

**\*\* SOLUTION \*\***

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Title Diagnostic / Troubleshooting Procedures For EGR System Components; Diagnostic Trouble Codes (DTC) P0401-00, P0402-00, P04DD-00, P1121-00, P1121-98 Or SPN 2659 FMI 16, SPN 2659 FMI 18, SPN 412 FMI 0, SPN 412 FMI 15 - **US10, US10+OBD13, US14+OBD\*, US17+OBD\* With A Variable Geometry Turbocharger (VGT)**

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**Mack Models**

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**Mack Model** LEU , LR , MRU - TerraPro , TE - TerraPro , AN - Anthem , CHU - Pinnacle, Axle back , CXU - Pinnacle, Axle front , GR - Granite , GU - Granite , PI - Pinnacle , TD - Titan

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**Volvo Models**

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**Volvo Model** VNL , VNM , VNR , VNX , VAH , VHD , VT

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**Emission Standard**

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Emission Standard US10 , US10+OBD13 , US14+OBD13 , US14+OBD15 , US14+OBD16 , US17+OBD16 , US17+OBD18 , US17+OBD19

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**Engine family**

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Engine family 11L Engine , 13L Engine , MP7 , MP8

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**\*\* SOLUTION \*\***

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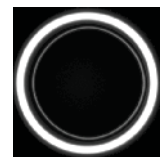
**Cause** Current Guided Diagnostic steps in Premium Tech Tool ( PTT ) begin with electrical wiring and connector checks for the EGR valve, then move to a Turbocharger Actuator (VGT, SRA) function test. Field testing has indicated that insufficient flow codes are not typically caused by electrical issues or EGR valve failure, and these initial electrical-related checks and inspections can be time-consuming. The new Diagnostic Steps start with an enhanced review of an EGR Function test during modified test conditions that will reveal more information in less time. The new procedure has the dual purpose of not only checking EGR valve function, but also determining EGR cooler condition.

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Solution



**An eService case is NO LONGER REQUIRED for this solution. Repairs should be performed based on the findings from the diagnostic steps below.**



**If a vehicle has any of the fault codes listed in the fault code section and no obvious issues are found from a visual inspection, follow the procedure below:**

## I. Initial Conditions

Begin by starting Operation **2939-08-03-01 Exhaust Gas Recirculation Function** under the Test tab in PTT.

- Coolant temp **must** remain below 155 °F (68 °C) during this test. The EGR valve is commanded closed by the Engine Control Module during this time.
  
- Engine speed should be set to 780-840 RPM using the Cruise Control switch. 800 RPMs is ideal.
  - Note that it may be necessary to set engine speed using the accelerator and the SET button initially. From there the SET and RESUME buttons should work to adjust speed.
  - Certain chassis may need to have Maximum Stationary Engine Speed set to 900 before the cruise control buttons will work to adjust idle.
  
- VGT position should range between 6% and 14% depending on the coolant temperature.
  - **It is important that the turbocharger position be in the above range.** If the exhaust temperature is very low, the VGT will open to 40% until the DPF outlet temperature sensor (T3) reaches 140 °F (60 °C). If the turbo position is greater than 14%, the truck should be allowed to run until position returns to between 6% and 14% before performing the checks below.

## II. Checks

Both steps below should have a screenshot taken showing the parameter list as shown in the pictures for each step.

1. With initial conditions achieved, turbo speed should be checked when the EGR Position is 0%.

**Screenshot** : Should be taken with Conditions (in **YELLOW**) achieved and showing EGR valve at 0%.

## EGR Valve Activation



### Primary Parameters

0 %	EGR valve position
	EGR Differential pressure
	EGR Mass Flow
	EGR temperature
6% to 14%	VGT Nozzle position
Above 35,000 RPM	Turbocharger #1 Speed

