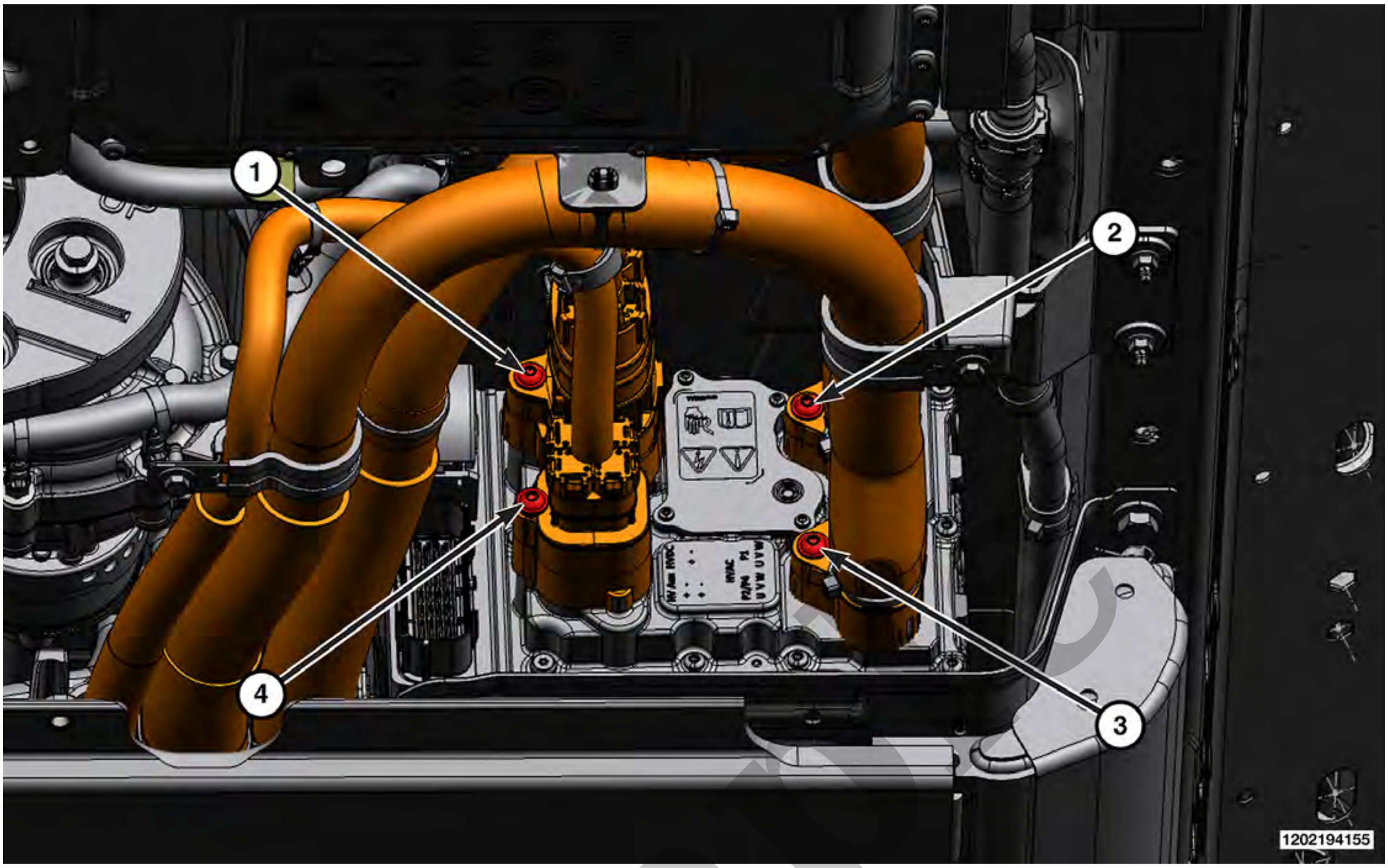
CAUTION

To prevent dirt which might damage or impair the seal from entering, fit the protective caps included in the specific equipment onto the disconnected electrical connections.

