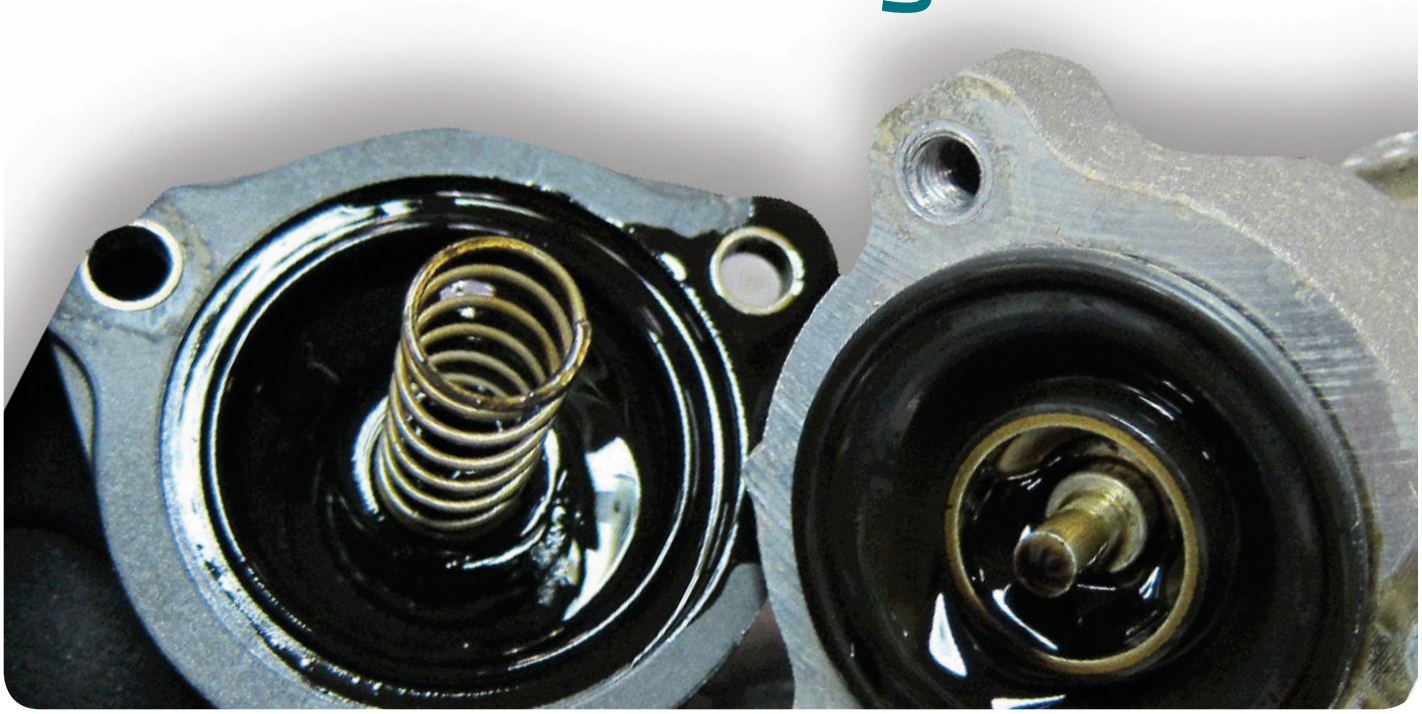
TECH LINK

Mid-April 2017, Volume 19, No. 8

Misdiagnosis of Returned Turbochargers



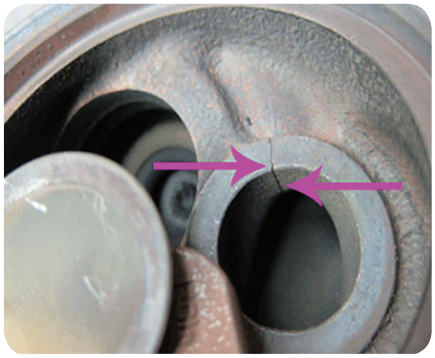
All turbochargers that are returned to the Warranty Parts Center (WPC) are inspected by GM Engineering for root cause failure. Many of the turbochargers from 2011-2016 Cruze, 2012-2018 Sonic, 2013-2018 Encore, and 2014-2018 Trax models equipped with the 1.4L turbocharged engine (RPO LUV, LUJ) being returned have no trouble found.

