STAR ONLINE PUBLICATION

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Symptom/Vehicle Issue: 12v Ignition Off Draw (IOD) Caused By Power Electronics Coolant Pump 1 (PECP-1) Continuously Running When Vehicle Is Asleep

Discussion: The vehicle may come in with a depleted 12v battery. Upon charging the battery and performing IOD testing, three minutes after the ignition is switched OFF you may find a 16A+ draw and hear the Power Electronics Coolant Pump 1 (PECP-1) running at full speed continuously.

The PECP-1 is controlled over LIN 2 (Circuit D548) by the Electric Vehicle Control Unit (EVCU). If the PECP-1 is woken up and does not receive a message from the LIN Master (EVCU), it goes into “Emergency Mode” and defaults to running at 100% pump speed creating a 16A+ draw.

While this can occur anytime the EVCU is not communicating with the pump, most commonly observed while performing flashes. Engineering has found that a malfunctioning component on LIN 2 (D548) can inadvertently provide a pull-down wakeup command which will awaken PECP-1 when the ignition and EVCU are OFF. Because the EVCU is OFF and not communicating with PECP-1 when this occurs, it goes into “Emergency Mode” and operates at full speed. Follow diagnostics steps below to determine root cause of inadvertent LIN wakeup.

Contact STAR Center, or your Technical Assistance Center Via TechConnect, eCONTACT or Service Library entry if no solution is found.

Diagnostics: To determine if this issue is applicable to the vehicle you are working on, perform and monitor the following:

1. Disconnect wiTECH to allow vehicle to go to sleep.
2. Locate PECP-1 (Use reference images on pages below)
3. Cycle the ignition OFF. Vehicle should begin going into sleep mode.
4. Two minutes after the ignition is switched OFF, the High Voltage contactors will open.
5. 1 minute following opening of the contactors the EVCU will issue a LIN bus sleep command, and all pumps will shut off.
6. Approximately 0.4-0.5 seconds after the LIN bus sleep command is given and all the pumps have shut down you will hear PECP-1 turn back on and run at full speed.

   In summary, if this issue applies PECP-1 should begin running at full speed approximately 3 minutes after the ignition is switched off and will create a 16+ Amp IOD.

7. Engineering has found that the most common component triggering this unintentional wakeup command is a malfunctioning Electronic A/C Compressor (EAC). Disconnect the low voltage 3 way connector (C1) from the EAC to isolate it from the LIN bus and repeat steps 1-6 above.

   7.1 Does PECP-1 continue to run at full speed 3 minutes after the ignition is switched off?

   YES – Further diagnostics are required. Continue to step 8.

   NO – Confirm circuit integrity of the EAC including all power and grounds. If no trouble found, replace the EAC. After replacement, confirm repair of IOD.