CAUTION

Do not allow liquids to come into contact with the high voltage component electric connections, since they would create a conductive path and thus cause loss of insulation. These substances would be difficult to remove and the contaminated high voltage component would have to be replaced.

CAUTION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	PIM to HV Battery Connector	**12 N·m (9 Ft. Lbs.)**	–
2	PIM to MGU (P1) Connector	**12 N·m (9 Ft. Lbs.)**	–
3	PIM to Transmission Connector (P2)	**9 N·m (80 In. Lbs.)**	–
4	PIM to Electric Air-conditioning Compressor	**12 N·m (9 Ft. Lbs.)**	–

CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
–	High Voltage Battery Jumper Harness Bridge Bolt to Body	**6 N·m (53 In. Lbs.)**	–
–	High Voltage Battery Jumper Harness Bridge Bolt to Battery	**8 N·m (71 In. Lbs.)**	–
–	HV PIM to High Voltage Battery Nuts	**9 N·m (80 In. Lbs.)**	–
–	High Voltage Trough to Transmission Crossmember	**8 N·m (71 In. Lbs.)**	–
–	High Voltage Trough to Transmission Support Bracket	**8 N·m (71 In. Lbs.)**	–
–	P2 Wiring Harness Attachment TO B20 Strain Relief Bracket	**8 N·m (71 In. Lbs.)**	–
–	High Voltage Trough to Body	**5 N·m (44 In. Lbs.)**	–
–	High Voltage Battery Fuse Service Door Nuts	**4 N·m (35 In. Lbs.)**	–

Refer To List:

List 1

- 13 - Frame and Bumpers / Under Body Protection / PLATE, Skid / Removal and Installation
- 13 - Frame and Bumpers / Under Body Protection / PLATE, Stiffening / Removal and Installation

done on the approved Mopar battery tester, it will not test the battery correctly if connected and charged through the IBS. After performing any testing requiring blind charging, a battery has been replaced or after any repairs are made, the IBS learning curve should be initiated to allow the IBS to update quickly. **See the IBS Component Functional Description section for details on initiating the IBS learning curve.**

2. **CHARGING USING A STANDARD BATTERY CHARGER** - This should only be performed if the vehicle was not brought in for a battery issue and the battery is depleted during service. The battery should be charged through the IBS. To do this the negative clamp on the charger should be placed on the negative cable attachment to the IBS, the Jump Post terminal if equipped, or a good chassis ground, NOT the Pole clamp at the negative Battery post. Without proper clamp placement, the IBS data will not update.

FUNCTIONAL DESCRIPTION - BATTERY PACK CONTROL MODULE (BPCM)