Prior to replacing a turbocharger, follow these inspections to help ensure a correct diagnosis.

DTC P0299

Do not replace the turbocharger if DTC P0299 (Engine Underboost) is set and one of the following is present:

- Crack(s) at the wastegate port (this is normal)
- Broken wastegate solenoid valve port (replace solenoid valve)
- Bent wastegate actuator port (replace actuator)
- Missing wastegate actuator clip (replace clip)



Normal wastegate port crack

continued on page 2

CONTENTS

GM Customer Care and Aftersales

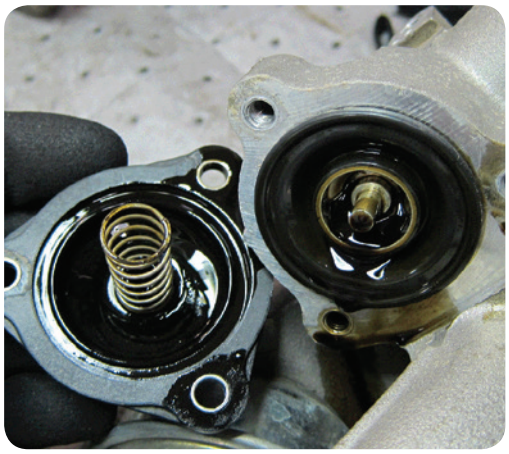
Misdiagnosis of Returned Turbochargers

– continued from page 1

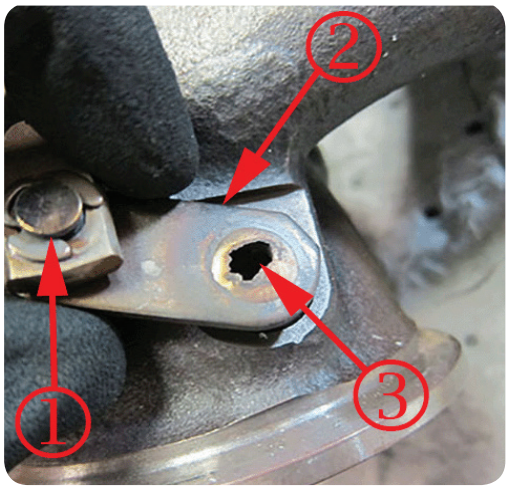
- Tamper paint have been removed, the seal broken, or the actuator has been adjusted
- Broken bypass (recirculation) valve cover port or water/oil found inside the valve (clean the components)
- Restrictions in the induction system
- Soft, twisted or collapsed air ducts
- Restrictions to air flow to the turbocharger
- Excessive exhaust system backpressure

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

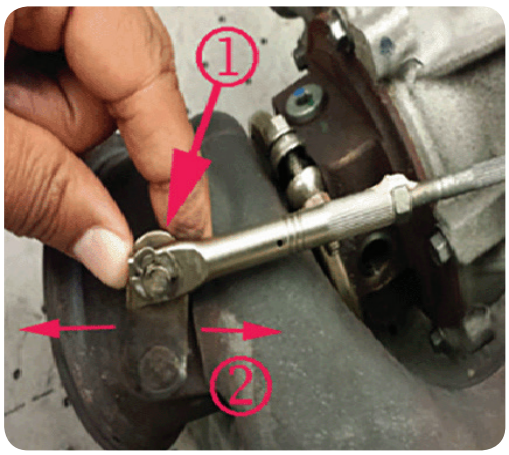
- Disconnected wastegate lever arm (crank) from the shaft
- Seized wastegate valve/linkage
- Turbine wheel not rotating, broken turbine wheel shaft, or missing wheel nut



Oil inside bypass valve



1. Wastegate lever arm pin
2. Wastegate lever arm (crank)
3. Shaft



Wastegate lever arm (1) movement direction (2) with insufficient preload

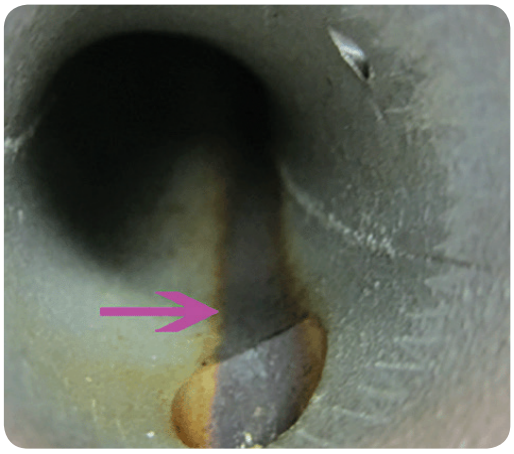
TIP: If DTC P0299 is set and no other issue has been found, always perform the Turbocharger Boost Control Test using GDS2 prior to replacing the turbocharger.

