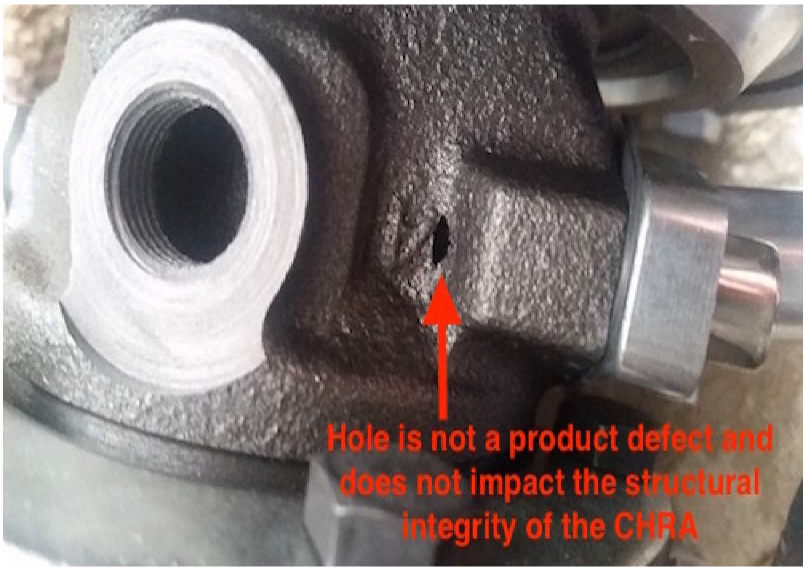
Frequently Asked Questions (FAQ)

1. Why is there a hole between the oil drain flange and coolant port of the CHRA. Is it a defect?

   No, the hole between the oil drain flange and coolant port is not a product defect and does not impact the structural integrity of the CHRA. The hole is **NOT** perfectly round and measures 3 to 4 mm in diameter.

   During the CHRA machining process, the oil drain flange is tapped with the proper thread pattern and at the leading edge of the threads, the holes are designed to "break through" the casting at various points. The "hole" is one of the points where the casting is designed to break through. Typically, it will break "all the way" through which makes it look less like a "hole". But because there is extra material that remains around the tip of the machined area, it looks like a hole. That hole is "external" to the CHRA and has absolutely no bearing on the structural integrity or the internal operation of the CHRA itself.

   So, regarding this hole... you have absolutely nothing to worry about!

2. Garett T04B frame compressor housing air leak (between compressor housing and backplate) causes a significant negative impact to perfromance?

   No, Garrett designed the GT and GTX series turbochargers with a "T04B" frame size compressor housing (.60 A/R, 3 inch inlet and 2 inch outlet hose connections) without a o-ring at the contact point between the compressor housing and backplate. The contact point was intended for a metal to metal interface with minimal amount of air leakage designed into the system. As a result, the contact point has a minor leak during a boost pressure test of the charge pipe system. The leak is 100% normal and factored into the performance of the turbo. The leak causes a neglible loss in pressure and will not cause a measurable impact to the turbo's perfromance.

   The Garrett "T04B" frame size compressor housing is commonly found on Garrett GT28 and GTX28 series turbocharger models. Additionally the "T04B" frame is available as a compact housing option for the Garrett GTX29, GT30, GTX30, GT35, and GTX35 series models. Numerous turbo kits require the "compact" compressor housing to fit a Garrett performance turbo into a limited space engine bay.

3. What is a CHRA?

   The 'CHRA' (**Center Housing Rotating Assembly**) is the TURBOCHARGER less the turbine housing and compressor housing. A CHRA can be the quickest most efficient way to 'renew' the turbocharger to essentially a NEW state. By assembling a new CHRA into your old end housings, your turbo can be up and running with 100% brand new internal parts in very little time. Renewing via a factory NEW Garrett CHRA is better than rebuilding from a reliability standpoint because EVERYTHING on the critical assembly of the turbocharger is new. All parts such as, bearing housing, bearings, seals, shaft, wheels, etc. are ALL NEW! There are no re-used components when buying a NEW Garrett CHRA. The new rotating assembly is factory assembled by the same process in the same factory that built the original unit to the same (high) standards. The NEW CHRA will also have its own P/N and with a NEW SERIAL NUMBER as it did when the turbocharger was delivered new from the factory.

