



## Preliminary Information

### PIP5495G Check Engine Light On With P0299 Or P0234

#### Models

Brand:	Model:	Model Years:	VIN:		Engine:	Transmissions:
			from	to		
Buick	Encore	2013 - 2019	All	All	1.4L LUV or LUJ	All
Chevrolet	Cruze	2011 - 2016	All	All	1.4L LUV or LUJ	All
Chevrolet	Sonic	2012 - 2019	All	All	1.4L LUV or LUJ	All
Chevrolet	Trax	2013 - 2019	All *See Note	All * See Note	1.4L LUV or LUJ	All

\* 2013 Chevrolet Trax (Canada), 2015-2019 Chevrolet Trax (U.S. and Canada)

Involved Region or Country:	North America
Condition:	All turbochargers that are returned to the Warranty Parts Center (WPC) are inspected by Engineering for root cause failure. The purpose of this information is to reduce the number of no trouble found (NTF) turbochargers being returned to the WPC by informing the Service Department personnel of what inspections and/or diagnosis to perform, prior to replacing and returning a turbocharger to the WPC. Read the entire bulletin prior to beginning any work.
Cause:	Misdiagnosis Leading to Returned Turbochargers with NTF

#### Correction:

##### Causes of Misdiagnosis Leading to Returned Turbochargers with NTF:

Before replacing a turbocharger, the following information should be reviewed for the turbocharger condition that was observed and the recommendations listed.

Do not replace the turbocharger if P0299 is set and one of the following is present:

Crack(s) at the wastegate valve port (this is normal and does not affect performance)



Wastegate solenoid valve port broken (replace solenoid valve - released for service)

Wastegate actuator port bent (replace wastegate actuator - released for service)

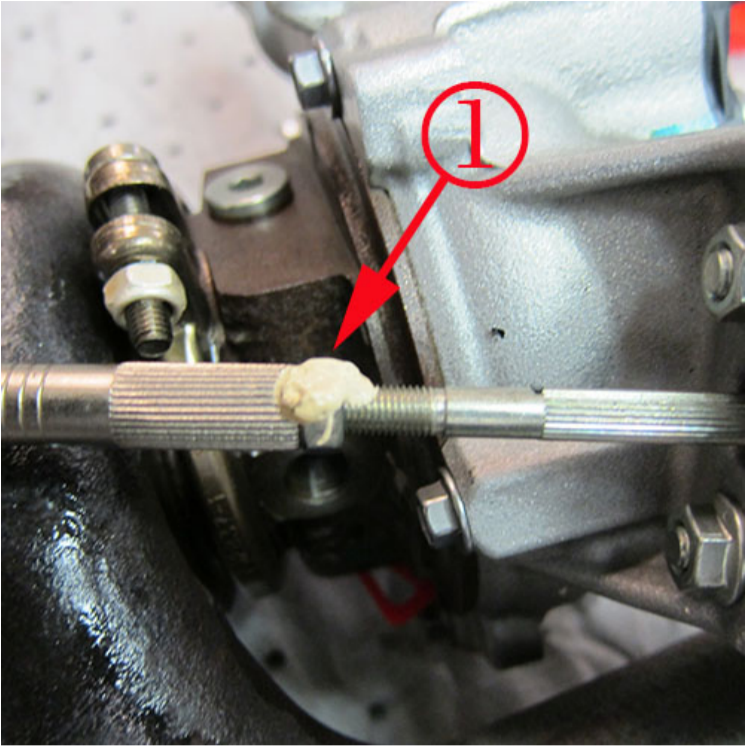
Wastegate solenoid valve or hoses obstructed with deposits or oil

If obstruction/deposits cannot be removed replace solenoid (released for service)

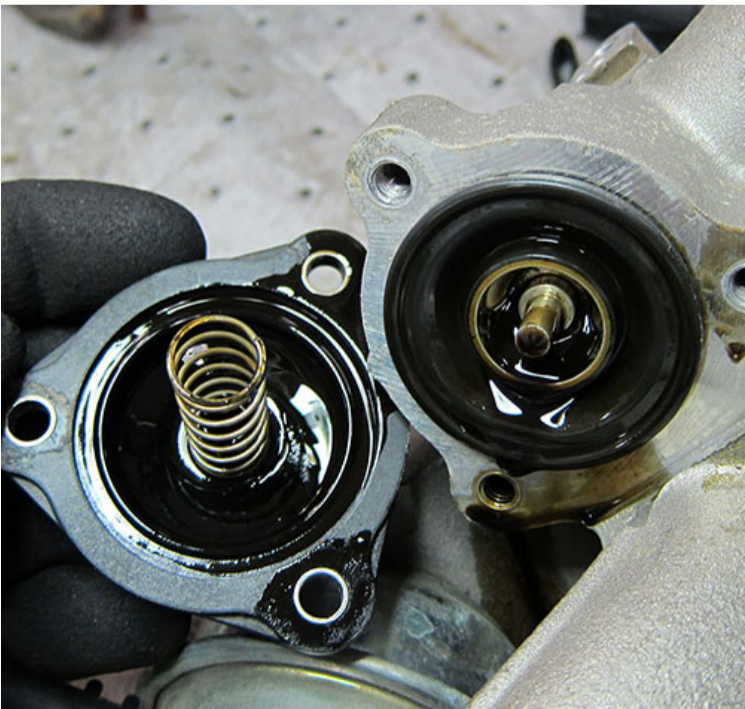
Wastegate actuator clip missing (replace wastegate actuator clip - released for service)

If the tamper paint seal is broken or missing, check the vehicle for any additional sign of modification to the induction, exhaust, or engine calibrations as this may indicate an attempt to adjust the wastegate arm to modify the powertrain operation.