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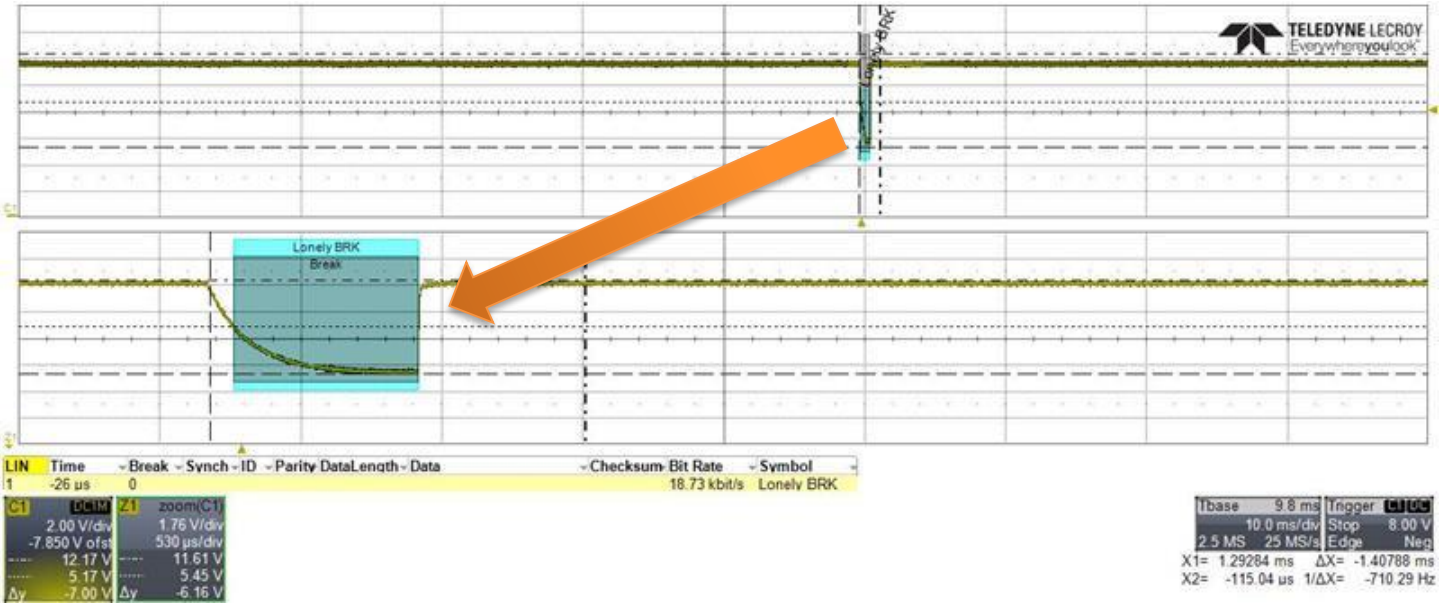
8. Connect an Oscilloscope to monitor and continuously record LIN 2 (D548). Cycle the ignition off, after approximately 3 minutes monitor the LIN bus for an unintentional wakeup command. A LIN bus wakeup command is defined as a voltage pull down which is greater than 50% of B+ voltage.



The example above shows a normal view (top) and zoomed in view (bottom) of the same unintentional LIN wake up command, dropping from 11.6v to 5.15v. This unintended wakeup command is only 5 milliseconds or 0.005 seconds long. Reviewing the recording will be necessary to identify.

If you observe the LIN wakeup command occurring after cycling the ignition OFF causing PECP-1 to run and no change when disconnecting the EAC. You will need to individually disconnect each component from LIN 2 to identify which one is providing the unintentional wake up command. Besides the EAC, the Auxiliary High Temperature Heat Pump is the other most likely cause as it is provided B+ at all times. Though malfunction of the Low Temp Expansion Valve, EVCU and wiring are also a possibility.

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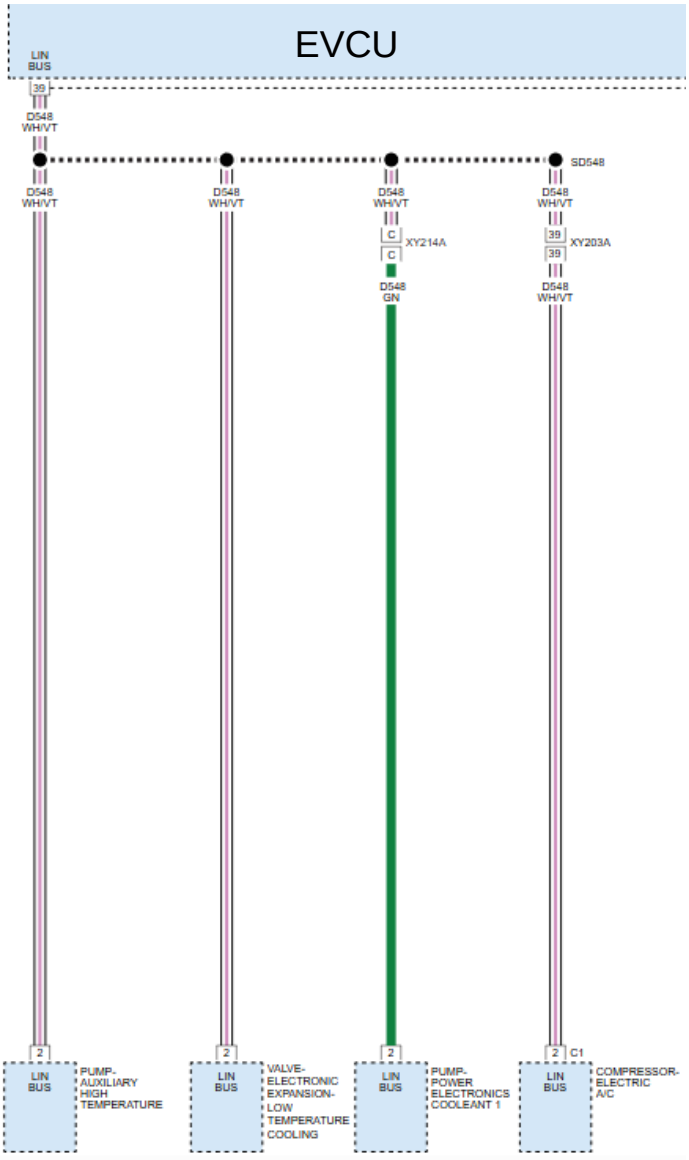