Insufficient Wastegate Preload

If the wastegate lever arm moves or wiggles with little effort while the actuator rod remains static, the preload is insufficient and the turbocharger must be replaced. This insufficient preload condition applies to 2011-2012 models with original equipment turbochargers. The wastegate actuator design was updated for the 2013 model year.

Engine Oil Leaks

If there is a low engine oil level, excessive oil consumption, oil leaking into the induction or exhaust system, excessive oil in the PCV bypass hose, or excessive smoke or oil leaking at the tail pipe, verify the proper engine oil level and perform an inspection of the entire engine, checking for any aftermarket devices or custom modifications.



Normal oil staining in the turbocharger outside air inlet

In addition, remove the turbocharger rubber outside air inlet duct (there will be normal oil staining in the turbocharger outside air inlet) and inspect the inlet tube for oil leaking into the opening of the turbocharger bore for the PCV bypass hose. Also check the turbocharger oil feed and return pipe for leaks, restrictions or damage.

Inspect the exhaust system for the presence of oil as well. If oil is present, there may be a broken turbocharger turbine or compressor wheel. It is very unlikely that the turbocharger will leak oil internally if the turbine and compressor wheel shaft is not broken.

Cold Weather

DTC P0299 could set due to ice buildup in the induction system, Charge Air Cooler (CAC) and/or Boost Pressure sensor.

Engine Coolant Leaks

For coolant leaks at the turbocharger, check the coolant pipes and related connections. The turbocharger does not have any moving parts or seals for the engine coolant that would allow coolant to leak internally into the intake or exhaust system.

Turbocharger Replacement

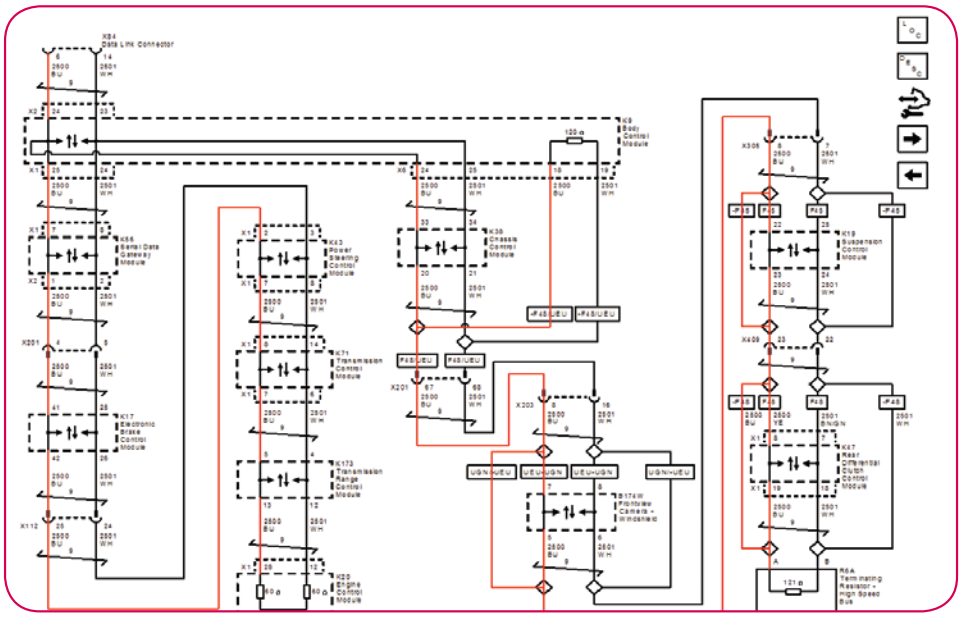
If turbocharger assembly replacement is necessary, check the oil feed pipe and oil return pipe for any restrictions before reinstalling the turbocharger assembly. Replace the pipe if it's restricted. Do not clean it. The oil return pipe may be damaged due to excessive heat if there is an inadequate oil supply to the turbo.