If found, review the powertrain warranty status with your service manager prior to performing repairs



Bypass (recirculation) valve cover port broken or water/oil found inside the valve (clean the components, if necessary replace bypass (recirculation) valve assembly - released for service)





Restrictions in the induction system including the air cleaner, air cleaner housing, resonator and ducts,

Check for Soft, Twisted or collapsed air ducts.

Check for animal nesting materials restricting air flow to the turbocharger.

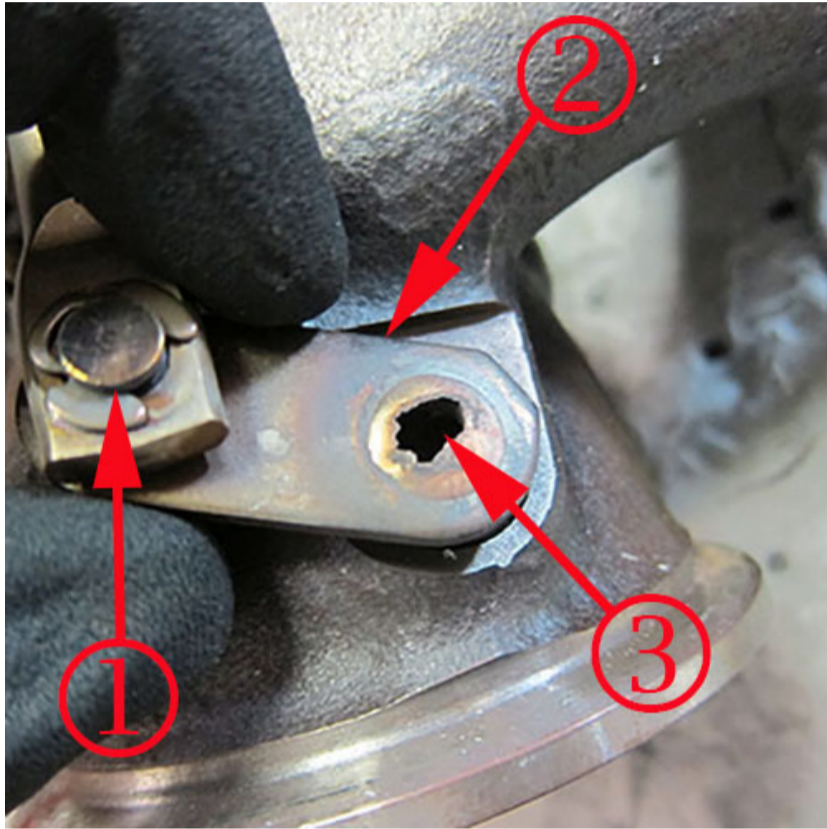
Excessive exhaust system backpressure.

**Note: In cold weather conditions, moisture in the induction system can freeze. Refer to Charger Air Cooler (CAC) ICING section in this bulletin.**

Replace the turbocharger if P0299 is set and at least one of the following is present:

If the following failures are identified, it is not necessary to perform the Turbocharger Boost Control Test.

Disconnected wastegate lever arm (crank) (2) from the shaft (3).



Disconnected wastegate lever arm pin (1) from the lever arm (crank) (2).

Wastegate valve/linkage seized (cannot move).

Turbine wheel not rotating, turbine wheel shaft broken or missing wheel nut.

If wheel nut is missing, be sure to locate prior to turbocharger replacement.

If the Wastegate lever arm (crank) (2) is bent, performing the Turbocharger Boost Control Test is required.

Insufficient wastegate preload.

Wastegate lever arm (1) moves with little effort in the direction as shown (2) while the actuator rod remains static, see picture below "Wastegate Preload Inspection".

**Note: This issue will only be found on 2011 or 2012 vehicles equipped with original equipment turbochargers.**

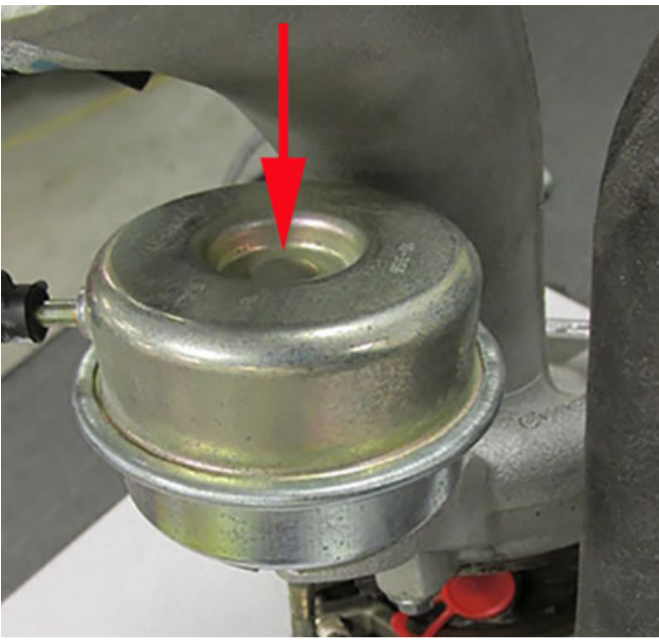
If the lever wiggles with little effort while the actuator rod remains static, the pre-load is insufficient and the turbocharger must be replaced.