4. What is a supercore?

"Supercore" - Often referred to as a "core" (CHRA) assembled complete with a compressor housing. The "Supercore" is the TURBOCHARGER less the turbine housing. Buying the supercore separately allows you to purchase the turbine housing of your choice separately or from a different supplier.

5. Having boost spike issues?

Spikes are inherent in internally gated setups. Some things that can exacerbate the spiking:

1. Too much preload set on the actuator arm
2. A restrictor pill in the boost pressure source plumbing - like a restrictor pill inline.
3. Excessive length in the boost source plumbing
4. Boost controllers and additional hoses associated
5. Restrictors built into the boost control solenoid

All of these things delay the timing of the actuator response and/or open time and contribute to spiking as a result.

A spike of 2 psi is an accepted norm, but if this is not acceptable go back to zero by eliminating all of the above to confirm what minimal spike is and see if it's zero.

To do that, adjust the preload on the actuator arm to only about 2mm and run a sole 1/4" (6mm) vacuum hose directly from the boost source near the compressor housing outlet neck directly to the nipple on the actuator and nothing in between.

Confirm that there is near 0 spiking.

Then go back and add items 1 through 5 back as needed (if you're using any of these items in your setup).

Oil Specific (#6-10)

6. I just installed a new turbo and now I'm "smoking" out of the tailpipe, is my turbo "blown"?

Not necessarily. 9 out of 10 times, a new turbo is misdiagnosed as "bad" or "blown" because of an internal leak once installed. In most cases, the TURBO SYSTEM/ENGINE issue is resolved and the leak (smoking) is eliminated without any repair done to the turbo at all. Refer to our turbo oil troubleshooting guide to help determine the "real cause" of the symptoms you're experiencing before pulling or replacing the turbo. This can save you a lot of unnecessary downtime and money spent needlessly on replacing a turbo.

7. If my turbo is "smoking" and burning oil, what else should I check to confirm that my turbo has failed?

   Check to see if there are signs of a correlating bearing failure. To do this, grab the shaft and compressor wheel (when the turbo is not hot) and try to rotate and give it a whirl. If there is no obvious binding due to wheel to housing contact, then the bearing system is probably OK. In this case, your smoking turbo may not be "broken" and the problem rests somewhere else in you TURBO SYSTEM/ENGINE. It can happen, but it's very rare that you can develop a leaking issue without first developing an issue with failed bearings. Refer to our turbo oil troubleshooting guide to help determine the "real cause" of the symptoms you're experiencing before pulling or replacing the turbo. This can save you a lot of unnecessary downtime and money spent needlessly on replacing a turbo.

8. My turbo looks to be good, spins freely, and nothing appears to be broken. Why did it start smoking all of a sudden?

   Usually, when smoking appears out of nowhere, you may have inadvertently altered the operating environment for the turbo and not know it, so the oiling system is no longer working properly. There are ways to fix this without removing the turbo and still have the smoking go away.

9. W hat is the most common cause of turbo "smoking" if the turbo itself has been found to be good and confirmed leak free?

   An improperly altered breather system on the engine. 9 out of 10 times, someone will install a part that negatively affects the turbo oiling system and not know it. A compromised breather system will cause it to choke and with the inability to keep up with venting the crankcase, excess pressure will accumulate in the crankcase. This pressure will subsequently get sent upwards into the turbo via the oil drain tube. This excess crankcase pressure becomes effectively, a "blockage to the oil drain". When this occurs, the oil being fed into the turbo is unable to evacuate from the turbo and will be forced to drizzle down the shaft and seep into the housings. It's very common to see something like an improper implementation of an oil "catch-can" product wreak havoc on the turbo's oiling system and introduce smoking. Bottom line is, any modification to the engine's breather system that results in LESS breathing capacity for the engine will increase the chance of a breather system malfunction. While, the intention of a catch-can is good (to "catch" unwanted oil in the intake tract and keep it clean), plumbing little tiny "10mm" diameter hoses of the new catch-can into your engine's breather system where a "19mm" hose diameter is standard, you have effectively choked or disabled your factory breather system.

10. W hat else can cause turbo "smoking" if the turbo itself has been found to be good and confirmed leak free, and my breather system is left stock?

    Answer 1: An outright obstruction at the oil drain hose or maybe a drain hose that is too short to have a proper amount of "gravity" to assist in flowing the oil out of the turbo and back into the drain point on the engine. An "uphill" drain where the oil drain flange at the turbo sits lower than the return point on the engine is an absolutely no-no, except where a "scavenge pump" is implemented to pump return oil back into the engine.