For 2011-2012 models, verify the Engine Control Module (ECM) has the latest calibration. The calibration enables the cooling fans

continued on page 3

Diagnosing Communication U Codes before Replacing Parts

If the Driver Information Center (DIC) displays a "Steering Assist Reduced" message on a vehicle that comes into the dealership for service, it makes sense to check the steering components, right? But what if there are two DTCs set: P0128 (Engine Coolant Temperature Below Thermostat Regulating Temperature) and U0401:71 (Invalid Data Received From Engine Control Module)?



When diagnosing a vehicle with multiple Diagnostic Trouble Codes (DTC) set, it's critical to understand each code and why it may have set. Any control module may set a DTC for one of its inputs, and that data is shared across the communication bus for other modules to perform their respective functions. The receiving module may set a network communication U code.

Symptom Byte 71

DTCs with a symptom byte of 70-7F fall into the category of Bus Signal/Message Failures. This category includes faults related to bus hardware and signal integrity. It's also used when the physical input for a signal is located in one control module and another control module diagnoses the circuit.

Symptom byte 71 is set when there is invalid data, which means the control module received a signal with the corresponding validity bit equal to invalid or post processing of the signal determines it's invalid.

In these cases, the DTC list should be checked to determine which control module the missing data U code points to. Also look for DTCs that are related to the inputs of the managing control modules.

TIP: Never replace components for Invalid Data Received codes within the component. Resolve the system-wide non-communication first, not the U code.

U Code Examples

The "Steering Assist Reduced" DIC message mentioned earlier is a condition recently found on some 2017 XT5 and Acadia models. In some cases, the steering gear has been replaced without correcting the actual cause of the condition.

The "Steering Assist Reduced" message is displayed due to an invalid coolant temperature signal from the Engine Control Module (ECM). The Power Steering Control Module looks for a valid coolant temperature so it can compensate for cold and thick grease. As grease gets cold, it becomes thicker and harder to move, which can cause a heavier than normal steering feel. When the steering module thinks it's cold due to the coolant temperature value, it provides extra assist to support the heavier condition. Since the coolant value on the CAN bus went invalid, this function of the steering module went inoperative.

For this repair, DTC P0128 should be diagnosed first, which is most likely related to a failing thermostat. Once the cause of that DTC is resolved, DTC U0401 can be cleared.
Another example covers several U codes corresponding to a number of DIC messages. An erratic wheel speed sensor signal caused the Electronic Brake Control Module (EBCM) to set wheel sensor codes C0035-C0050 and several U codes.

The EBCM would set the wheel speed sensor code intermittently, triggering a system malfunction message to be transmitted, resulting in multiple U codes across the chassis expansion and HS CAN buses. An erratic wheel speed signal can cause this failure due to the miscommunication in the system when it intermittently fails. Checking the ABS data on a scan tool would show an erratic signal from the wheel speed sensor. A faulty front hub wheel bearing was the cause of the erratic wheel speed sensor signal.

In general, when diagnosing multiple DTCs that include network communication codes, think about what DTCs could be caused by another DTC.

Thanks to Bob Wittmann and Len Tillard

Misdiagnosis of Returned Turbochargers

– continued from page 2

to run after the vehicle has been turned off under certain conditions, allowing the turbocharger to cool in less time and reduce the likelihood of the oil coking in the oil feed pipe. Be sure to inform the customer that the fans may run after the engine is turned off.

Refer to #PIP5495 for additional diagnostic information and instructions on performing the Turbocharger Boost Control Test.

Thanks to Raymond Haglund

Improper Engine Gasket Cleaning Methods Using Surface Conditioning Discs

When cleaning engine gasket sealing surfaces or cleaning parts from an engine that are to be reused, it's critical to not use surface conditioning discs, such as abrasive pads or bristles. These discs can cause damage to the sealing surface or generate debris that will cause damage to bearing surfaces in cast iron and aluminum engine blocks.

TIP: Dealerships that use improper gasket cleaning methods that result in engine failure will be debited the cost of the replacement and repair.