The original equipment wastegate actuator found on 2011 and 2012 model years shown below, has a recessed stop at the head of the actuator.

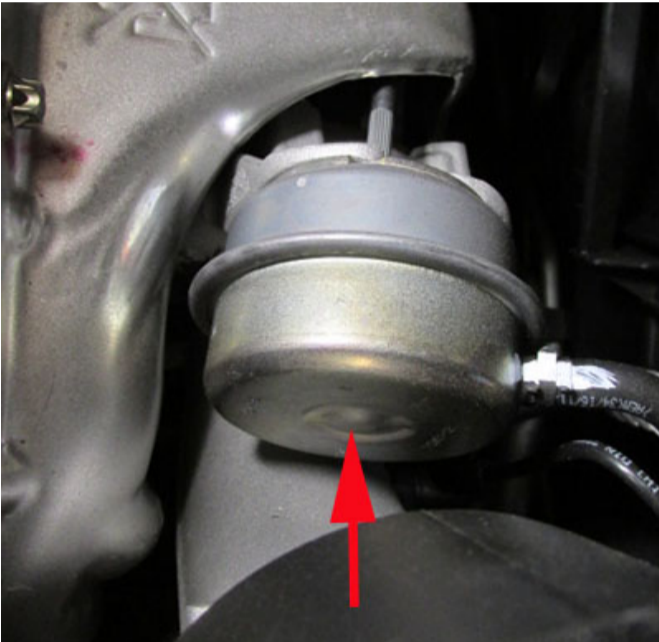
The updated design actuator shown below has a stop that is not recessed and allows 5mm more travel in the closed direction.

With this updated design, it is very unlikely that an insufficient preload issue exists.

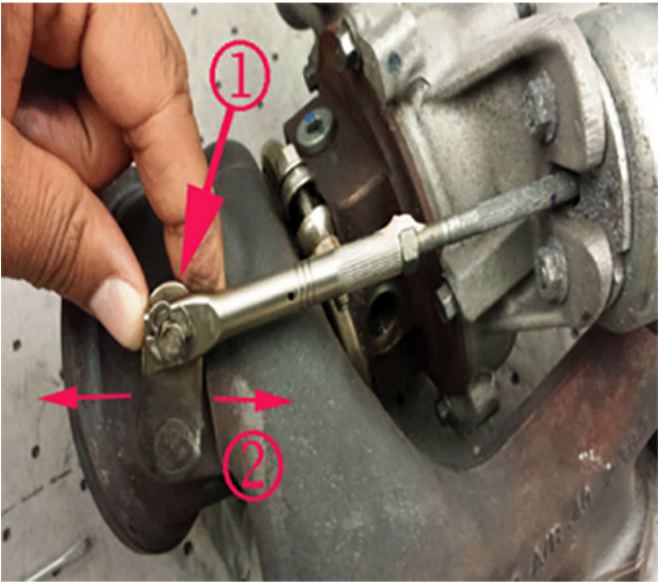
Original equipment actuator is found on 2011 and 2012 model years.



Updated design.



Wastegate Preload Inspection.



**Turbochargers Returned for Engine Oil Leaks:**

If you have any of the following conditions:

Low engine oil, excessive oil consumption, oil leaking into the induction or exhaust system, excessive oil in the PCV bypass hose, excessive smoke or oil leaking at the tail pipe.

Perform the following to isolate the cause as needed.

Understand and verify the customer concern. Perform the Diagnostic System Check - Vehicle and utilize Strategy Based Diagnosis.

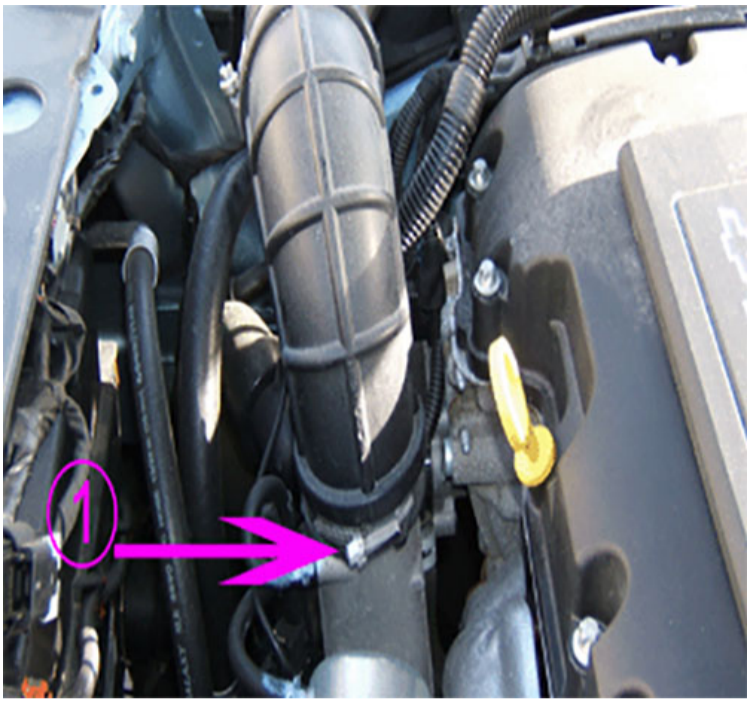
Verify the proper engine oil level.

