

P0299-00-TURBOCHARGER/SUPERCHARGER "A" UNDERBOOST CONDITION

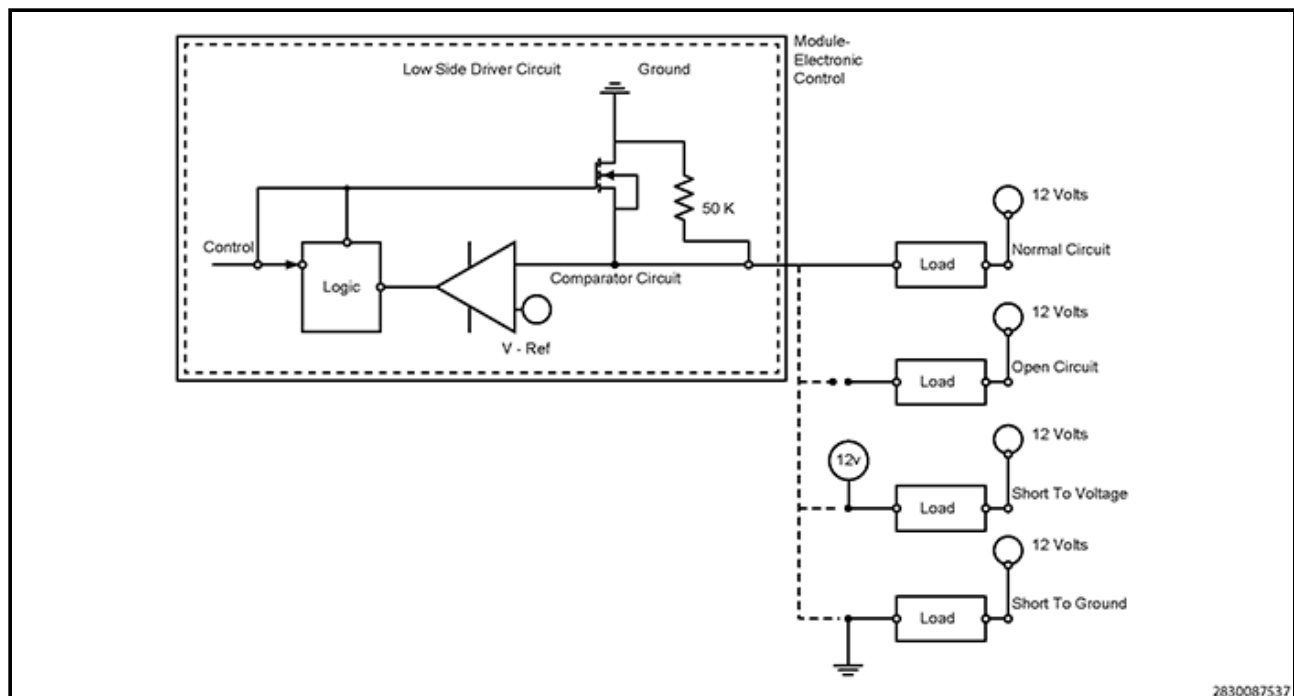
For a complete TURBO CHARGER SYSTEM wiring diagram, ([refer to the Wiring Information](#)).

Theory of Operation

The base Turbocharger boost pressure is managed by the mechanical Wastegate. The Wastegate is a spring loaded mechanical valve that is normally open, allowing the exhaust gases to bypass the turbine inside the Turbocharger. When the Powertrain Control Module (PCM) decides to allow boost, it energizes the Wastegate Solenoid, allowing Boost pressure to be applied to a diaphragm that works against the spring pressure of the Wastegate. The boost pressure is supplied to the Wastegate Solenoid through a hose connected to the compressor side of the Turbocharger. The Boost pressure is low at lower engine speeds and increases as engine speed increases. The increase in Boost pressure with engine speed controls the rate that the Wastegate opens. As the Boost pressure increases and closes the Wastegate, it allows more of the exhaust gases to be directed through the turbine, increasing the turbine speed and amount of boost by the Turbocharger.

The PCM controls the Wastegate Solenoid through a **Low Side Driver (LSD)** circuit. The Wastegate Solenoid is located between the Turbocharger compressor and mechanical Wastegate. When energized by the PCM, the Wastegate Solenoid allows Boost pressure from the Turbocharger compressor to act on the diaphragm connected to the Wastegate.

Typical Low Side Driver Operation and Fault Detection: This type of driver circuit is generally used for relay control, solenoid control or a similar type of driver device. The PCM provides a ground to operate the device when switched on. The ground could be constant or Pulse Width Modulated (PWM). The PCM also provides fault detection for the device, wiring and internal driver. Fault detection can be done by monitoring voltage on the circuit, current draw, or a combination of both. For diagnostic purposes the PCM uses an internal pull down diagnostic resistor connected in series and a voltage reference (V-Ref) comparator for fault detection:



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- **Circuit Open and Circuit Low Detection:** The PCM monitors for an **open circuit** and **short to ground** when the driver is switched off. When switched off, the available voltage passes through the device and the **internal pull**

down resistor connected in series. The voltage at the **comparator circuit** should be close to Battery voltage since the majority of the voltage drop occurs through the diagnostic resistor. If the available voltage is less than the V-Ref, a fault is set. In this scenario the V-Ref would be slightly below Battery voltage. **An alternative method of fault detection for an open or short to ground** that is used is to monitor current draw when the internal driver is switched on. If the module does not detect any current draw it determines that the component or circuitry is open. Excessive current draw detected would indicate a short to ground.