Abrasives Cause Engine Damage

Examples of surface conditioning discs

Abrasive pad or bristle devices — typically made of woven fiber or molded bristles — should not be used because:

- Abrasive pads will produce fine grit that the oil filter will not be able to remove from the oil. This grit is abrasive and may cause internal engine damage. Abrasive pads can easily remove enough material to round cylinder head surfaces, which can affect the gasket's ability to seal, especially in the narrow seal areas between the combustion chambers and coolant jackets.
- Abrasive pads, wire, and rubber finger wheels can remove enough metal to affect cylinder head, block, oil pan rail, and intake manifold runner flatness, which can cause coolant and oil leaks and air leaks. It takes about 15 seconds to remove 0.203mm (0.008 in.) of metal with an abrasive pad.
- Abrasive pads, rubber finger wheels and wire wheels with high-speed grinders produce air-borne debris that can travel throughout the shop and contaminate other work being performed outside of the immediate work area.

When using surface conditioning discs that contain abrasives, aluminum oxide (a common component of sandpaper) is dislodged from the disc along with metal particles from the engine component. Even the finger-type discs, which don't appear to have any type of abrasive material, contain aluminum oxide. The presence of aluminum oxide in engine oil has been shown to cause premature engine bearing failure, in some cases, in as little as 1,367 miles (2,200 km) or less after the repair has been made.

Surface conditioning discs also may grind the component material and imbed it into the disc when more aggressive grinding of the gasket surface takes place.

Any debris from these surface conditioning discs cannot be properly cleaned from the oil passages with shop air or solvents.

Recommended Cleaning Procedures

GM recommends the use of a razor blade or plastic gasket scraper to clean the gasket surface on engine components that are to be reused. When using a razor blade-type gasket scraper, use a new razor blade for each cylinder head and corresponding block surface. Hold the blade as parallel as possible to the gasket surface to ensure that the razor blade does not gouge or scratch the gasket surfaces. Do not gouge or scrape the combustion chamber surfaces or any engine-sealing surface during the cleaning process.

To properly clean the sealing surface prior to reassembly, GM Low VOC Cleaner, part number 19287401 (in Canada, part number 88901247), should be sprayed on the mating surface. Avoid getting solvent in any area other than the mating surface to be cleaned. Allow it to soak in for several minutes to loosen old RTV sealer/gasket material.

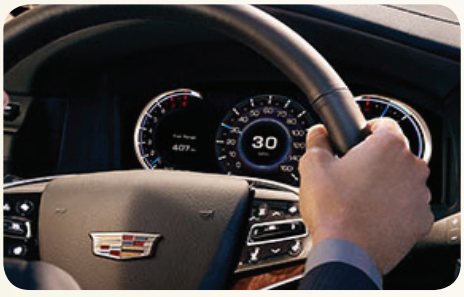
TIP: GM recommends using a plastic razor blade or non-metallic scraper to remove all loose sealer/gasket material.

When cleaning engine components, the feel of the sealing surface is critical, not the appearance. After all the gasket material is removed, there will be indentations from the gasket left in the cylinder head. The new gasket will fill these small indentations when it is installed.

For additional information, refer to GM Bulletin #00-06-01-012F.

Thanks to Tracy Lucas

Speedometer Indicates Lower Speed than Vehicle is Traveling



The speedometer reading may be inaccurate on some 2015-2017 Express, Savana, Silverado, Sierra, Tahoe, Suburban, Yukon, and Escalade models. The speedometer may indicate a lower mph than the vehicle is actually traveling. The inaccurate speedometer reading may occur when drivers use two-pedal driving techniques or when there is a short to the four-wheel drive (4WD) Low switch.

These conditions may be caused by incorrect initialization of the Utilized (Buffered) Transfer Case Range to Low range. When the transfer case 4WD Low switch is high, it causes the discrepancy between the switch and Utilized (Buffered) Transfer Case Range. When this occurs, the vehicle speed will constantly display 37% of actual vehicle speed (2.7 ratio) until the transmission is shifted to Park or Neutral.

To confirm the condition:

1. Start the vehicle.
2. Apply the throttle to greater than 7%.
3. Shift into Drive.

The speedometer will now be latched at 39% of actual speed until vehicle is shifted to N or P.