Perform a visual/physical inspection of the entire engine. Refer to Oil Leak Diagnosis and Oil consumption diagnosis in SI.

Inspect for any aftermarket devices or customer modifications. Refer to Checking Aftermarket accessories in SI.

Remove the turbocharger rubber outside air inlet duct.





Notice: The view shown below indicates NORMAL oil staining in the turbocharger outside air inlet. This dry stain does not represent an oil leak.



Inspect the inside of the turbocharger outside air inlet tube (3) for oil leaking into the opening of the turbocharger bore for the PCV bypass hose.

**Note: If oil is leaking into the opening; refer to the current version of PIP5197.**

Inspect the turbocharger oil feed and return pipe for leaks, restrictions, damage or blockage. Refer to Turbocharger Oil Feed Pipe Replacement in SI.

Inspect for the presence of oil in the exhaust system.



If oil is present in the exhaust system, then inspect the turbocharger turbine and compressor wheels to be sure that they are not broken off.

It is very unlikely that the turbocharger will leak oil internally if the turbine and compressor wheel shaft is not broken.

Refer to the current publication of [PIP5197](#) for diagnostic tips for oil coming through the exhaust ports or PCV system.

**Charger Air Cooler (CAC) Icing and cold weather issues:**

P0299 could set as a result of ice buildup in the Induction system, Charge Air Cooler (CAC) and/or the Boost Pressure sensor.

For Encore and Trax refer to the latest version of [16-NA-405](#): (Poor Engine Performance in Extremely Cold Weather Conditions, PCV Bypass Hose and Charge Air Cooler Icing - Malfunction Indicator Lamp (MIL) Illuminated, DTC P0299, P0236, P2227, and P00C7 Set)



**Turbochargers Returned for Engine Coolant Leaks:**

While not totally impossible, it is highly unlikely that the turbocharger will be the source of an engine coolant leak into the intake or exhaust system.

The turbocharger does not have any moving parts or seals for the engine coolant that would enable it to leak internally into the intake or exhaust system.

For coolant leaks at the turbocharger, check the coolant pipes and related connections.

If you are unable to isolate the cause of the P0299, perform the Turbocharger Boost Control Test listed below.

**Turbocharger Boost Control Test:**

(See Included Unique Labor Operation created specifically for this test only - Not to be utilized if the Turbocharger is replaced for any issue listed above)

Always perform this test prior to replacing the turbocharger if DTC P0299 is set and no other issue has been found.

1. Connect GDS2 to the vehicle.
2. Clear all DTCs.
3. Warm the engine up to the normal operating temperature.
4. Move the vehicle to a safe area for the following drive cycle.
5. Enter ECM induction data list in GDS2.
6. From a stop, accelerate the vehicle at WOT until the transmission forces the 1<sup>st</sup> to 2<sup>nd</sup> gear shift, return to a stop.
7. Repeat this step three times and then exit induction data.
8. Determine the difference between actual and desired boost pressures (see GDS2 set up and examples).
9. Utilize the Print Screen Function to take a screen shot of GDS2 showing the line graph.
10. Replace the turbocharger if the difference within the Measured Window is more than 14 KPA (2.0 PSI) as shown in the examples.
11. Repeat steps 3-9 with the newly installed turbocharger. Utilize the Print Screen Function to take a second screenshot of the line graph.
12. Be sure that the full VIN at the bottom of the GDS2 screen is captured in the screenshot.



13. Print and attach the screenshots to the replaced turbocharger paperwork. (You should have two printouts attached to the warranty part return).
14. Retain the session file for at least 30 days in the event engineering requests it.

GDS2 set up and examples:

### GDS2 SESSION LOG REVIEW DIRECTIONS

Open session, select Desired and Actual Boost pressure parameters and lock

Stored Data Review

Graphical Data Display / Diagnostic Data Display / Live Graph / DTC Display / Bookmarks / System Information / Selected Vehicle Configuration / RPO

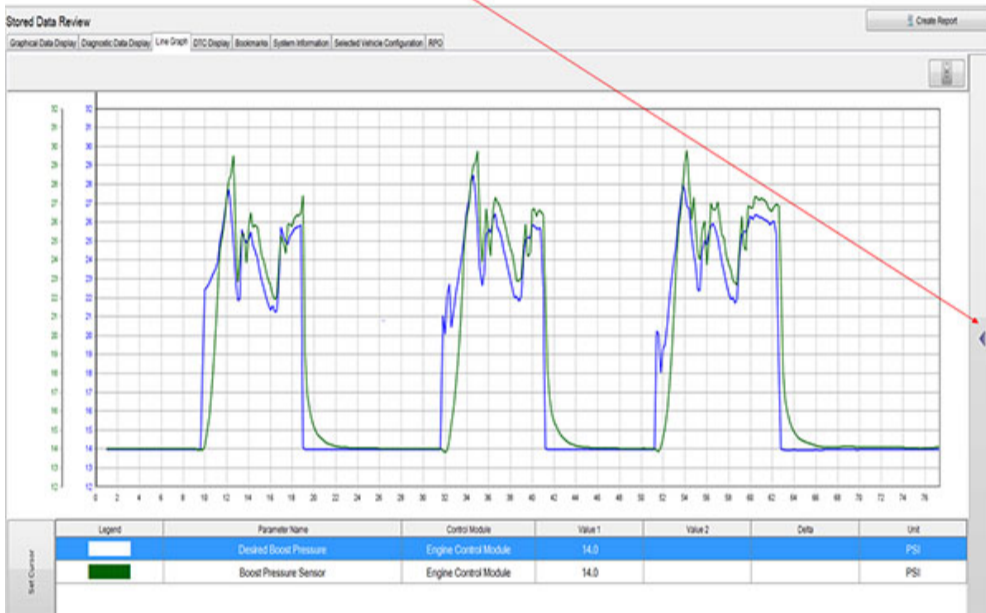
Date List / Monitor Data

Parameter Name	Value	Unit	Control Module
Desired Boost Pressure		PSI	Engine Control Module
Boost Pressure Sensor		PSI	Engine Control Module