- **Circuit High Detection:** The PCM monitors for a **short to voltage** when the driver is switched on. When the driver is switched on providing a path to ground through the transistor, the available voltage should be pulled low, near zero volts since the **comparator circuit** is monitoring the ground side of the device. If the voltage is greater than V-Ref, a fault is detected. In this scenario V-Ref would be slightly above zero volts.

NOTE: A load that has a resistance that is below manufacturer specification, or a second load device shorted to the low side driver circuit can cause excessive current draw on the internal driver. The driver will be switched off to protect against overheating and damaging the driver. In this instance the Circuit High fault may be detected because the available voltage on the comparator circuit is above V-Ref.

When Monitored and Set Conditions

When Monitored: This diagnostic runs continuously when the following conditions are met:

- With the engine running.
- DTCs P0033, P0034, P0035, P0237, P0238, P006C, P006D, P012B, P1185, P2261, P2262 are not present..

Set Conditions:

- The PCM detects that the difference between the Boost Pressure Sensor desired value minus the actual reading is above a calibrated value for the driving conditions.

Default Actions:

- The MIL will illuminate.

Possible Causes
RESTRICTED AIR FILTER
INTAKE SYSTEM LEAK OR RESTRICTION
EXHAUST SYSTEM RESTRICTION
WASTEGATE VALVE STICKING
WASTEGATE SOLENOID CONTROL (+) CIRCUIT OPEN OR HIGH RESISTANCE
WASTEGATE SOLENOID CONTROL (-) CIRCUIT OPEN OR HIGH RESISTANCE
WASTEGATE SOLENOID
TURBOCHARGER (DRAGGING TURBINE)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

1. CHECK FOR AN ACTIVE DTC

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1. With the scan tool, read Powertrain Control Module (PCM) DTCs and Freeze Frame Data and record on the repair order.
 2. Using the recorded Freeze Frame Data and the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
 3. With the scan tool, read PCM DTCs.

Is the DTC active or pending?

Yes

- Go To [2](#)

No

- Perform the INTERMITTENT DTC Diagnostic Procedure. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

2. CHECK THE AIR FILTER

1. Turn the ignition off.
2. Remove and inspect the Air Filter and housing inlet for snow, soiling or excessive dirt and debris which may cause air flow restriction.

Were any of these problems found?

Yes

- Replace the Air Filter or remove the obstruction.
- Perform the POWERTRAIN VERIFICATION TEST. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

No

- Go To [3](#)

3. CHECK FOR INTAKE SYSTEM LEAKS OR RESTRICTIONS

NOTE: Damaged, restricted or poorly connected Intake System and Turbocharger System related tubes can cause this DTC to set.

1. Inspect all air intake, crankcase vent and Turbocharger related hoses/tubes and clamps for leaks or damage.
2. Inspect all boost pressure system hoses for leaks or restrictions.
3. Inspect the Intercooler Assembly for signs of a leak.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

No

- Go To [4](#)

4. CHECK THE WASTEGATE VALVE AND LINKAGE FOR BINDING

1. Inspect the Wastegate Actuator, linkage and the Wastegate Valve for proper operation. Move the linkage by hand to check for any sticking or binding during travel.

Were any problems found?

Yes

- Repair as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

No

- Go To [5](#)

5. CHECK FOR EXHAUST SYSTEM RESTRICTIONS

1. Inspect the complete exhaust system for damaged, bent or clogged pipes that can cause exhaust system restrictions and excessive back pressure.

Were any problems found?

Yes

- Repair or replace as necessary.
- Perform the POWERTRAIN VERIFICATION TEST. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

No

- Go To [6](#)

6. CHECK THE (K137) WASTEGATE SOLENOID CONTROL (+) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Turn the ignition off.
2. Disconnect the Wastegate Solenoid harness connector.
3. Disconnect the PCM C2 harness connector.
4. Measure the resistance of the (K137) Wastegate Solenoid Control (+) circuit between the PCM C2 harness connector

and the Wastegate Solenoid harness connector.

Is the resistance below 3.0 Ohms?

Yes

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No

- Repair the (K137) Wastegate Solenoid Control (+) circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

7. CHECK THE (K139) WASTEGATE SOLENOID RETURN (-) CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

1. Measure the resistance of the (K139) Wastegate Solenoid Return (-) circuit between the PCM C2 harness connector and the Wastegate Solenoid harness connector.

Is the resistance below 3.0 Ohms?

Yes

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No

- Repair the (K139) Wastegate Solenoid Return (-) circuit for an open or high resistance.
- Perform the POWERTRAIN VERIFICATION TEST. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

8. REPLACE THE WASTEGATE SOLENOID AND RETEST FOR DTCS

1. Replace the Wastegate Solenoid in accordance with the Service Information.
2. Connect the Wastegate Solenoid and PCM harness connectors.
3. With the scan tool, erase DTCs.
4. Using the recorded Freeze Frame Data and the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read PCM DTCs.

Did the DTC return?

Yes

- Repair or replace the Turbocharger in accordance with the Service Information. ([Refer to 09 - Engine/Turbocharger System/TURBOCHARGER/Removal and Installation](#)).
- Perform the POWERTRAIN VERIFICATION TEST. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).

No

- Replacing the Wastegate Solenoid repaired the fault.
- Perform the POWERTRAIN VERIFICATION TEST. ([Refer to 28 - DTC-Based Diagnostics/MODULE, Powertrain Control \(PCM\) - Standard Procedure](#)).