If two pedal driving techniques are used during start-up, it may cause the accelerator pedal position to be maintained at value while the transmission is not engaged. The vehicle should not be started with the driver's foot on the accelerator pedal while shifting into gear.

Thanks to Richard Renshaw

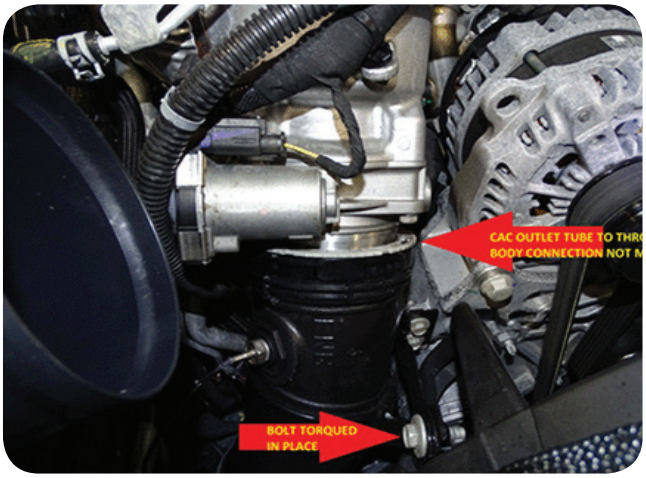
Loose Charge Air Cooler Ductwork

Loose connections of the charge air cooler ductwork on some 2017 Silverado and Sierra models equipped with the 6.6L Duramax diesel engine (RPO L5P) may result in an illuminated Check Engine light and DTCs P0101, P0299, P11CC, P11DC, P20EE, P2002 and/or P2463 set.

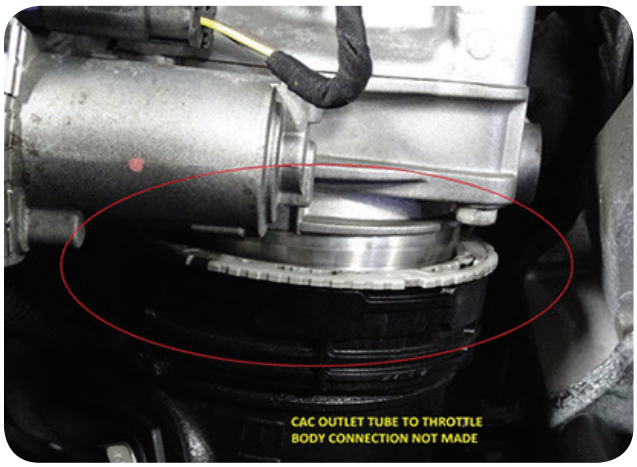
If any of the DTCs are set, check for loose charge air cooler ductwork at the turbocharger outlet pipe, the charge air cooler inlet pipe, the charge air cooler outlet pipe, and the connection at the intake air flow valve (throttle body). The loose ductwork is most likely to become disconnected during engine roll or brake torque.

Also check for proper alignment of the charge air cooler pipe bracket and bolt hole. The bracket and bolt hole may require realignment after the charge air cooler outlet hose is properly connected to the throttle body.

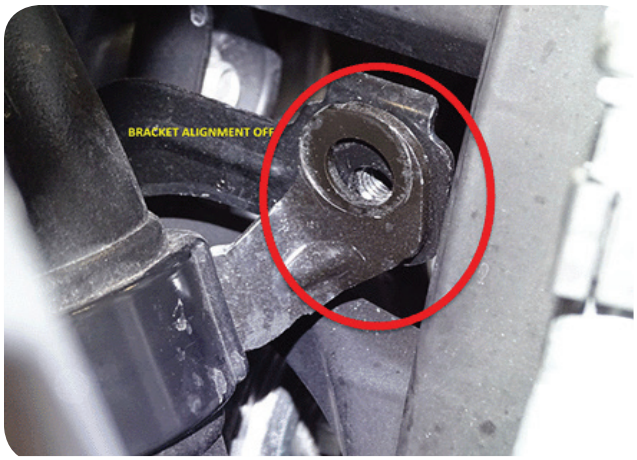
Thanks to John Stempnik



Charge air cooler pipe at the intake air flow valve



Non-secured connection of the charge air cooler pipe.



Charge air cooler pipe bracket and bolt hole misalignment

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