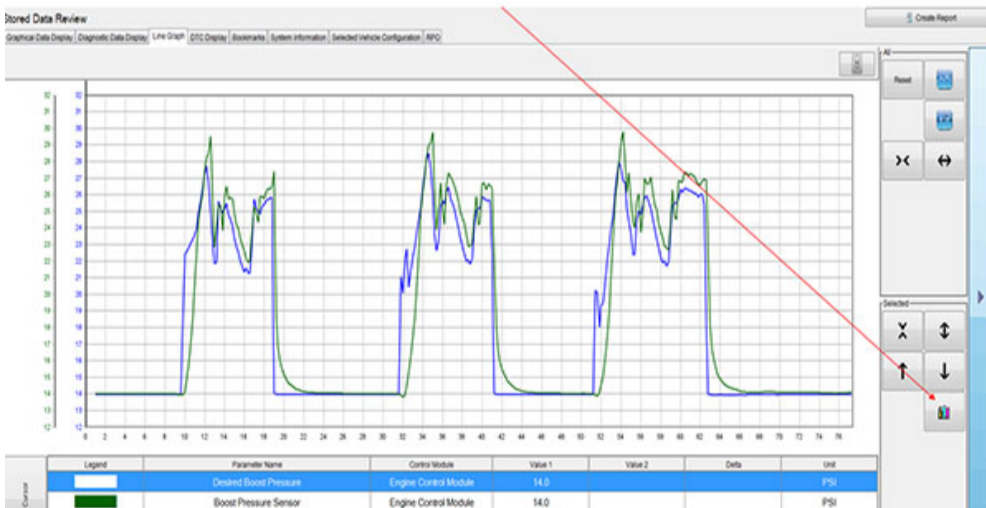
  

Parameter Name	Value	Unit	Control Module
BARO		PSI	Engine Control Module
BARO Sensor		V	Engine Control Module
MAP Sensor		PSI	Engine Control Module
MAP Sensor		V	Engine Control Module
Ambient Humidity		%	Engine Control Module
MAP Sensor		g/s	Engine Control Module
Calculated Air Flow		g/s	Engine Control Module
Inlet Air Humidity Sensor		%	Engine Control Module
Boost Pressure Sensor		V	Engine Control Module
MAP Sensor		PSI	Engine Control Module
Turbocharger Bypass Solenoid Valve Command		%	Engine Control Module
Turbocharger Bypass Solenoid Valve Command		%	Engine Control Module
Turbocharger Bypass Solenoid Valve Control Circuit Low Voltage Test Status			Engine Control Module
Turbocharger Bypass Solenoid Valve Control Circuit High Voltage Test Status			Engine Control Module
Turbocharger Bypass Solenoid Valve Forward Power Test Status			Engine Control Module

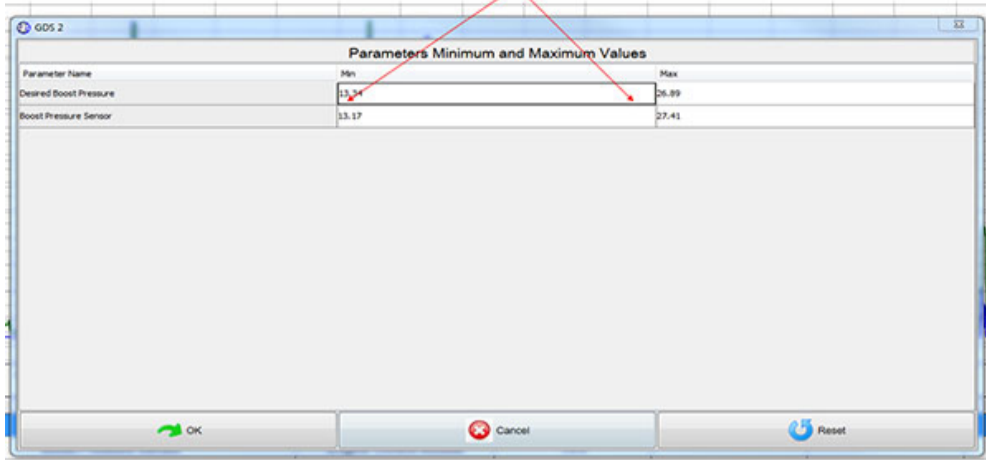
Select Show / High Graph Control Buttons.