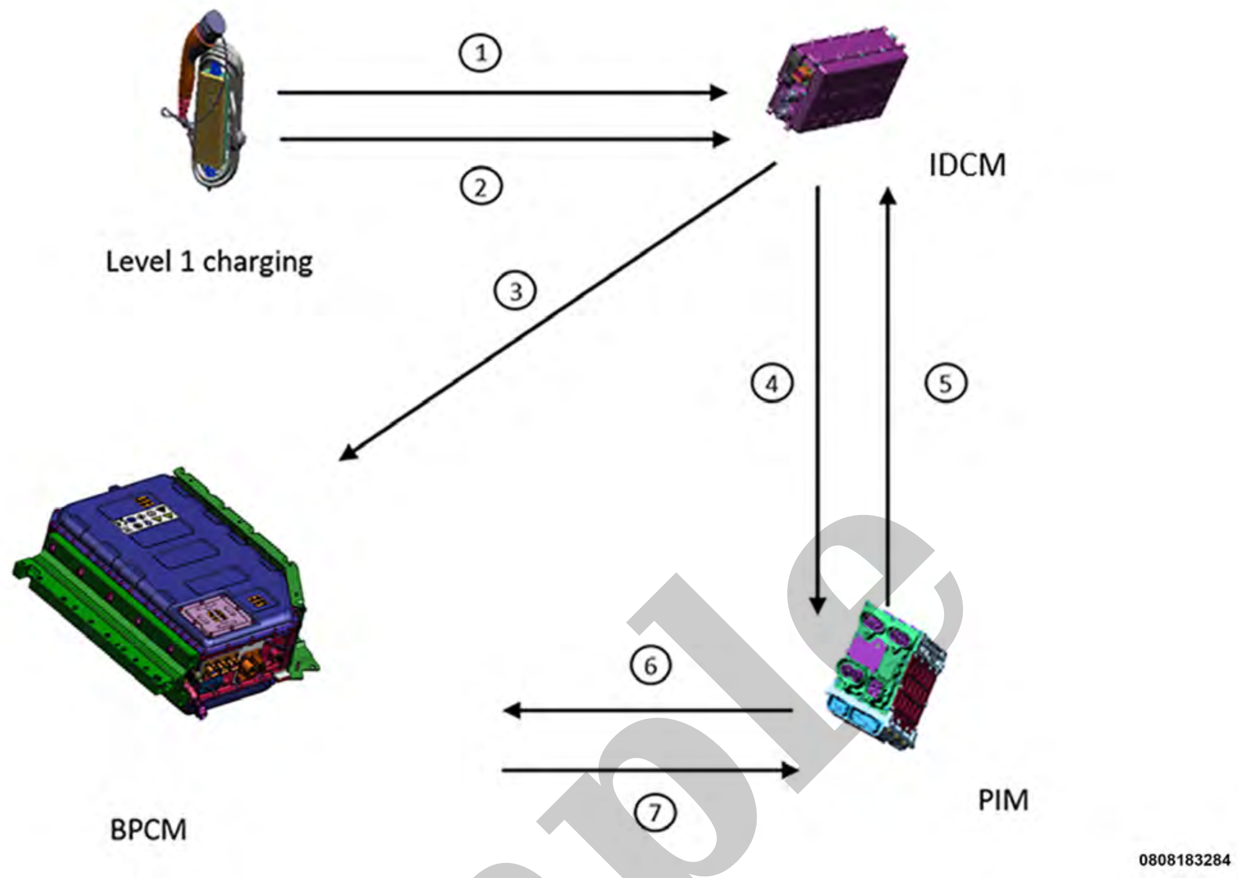
The Battery Pack Control Module (BPCM) is an electronic control module integrated with the high voltage (HV) battery. The BPCM includes the Analog/Digital (A/D) circuitry for the internal input/output controls and Controller Area Network (CAN) communications. The BPCM monitors and manages the voltage, current and temperature of the HV battery.

BPCM inputs include:

- Inlet coolant temperature sensor
- Outlet coolant temperature sensor
- IDCM coolant inlet temperature sensor
- HV wake up signal
- Individual cell voltage and temperature
- Current sensor
- High Voltage Interlock Loop (HVIL) source signal
- High Voltage Interlock Loop (HVIL) return signal

The BPCM responsibilities include:

- Component protection
- Report HV battery system status
- ePT wake up
- Battery State Of Charge (SOC)
- Providing current and voltage limits during driving and charging
- Controlling the three contactors
- Maintaining the battery cells at an appropriate temperature to ensure the usage life of the battery
- Providing loss of isolation monitoring
- Providing High Voltage Interlock Loop (HVIL) monitoring
- Battery coolant pump operation via LIN communication



1 - Dual Integrated Charging Module (IDCM) indicator	5 - Controller Area Network - Electrified Powertrain (CAN-C ePT) messaging to the IDCM
2 - Alternating Current (AC) supplied to the IDCM	6 - CAN-C ePT messaging to the Batter Pack Control Module (BPCM)
3 - Direct Current (DC) supplied to the battery	7 - CAN-C ePT messaging to the PIM
4 - Hard-Wired Wake-Up to Hybrid Control Processor (HCP) - located within the Power Inverter Module (PIM).	