Diagram of LIN 2

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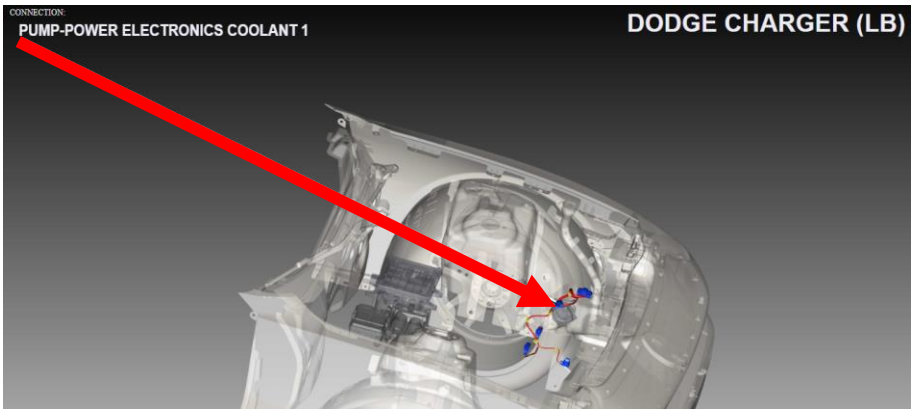
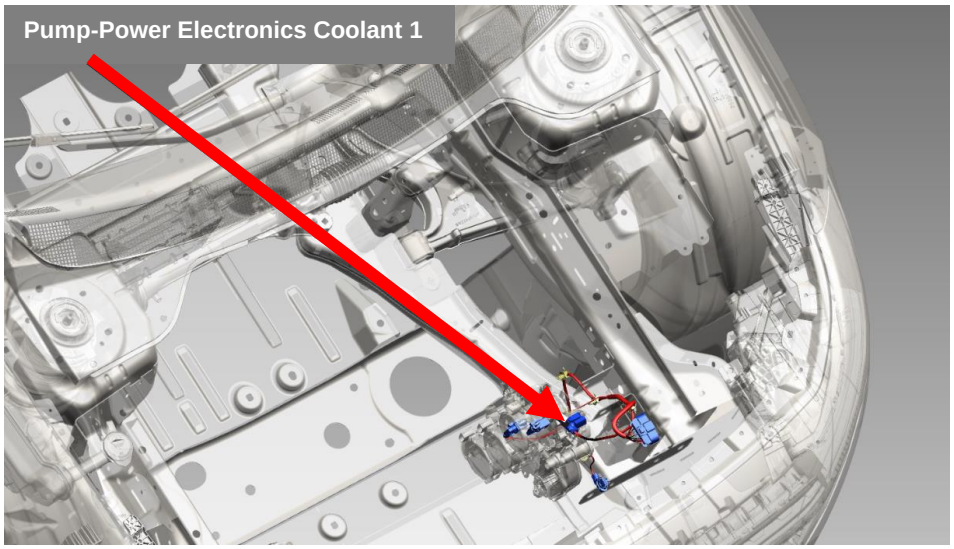