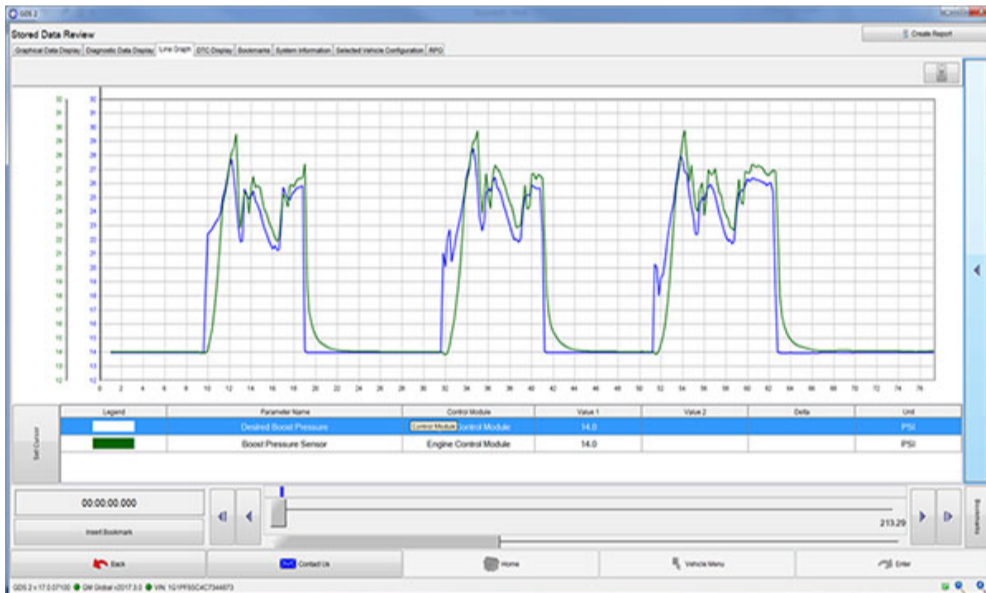
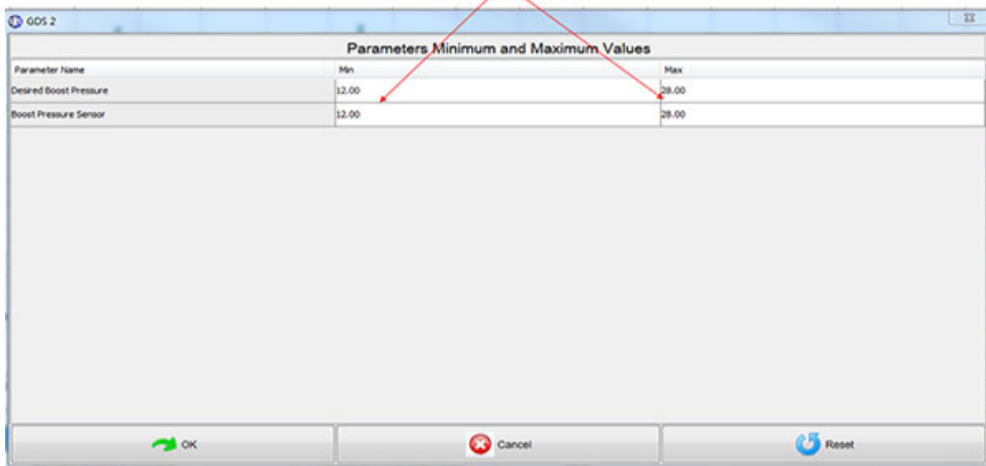
Select Change Scale Button



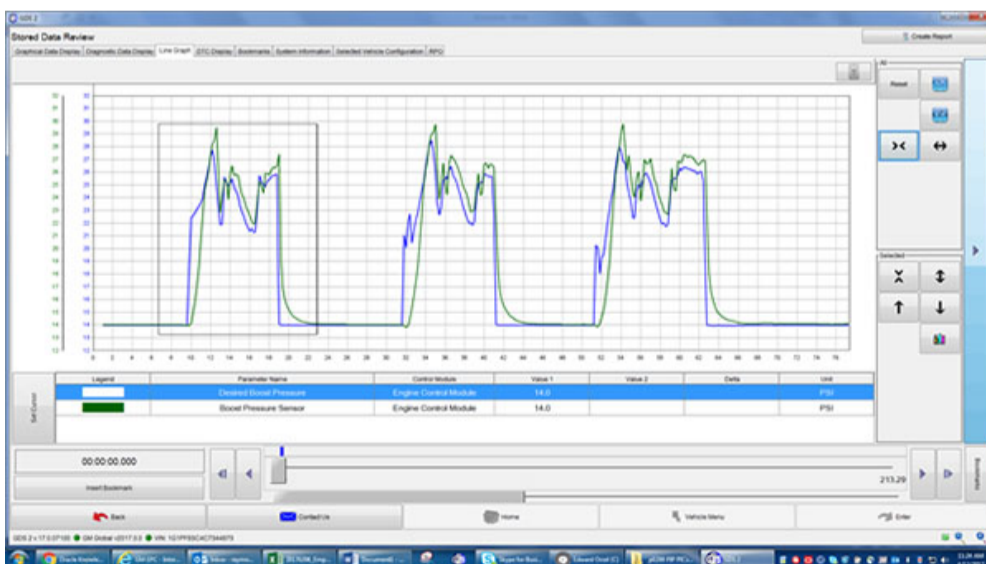
Adjust the Min values to just below the lowest reading and adjust the Max value to just above the highest readings.



Updated value example



Using your mouse, drag a box around each individual acceleration event to zoom in as shown below.