COMMUNICATION

The HCP plays the most important role in high-voltage charging but most of the work is done by the on-board charging module. When the IDCM detects that a charger is connected to the vehicle, several actions occur.

- The IDCM sends a hard-wired wake-up signal to the HCP.
- Once being woken up, the HCP will wake up the rest of the ePT.

PLUG IN STATUS	IDCM PROXIMITY SENSE VOLTAGE
Connected	1.5v
Release Button Pressed	2.8v

The proximity circuit lets the IDCM in the vehicle know two things:

- If a proper charging plug is plugged in.
- If the release button on the charging connector is pressed.�

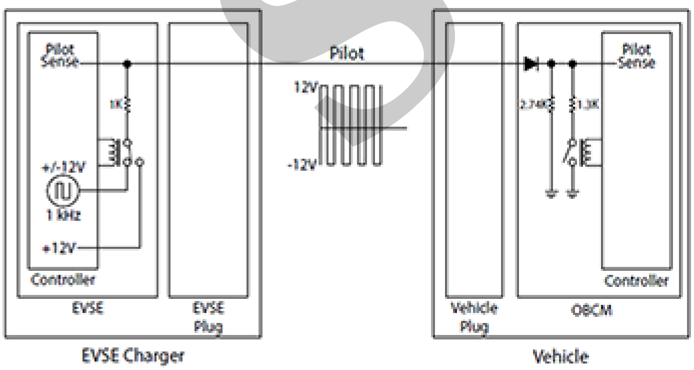
When a charger is first plugged in, the charging station does not just start supplying current to the vehicle. Once the IDCM detects that a proper charger is plugged in, it will then communicate over the pilot circuit with the charging station to initiate the charging sequence.

The IDCM initially sources 5v and that voltage is dropped over a series of resistors and the switch for the charging plug release button. The IDCM will monitor the voltage drop of the circuit to determine if the charger is plugged in and if the release button is pressed.

NOTE

The IDCM will send a message on the CAN-C ePT bus letting the rest of the vehicle know that a charger is plugged in. This is how the vehicle knows to not permit the vehicle to move when charging.

J1772 Pilot Schematic



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The purpose of the pilot circuit is a single wire bidirectional means of communication between the vehicle IDCM and the charging station. The following information is communicated on this line:

- **Auxiliary Power Module (APM):** Converts the high voltage DC power in the High Voltage Battery into a low voltage DC power for charging the Low Voltage Battery. The APM contains systems that ensure voltage output, current draw, and current demand “spikes” do not damage any electronic components within the LV circuit while charging the 12V battery.

When the Electric Vehicle Supply Equipment (EVSE) Charging Cable is plugged into the charge port the IDCM sends a wake up signal to the high voltage modules to allow the modules to operate and the batteries to charge.

- **High Voltage Charging:** The OBCM converts the AC current from the grid into a suitable DC current supplied to the Battery Pack Control Module (BPCM) for charging of the high voltage battery. The IDCM regulates voltage and current flow to maintain proper State Of Charge (SOC) and State Of Health (SOH) of the high voltage Battery system.
- **Low Voltage Charging:** The APM is used as a DC to DC converter, responsible for charging of the low voltage system battery. This replaces the need for an alternator on PHEV vehicles. The high voltage can be provided by the EVSE charging cable or the high voltage battery.

The IDCM generates heat as it operates. The IDCM is liquid cooled by the Low Temp Cooling Loop. The IDCM monitors its internal temperature, voltage and current flow. If any of these items are out of range, the IDCM will not operate.

For the IDCM to operate, the IDCM must detect a minimum of 10.0 volts from the 12.0 volt Battery, along with a wake up signal from the HCP Module through the EPT ECU Wake-Up Signal circuit.

The IDCM is a stand alone module that does not contain any internal serviceable parts, but does have full diagnostic and programming capabilities through the vehicle Controller Area Network (CAN) C-EPT Bus.