LB – PECP-1 Located Under Hood Front of Drivers Wheel Well



KM – PECP-1 Located Under Hood Lower on Front of Drivers Frame Horn

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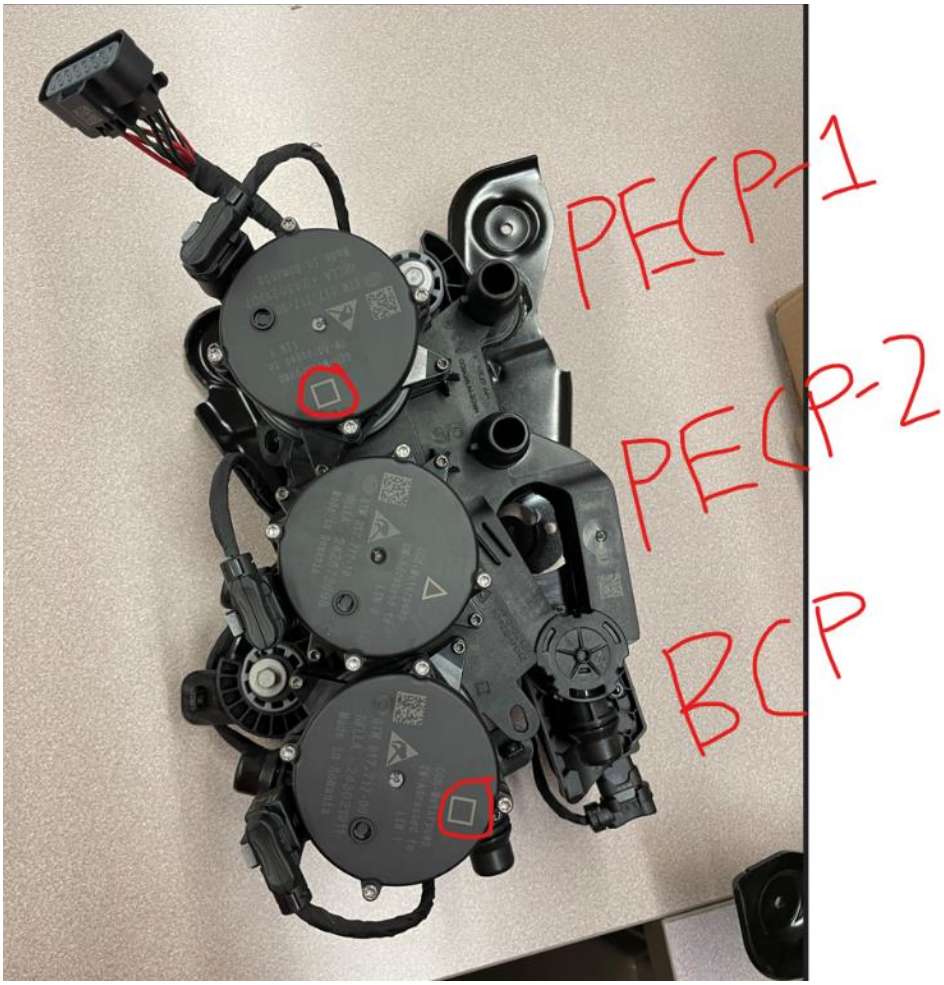

Pictured above you can see the coolant pump assembly with three induvial pumps. They communicate with the EVCU on three separate LIN buses. While these pumps are all keyed and physically the same, each pump has a unique part number and contains unique software for identification over their respective LIN bus. The circuit color for Power, Ground and LIN are identical across all three pumps. PECP-1 and BCP have the same square symbol. While PECP-2 has a triangle symbol. Engineering is planning to make these symbols unique for easier identification (no ETA). By referencing the above image and noting the location of the pumps on the assembly bracket, you should be able to identify the location of PECP-1 on vehicle.

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