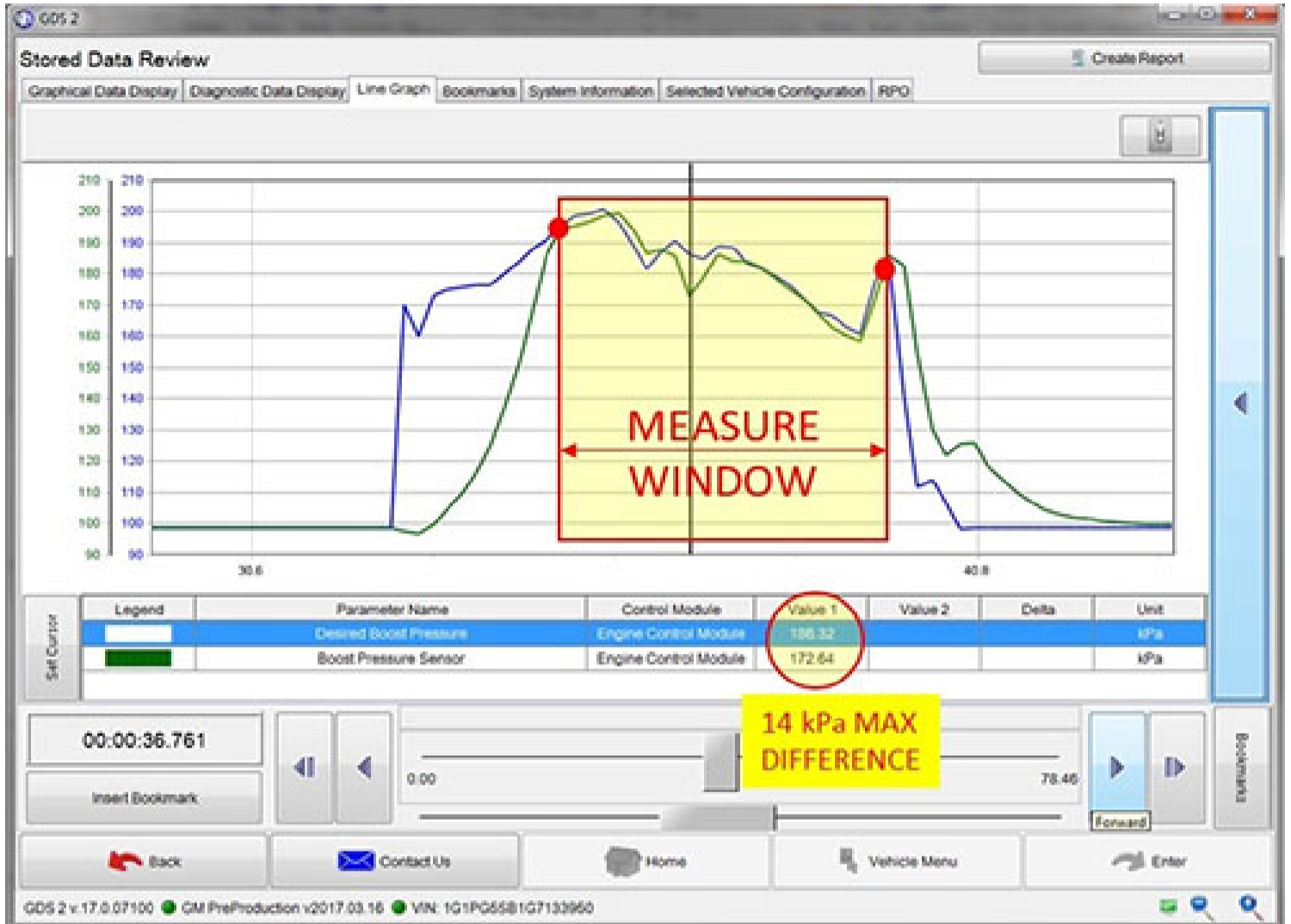
Example of normal turbocharger wastegate operation:

In this example, notice that the measure window begins once the Boost Pressure Sensor reading (Green) meets the Desired Boost Pressure reading (Blue) and ends when the APP is released per the testing instructions.

The Boost Pressure Sensor reading (Green) closely tracks the Desired Boost Pressure reading (Blue) indicating normal Turbocharger



operation.