FUNCTIONAL DESCRIPTION - INSTRUMENT PANEL CLUSTER (IPC)

The IPC receives information from the Powertrain Control Module (PCM), Power Inverter Module (PIM) and Integrated Dual Charging Module (IDCM) on the CAN-C Network to display current system voltages and vehicle modes.

FUNCTIONAL DESCRIPTION - MOTOR GENERATOR UNIT (MGU)

The Motor Generator Unit (MGU), or Motor “A” is a belt driven 3-phase electric motor mounted at the front of the engine (P1f). The P1f motor is used in place of a conventional starter motor to crank the engine during starting. When the engine is running, the mechanical force applied to the shaft of the MGU by the crankshaft induces an AC power delivered to the Power Inverter Module (PIM). The PIM converts the AC power into a DC power for charging the HV battery. The Motor Control Processor (MCP) located inside the PIM controls the operation of the MGU. The MCP monitors the MGU current phase, resolver and internal temperature sensor inputs. The MCP also monitors the MGU for any faults. The MCP communicates this information to the Hybrid Control Processor (HCP), which is also located inside the PIM.

FUNCTIONAL DESCRIPTION - POWERTRAIN CONTROL MODULE (PCM)

The HV battery is made up of eight battery modules. Each module has it's own Cell Sensing Circuit (CSC), known as the Cell Voltage and Temperature Node (CVTN) which communicates with the Battery Pack Control Module (BPCM). These CVTN modules "smart" devices. The CVTN reads cell voltages and module temperatures and provides that information to the BPCM. The CVTN also monitors cell balancing. The BPCM also monitors the temperature of the inlet and outlet of the battery pack thermal circuit with two temperature sensors.

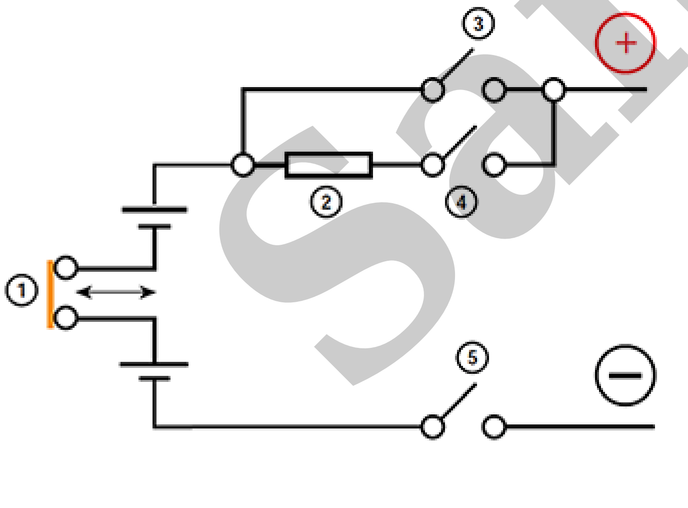
The high voltage battery has a Manual Service Disconnect (MSD) accessible from the interior of the vehicle. It is part of the electrical circuit and must be connected if electrical energy is to flow through the HV cables from the High Voltage Battery System. Removal of the MSD inhibits the flow of electrical energy from the High Voltage Battery System.

The HV battery generates heat during operation. The HV battery is liquid cooled by the battery cooling system. The HV battery has a temperature sensor hard-wired to the BPCM. The BPCM sends the signal to the PIM which controls the operation of the coolant pump in the system regulating the battery temperature.

The HV battery contains a Battery Disconnect Unit (BDU) that houses three HV contactors; a positive contactor and a negative contactor, a pre-charge contactor as well as a precharge resistor and a current sensor. The function of the BDU is to couple and uncouple the HV battery from the HV cables and vehicle. The contactors have three modes of operation described below:

CONTACTOR POWER FLOW

MSD INSTALLED AND HV BATTERY PACK INACTIVE



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CONTACTORS INACTIVE			
1	MSD	4	Open pre-charge contactor
2	Pre-charge resistor	5	Open negative contactor