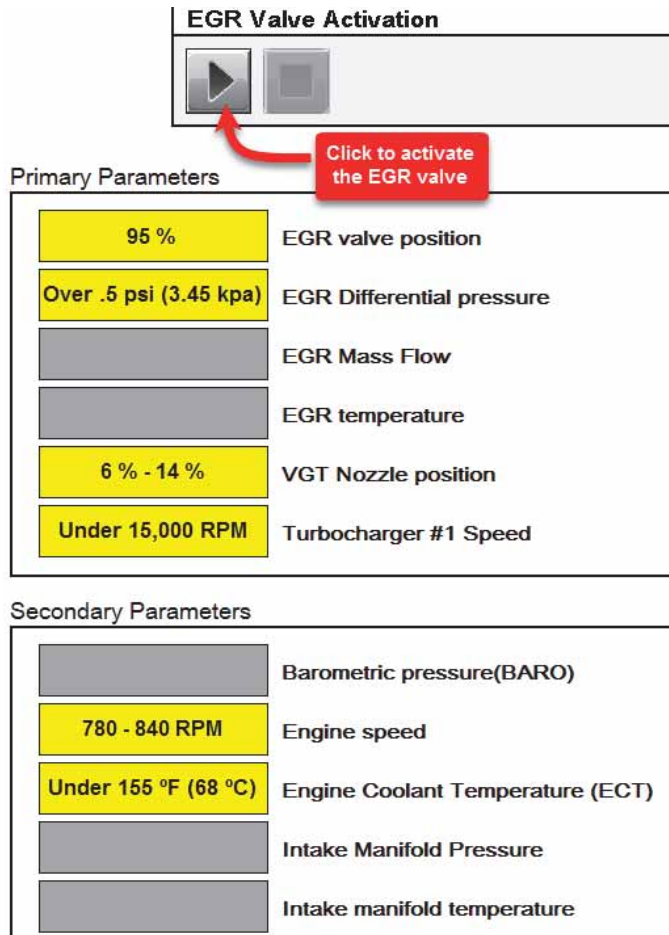
### Secondary Parameters

	Barometric pressure(BARO)
780 - 840 RPM	Engine speed
Under 155 °F (68 °C)	Engine Coolant Temperature (ECT)
	Intake Manifold Pressure
	Intake manifold temperature

- Turbocharger Speed (in **LIGHT BLUE**) should be greater than 35,000 RPM
- If Turbo Speed is less than 30,000 RPM, a sticking EGR valve is possible.
- If Turbo Speed is less than 20,000 RPM, a stuck EGR valve is highly likely
  - EGR differential pressure will likely show a value of at least .2 PSI (1.4 kPa).
  - The chassis may also generate excessive Parked Regeneration requests or driveability complaints.

2. Activate the EGR valve by pressing the Play button in the EGR Valve Activation box. The valve should open to 95%.

**Screenshot** : Should be taken with Conditions (in **YELLOW**) achieved and showing EGR valve at 95% just before the valve closes again OR the engine dies.



- **Turbocharger speed should drop below 15,000 RPM within 10 seconds of valve activation.**
- **If turbo speed does not change**, the EGR valve should be checked to confirm it is not stuck closed.
- **If turbo speed drops but remains above 20,000 RPM**, the EGR cooler is likely plugged.
  - A turbo speed reaction to EGR valve activation is a normal indicator of an operational EGR valve.
  - The Venturi tube should also be checked to ensure it is free of blockage (Much less likely).
- **If turbo speed reacts as expected**, the EGR differential pressure sensor or EGR Temperature Sensor are the likely issue for High or Low Flow codes.
  - Check for clogs or excessive condensation in the EGR sensor, sensor supply tubes, or Venturi tube.
  - Check for a non-plausible differential pressure value during valve activation.
    - A negative value or low value, for instance .2 PSI (1.4 kPa) or less, at full valve activation is an indication of an EGR dP sensor and/or venturi tube issue.
  - Check for a non-plausible EGR temperature value during valve activation.
    - A temperature reading below coolant temperature or higher than exhaust temperature is an indication of an EGR temperature sensor issue.

Solution visibility

Dealer distribution

**Function(s)/component(s) affected**

Function affected

Diagnostic tool , Turbocharger , EGR

## Function Group

Function Group	293 EGR (Exhaust Gas Recirculation)
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### Customer effect

Main customer effect	diagnostics/methodology , fault code/display
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### Fault code(s)

US10 Fault Codes	SPN 412 FMI 15 , SPN 412 FMI 0 , SPN 2659 FMI 18 , SPN 2659 FMI 16
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OBDDII Diagnostic Trouble Codes (2013- )	P0401-00 , P0402-00 , P04DD-00 , P1121-00 , P1121-98
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### Conditions

Vehicle operating mode	when driving , when stationary
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Frequency of occurrence of problem	random
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### Administration

Author	UT9246H
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Dealer ID	UT9246H
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Last modified by	RU4469V
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Creation date	13-02-2018 15:02
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Date of last update	17-04-2019 21:04
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Review date	15-04-2018 00:04
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Status	Published
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Average score	1.5
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Number of scores	2
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