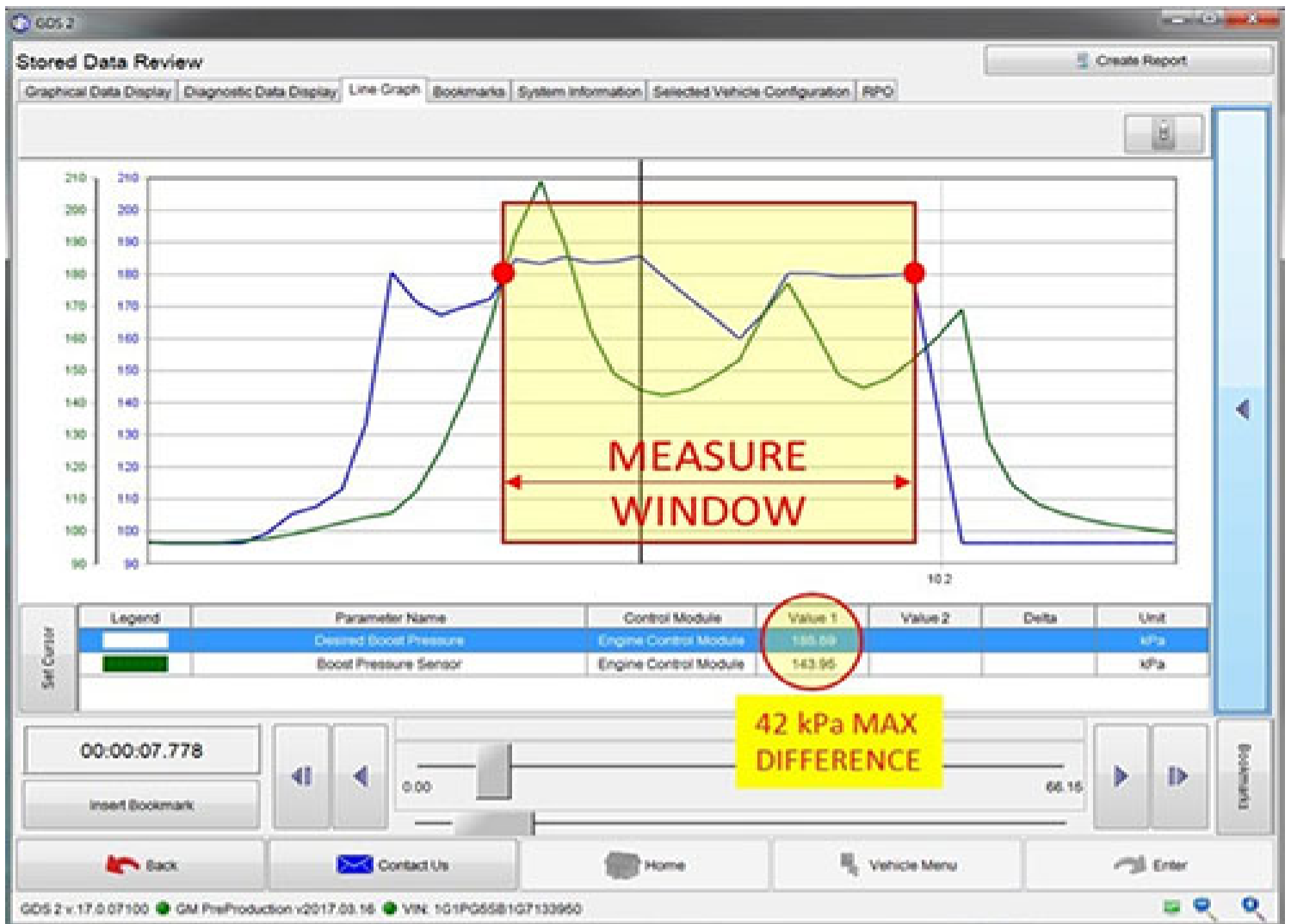


Example of a malfunctioning turbocharger wastegate:

In this example, notice that the Boost Pressure Sensor reading (Green) moves thru and well above the Desired Boost Pressure reading (Blue).

As the abnormally high pressure is corrected by the management system, the Boost Pressure Sensor reading (Green) over reacts and dips well below Desired Boost Pressure reading (Blue).

A difference of 14 KPA (2 PSI) between the Boost Pressure reading (Green) and the Desired Boost Pressure Sensor reading (Blue) Indicates a Malfunctioning Turbocharger.



**Turbocharger Replacement - Inspection to Perform:**

**Oil Line Inspection/Recommendation:**

If turbocharger assembly replacement is necessary, the oil feed pipe should be checked for restriction.

Replace the pipe if restricted. Do not attempt to clean the pipe assembly.

It is also a good practice to inspect the oil return pipe for any damage or restriction before reinstalling the turbocharger assembly.

Another indication of a restricted oil feed pipe could be a claim of an oil leak in the area of the turbo oil return pipe.

Inspection of this pipe could lead to finding the return pipe has been damaged as a result of excessive heat due to an inadequate oil supply to the turbo.

**ECM Calibration (2011 and 2012 Model Years Only):**

In addition to checking the oil pipes, the technician should verify the ECM has the latest calibration.

When the vehicle has been driven under certain conditions, this calibration contains a function that allows the cooling fans to run for a short period of time after the vehicle has been shut off.

This latest calibration allows the turbocharger to cool in less time, reducing the likelihood of the oil coking in the oil feed pipe.

Proper vehicle maintenance practices will help to reduce the oil coking in the oil feed pipe.

If this calibration is installed during the service visit, inform the customer of the calibration change that allows the fans to run after the engine is off.

This may avoid the customer returning to service with a noise concern after engine off.

Warranty Information

For any component requiring replacement, use the applicable labor operation time as an add to the unique labor operation time listed.

Labor Operation:	Description:	Labor Time:
4081678*	Turbocharger Boost Control Test	.3
Add	Turbocharger Replacement and Coolant System Fill.	Trax - 2.8
		Sonic - 2.5
		Cruze - 2.4
		Encore - 2.8

This is a unique Labor Operation for Bulletin use only.

\*This labor operation must only be utilized if Turbocharger Boost Control Test has been performed with screenshots attached to warranty paperwork.



## Version History

Version	8
Updated	4/12/2017 - Created 06/08/2017 Updated Correction Section and photos. 06/09/2017 Updated verbiage related to anti tamper paint. 10/13/2017 Updated to clarify portions of the Turbocharger Boost Control Test verbiage. 01/17/2018 Updated to correct labor op for Chevrolet Trax. <b>09/14/2018 Updated to add 2019 Encore, Trax and Sonic.</b> <b>09/24/2018 Updated to add 2013 model year Chevrolet Trax.</b> <b>10/17/2018 Updated to add verbiage to Correction section.</b>



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