Answer 2: Excessive "blow-by" from the engine piston rings. It is possible for the amount of blow-by in the crankcase to be too much for the stock breather system. If the "breather" system cannot vent the buildup of crankcase pressure quick enough, pressure will continue accumulate and this can lead to an obstructed oil drain at the turbo. Excess crankcase pressure can occur naturally on an engine that is worn or has developed more and more piston ring blow-by over time or it can be present on a newly built engine that has runs a bigger piston ring gap than than a factory engine. The solution for this is to increase the breather capacity (via more or bigger breather ports) and measure for the presence of excess crankcase pressure once the change has been made.

11. I made an installation mistake on my oil drain line during installation and because of this, my turbo pushed a lot of oil into the housing(s) which also caused a lot of smoking out of the tailpipe. Did I "blow" the seals on my turbo?

No. There is no way for you to "blow your seals" in this way. If you inadvertently obstructed the oil drain line on your turbo system, the oil is unable to drain, has nowhere to go, so it will continue to "pool up" inside your turbos bearing cavity. As a result, you will force oil into the housings as long as the drain continues to be obstructed. Once you clear the obstruction, the system will function again and there is no harm done. There is no way to damage the sealing mechanism on the turbo by obstructing the drain. The oil you forced into the housings can be messy and disgusting because it goes EVERYWHERE, but once you clean it all up, you get a second chance to get it right.

12. I sent too much oil into my turbo and caused it to smoke. Did I just kill my turbo?

No. If you did over feed the oil supply into your turbo and "pushed" excess oil in the exhaust housing and caused it to burn off, you can set the oil feed to the proper requirements and the oil pushing will stop. There is no real way to damage the sealing mechanism on the turbo in this way.

13. My turbo setup uses a scavenge pump. My scavenge pump failed and caused my car to spew clouds of smoke out of the tailpipe that can be seen for miles. Did I "blow my turbo" because of this?

Usually no. Simply shut it down, clean the oil residue from the system, replace the broken scavenge pump, and everything will work as normal with no harm done to the turbo. Since you sent oil EVERYWHERE due to the broken scavenge pump, you will see symptoms of oil residue everywhere, but the turbo should not be broken because of this type of scavenge pump malfunction. Sometimes it takes A LOT of time for all the oil residue to clear out.

14. Turbocharger or Supercharger?

Turbochargers are the Answer!

The Aftermarket age-old question endures, I am looking to boost my engine, do I supercharge? This is not a quick answer, but let's look at some features that make the turbocharger the most powerful and economical power adder for your engine.

A Turbocharger is:

More Versatile - A turbocharger is equally appropriate whether your goal is a mild street application or an all-out drag racer. A properly matched turbo can provide superb response and the ability to run boost levels that will push your limits.

So-called Lag - Modern GT-series high-flow wheels are smaller than ever to reduce inertia, and in combination with the ball bearing system give throttle response that has to be driven to be believed. Additionally, a turbo's smaller and more compact package allows for greater flexibility in installation locations.

More Efficient - The turbo uses energy that is otherwise wasted through the tailpipe, where a supercharger has high parasitic drag since the power to drive it comes off of the crankshaft. Garrett's modern GT-series compressor and turbine aerodynamics push the state-of-the-art limit for stage efficiency and flow range.

More Durable - A turbocharger only has one moving part, the rotating assembly. No pulleys, belts or geared transmissions. This makes for a less complicated device with fewer things to go wrong.

15. Journal bearing or ball bearing turbo?

The journal bearing has long been the brawn of the turbocharger, however a ball bearing cartridge is now an affordable technology advancement that provides significant performance improvements to the turbocharger. Ball bearing innovation began as a result to work with the Garrett Motor Sports group of several racing series where it received the term the 'cartridge ball bearing'. The cartridge is a single sleeve system that contains a set of angular contact ball bearings on either end, whereas the traditional bearing system contained a set of journal bearings and a thrust bearing.

Turbo Response - When driving a vehicle with the cartridge ball bearing turbocharger, you will find exceptionally crisp and strong throttle response. Garrett Ball Bearing turbochargers spool up 15% faster than traditional journal bearings. This produces an improved response that can be converted to quicker 0-60 mph speed. In fact, some professional drivers using Garrett ball bearing turbocharged systems claim that they feel like they are driving a big, normally aspirated engine.

Reduced Oil Flow - The ball bearing design reduces the required amount of oil to provide adequate lubrication. This lower oil volume reduces the chance for seal leakage. Also, the ball bearing is more tolerant of marginal lube conditions, and diminishes the possibility of turbocharger failure on engine shut down.

Improved Rotor Dynamics and Durability - The ball bearing cartridge gives better damping and control over shaft motion, allowing enhanced reliability of both everyday and extreme conditions. In addition, the opposed angular contact bearing cartridge eliminates the need for the thrust bearing, commonly a weak link in the turbo bearing system.

Additional Ball Bearing Options - Another option one will find is a hybrid ball bearing. This consists of replacing only the compressor side journal bearing with a single angular contact ball bearing. Since the single ball bearing can only take the thrust in one direction, a thrust bearing is still necessary and drag in the turbine side journal bearing is unchanged. With the Garrett ball bearing cartridge the rotor-group is entirely supported by the ball bearings, maximizing efficiency, performance, and durability.

16. GT vs. T - What's the Difference?

Turbocharger technology has advanced during the recent years, and at the forefront of that wave has been Garrett, leading the charge of modernization at the OEM level. One notable advance at the OEM's has been the shift from the traditional T-turbocharger to modern GT technology. Older 'T' products served as a workhouse for the aftermarket for many years, but now Garrett GT will revolutionize turbocharger performance and enable the reduction of turbo lag to virtually undetectable levels.

The GT Evolution

In the 1990's Garrett engineers developed a radically new efficient turbocharger baptizing it 'New Garrett Technology' aka the 'NGT' turbo. Over time the term was shortened to 'GT' and is now used to specifically describe the aerodynamically advanced Garrett turbochargers that cause the turbo to spool up to boost and accelerate your vehicle quicker than ever.

WHY IS GARRETT GT BETTER THAN T PRODUCT?

Product Simplification - T product typically contained 54 components, compare this with GT technology which has drastically reduced the number of components by more than 45% to average of 29! Reducing the number of individual parts drastically diminishes the opportunity for failure, thus resulting in smoother motoring.

Journal Bearing - The bearing system in the GT turbocharger allows for improved shaft stability and less drag throughout the speed range. In fact, the GT shaft motion has decreased by 20%, which greatly improves the durability of the bearing system.

Thrust Bearings - The new GT turbochargers have an increased load bearing capacity of up to 35%. This provides greater resistance to thrust bearing failure, especially when the combination of an oversized compressor wheel to turbine wheel is used.

Improved Aerodynamics - The wheels used on the GT turbochargers increase the efficiency of the turbocharger system. Increased efficiency allows improved engine performance in each application.

Wheel Trims - The GT range has several more wheel trims that the T range, enabling a more accurate match of turbocharger to engine that will in turn result in optimum performance.

Piston Rings - The piston rings on the GT range are made from M2 tool steel. This material can withstand higher temperatures than traditional T range piston rings, making the GT product more appropriate for today's modern engines

17. Common terms used with turbochargers.

A/R

· A/R describes a geometric property of all compressor and turbine housings. Increasing compressor A/R optimizes the performance for low boost applications. Changing turbine A/R has many effects. By going to a larger turbine A/R, the turbo comes up on boost at a higher engine speed, the flow capacity of the turbine is increased and less flow is wastegated, there is less engine backpressure, and engine volumetric efficiency is increased resulting in more overall power

Choke Line

· The choke line is on the right hand side of a compressor map and represents the flow limit. When a turbocharger is run deep into choke, turbo speeds will increase dramatically while compressor efficiency will plunge (very high compressor outlet temps), and turbo durability will be compromised.

CHRA

· Center housing rotating assembly - The CHRA includes a complete turbocharger minus the compressor, turbine housing, and actuator.

Clipper Turbine Wheels

· When an angle is machined on the turbine wheel exducer (outlet side), the wheel is said to be 'clipped'. Clipping causes a minor increase in the wheel's flow capability, however, it dramatically lowers the turbo efficiency. This reduction causes the turbo to come up on boost at a later engine speed (increased turbo lag). High performance applications should never use a clipped turbine wheel. All Garrett GT turbos use modern unclipped wheels.

Corrected Airflow

· Represents the corrected mass flow rate of air, taking into account air density (ambient temperature and pressure)

Example:
Air Temperature (Air Temp) - 60°F
Barometric Pressure (Baro) - 14.7 psi
Engine air consumption (Actual Flow) = 50 lb/min

Corrected Flow= Actual Flow Ц([Air Temp+460]/545)
Baro/13.95

Corrected Flow= 50*Ц([60+460]/545) = 46.3 lb/min
14.7/13.95

Efficiency Contours

· The efficiency contours depict the regional efficiency of the compressor set. This efficiency is simply the percentage of turbo shaft power that converts to actual air compression. When sizing a turbo, it is important to maintain the proposed lugline with a high efficiency range on the map.

Free-Float

· A free floating turbocharger has no wastegate device. This turbocharger can't control its own boost levels. For performance applications, the user must install an external wastegate.

GT

· The GT designation refers to Garrett's state-of-the-art turbocharger line. All GT turbos use modern compressor and turbine aerodynamics which represent huge efficiency improvements over the old T2, T3, T3/T4, T04 products. The net result is increased durability, higher boost, and more engine power over the old product line.

On-Center Turbine Housings

· On-center turbine housings refer to an outdated style of turbine housing with a centered turbine inlet pad. The inlet pad is centered on the turbo's axis of rotation instead of being tangentially located. Using an on-center housing will significantly lower the turbine's efficiency. This results in increased turbo lag, more backpressure, lower engine volumetric efficiency, and less overall engine power. No Garrett OEM's use on-center housings.

Pressure Ratio

· Ratio of absolute outlet pressure divided by absolute inlet pressure

Example:
Intake manifold pressure (Boost) = 12 psi
Pressure drop, intercooler ($DP_{Intercooler}$) = 2 psi
Pressure drop, air filter ($DP_{Air\ Filter}$) = 0.5 psi
Atmosphere (Atmos) = 14.7 psi at sea level

$$PR = \frac{Boost + DP_{Intercooler} + Atmos}{Atmos - DP_{Air\ Filter}}$$

$$PR = \frac{12+2+14.7}{14.7-.5} = 2.02$$

Surge Line

· The surge region, located on the left hand side of the compressor map, is an area of flow instability typically caused by compressor inducer stall. The turbo should be sized so that the engine does not operate in the surge range. When turbochargers operate in surge for long periods of time, bearing failures may occur.

Trim

· Trim is an area ratio used to describe both turbine and compressor wheels. Trim is calculated using the inducer and exducer diameters. As trim is increased, the wheel can support more air/gas flow.

Wastegate

· A wastegated turbocharger includes an integral device to limit turbo boost. This consists of a pneumatic actuator connected to a valve assembly mounted inside the turbine housing. By connecting the pneumatic actuator to boost pressure, the turbo is able to limit its maximum boost output. The net result is increased durability, quicker time to boost, and adjustability of boost.

18. My ball bearing turbo has "a lot of shaft play", does this mean my turbo unit is bad?

Usually, no! If you are accustomed to checking bearing endplay (or "shaftplay") on a JOURNAL BEARING turbo where the clearance between the bearing and shaft is much tighter, you can easily misdiagnose a BALL BEARING turbo as "Bad due to excessive shaftplay". The BALL AND CAGE design of the ball bearing turbo has inherent slop built into it. The rule of thumb is, if the shaft rotates freely without any unusual drag or noise AND the wheel is not making contact with the housing, the ball bearing system should be fine!

19. INTERNAL vs. EXTERNAL Wastegate - What's the difference and what are the Pros and Cons?

The INTERNAL wastegate components mount directly onto the turbo unit itself and consist of a flapper valve, actuator canister, and mounting bracket. The EXTERNAL wastegate is usually an all inclusive poppet valve assembly that is mounted directly onto the exhaust manifold independently of the turbo unit itself. The main reason to go with the EXTERNAL is because it's capable of flowing more and is more responsive so it's MORE PRECISE at CONTROLLING BOOST. Precise boost control becomes more and more critical as the target HP and/or boost level gets higher. Besides the higher cost of the external wastegate component itself, you have to factor in the additional costs of mounting the wastegate into your turbo system along with the fabrication work associated with "plumbing" the exhaust flow in and out of the gate and into your primary exhaust system. The internal wastegate is often chosen to minimize cost and to reduce the amount of fabrication work. If the turbo is supplied with the internal wastegate assembly built-in, you simply bolt the turbo unit up as one assembly and you're done.