



CHOATE

ENGINEERING PERFORMANCE



Engine Installation Guide

Includes instructional guide for:

- Pre-installation
- Installation
- Break In
- Maintenance
- Warranty Overview

Please read this guide carefully as well as any instructions and product bulletins included with the engine.

For Product:

Manufacturer invoice # _____

Date _____

Installation break in and Maintenance Instructions

Proper installation is extremely important to avoid costly mistakes that can **void your warranty**. Correct installation, verifying and replacing engine support system components, and proper maintenance will lead to a long-lasting engine. If you are not confident in your ability please do not take on the RESPONSIBILITY of installing this engine, you may be liable for any damage resulting from improper installation or support system failure.

For any questions call 901-553-9847

This information contains partial instructions and is intended to be a guide only

When you first receive the engine

- Carefully inspect the item for damage in transit. Any shipping damage should be noted on the shipping receipt before signing and returning to the driver. Call immediately and we will give instructions.
- Inspect the item to ensure it is the same as the unit you're replacing. It is the installer's sole responsibility to verify fitment before attempting to install the item. Be sure to check if engine is manual or automatic.
- Read all warning tags and any additional information or product bulletins supplied with the engine.
- Have the most recently updated shop manuals available for information on factory specifications (torque, timing, etc.)
- Research all related
- **Find out what caused the old engine to fail. This is the most important step in pre-installation; Address the issue so it does not cause the new engine to fail and void your warranty.**

Check all your existing components now

- Clean any parts which are to be reused, including bolts
- Only use gasket adhesive where required by the gasket manufacturer or vehicle manufacturer.
- Clean and flush fuel system, tank and lines, replace filters.
- Engine oil coolers must be replaced.
- Inspect and replace radiator and cooling system

- Check all gasket and seal surfaces for damage. Clean the gasket mating surfaces of all parts being transferred from the old engine with a gasket scraper or razor blade. **DO NOT CLEAN ANY SURFACE WITH SURFACE CONDITIONING DISKS OR ABRASIVE PAD/ BRISTLE DEVICES** as these can cause contamination to the new engine and/or damage the surfaces so they don't seal (See "Surface Conditioning Disks warning")
- Clean major components thoroughly or replace. The intake manifold must be carefully cleaned.
 - Debris from the previous engine including piston, piston ring, valve and valve seal material can be trapped in the intake manifold, intake plenum and EGR system. This debris will be recycled into the new engine and **will** cause it to fail, voiding your warranty.
- **IT IS THE INSTALLERS RESPONSIBILITY TO DIAGNOSE, REPAIR, REPLACE AND VERIFY PROPER OPERATION OF ALL ENGINE SUPPORT SYSTEMS.**
- Recommended parts to inspect, clean and replace if necessary:
 - Pickup tube, pickup screen, thermostat and seal, radiator cap, water pump, fuel pump, intake manifold, exhaust manifolds, oil filter, fuel filter, air filter, crankcase filter, PCV valve, radiator hoses, belts, By-pass hose, pulleys, EGR, motor/transmission, mounts, catalytic converter, DPF system, Injectors, High Pressure Fuel Pump
 - Oil Cooler MUST BE REPLACED.

***VALVE COVERS ARE PLACED FOR SHIPPING PURPOSES ONLY. GASKETS ARE NOT INSTALLED! ***

DAMAGE TO THE NEW ENGINE CAUSED BY ENGINE SUPPORT SYSTEMS (FUEL, COOLING, ETC.) IS NOT COVERED BY YOUR WARRANTY.

*****All emission systems must have a well-documented cleaning schedule with receipts presented at any time of warranty.***

After installing the engine

- **Check engine for interference**
 - Rotate the crankshaft by hand a minimum of four complete revolutions before engaging the starter. Small pieces such as sockets, nuts, bolts, etc. that may have been dropped into the intake manifold or intake ports during installation will cause catastrophic failure to the new engine. If you cannot rotate the engine by hand **STOP IMMEDIATELY** and inspect for foreign debris in the engine.
- **Prime the engine and verify oil pressure**
 - This is essential to avoid a dry state issue which will cause the engine to fail and void your warranty.
 - Engine oil coolers must be replaced, and cooler lines cleaned thoroughly of all debris.
 - Disable the fuel and ignition system
 - Using a pressurized pre-lube engine oiling system is the preferred method. These are available from the engine manufacturer for an additional cost or can be purchased at most parts retailers.
 - Make sure that oil flows to the top of the engine and into the rocker arms.
 - After priming and purging the oiling system check and adjust oil levels as needed.
- Fill the new filter with oil
- Fill cooling system to manufacturer's recommended level
 - Use the proper antifreeze/water concentration of original equipment manufacturers recommendation.
 - Bleed cooling systems according to vehicle manufacturer guidelines; if this is not done overheating will occur.

SURFACE CONDITIONING DISCS WARNING FOR ENGINES AND CYLINDER HEADS

The AERA Technical Committee offers the following information regarding the use of grinding discs as obtained from the General Motors Corporation. When cleaning engine gasket sealing surfaces, surface conditioning disks (typically constructed of woven fiber or molder bristles) which contain abrasives, such as a high amount of Aluminum Oxide, are NOT RECOMMENDED. The information contained in this bulletin supersedes any previously published GM service information regarding the use of surface conditioning disks and pertains to all current and previously manufactured engines.

The use of such surface conditioning discs dislodges Aluminum Oxide from the discs and metal particles, which can lead to premature engine bearing failure. In some cases, this failure occurs in as little as 1,000 miles or less after the repair has been made.

Surface conditioning discs may grind the component material and imbed it into the disc. This can result when more aggressive pressure is applied during the cleaning/grinding of the gasket surface.

Abrasive pads will produce fine grit that the oil filter will not be able to remove from the oil. The grit that cannot be filtered out has been known to cause engine damage. Abrasive pads can easily remove enough material to round cylinder head surfaces. This has been known to affect the gasket's ability to seal, especially in the narrow seals area between the combustion chamber and the coolant jackets. Abrasive pads can also remove enough material to affect cylinder head, block oil pan rail, and intake manifold runner flatness, which can cause coolant and oil leaks. It takes only about 15 seconds to remove .008" of metal with an abrasive pad.

To clean such gasket mating surfaces, General Motors recommends the use of a razor blade or plastic gasket scraper. When cleaning gasket surfaces, please note the following:

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 to the gasket surface as possible. This will ensure that the razor blade does not gouge or scratch the gasket surface.

Do not gouge or scrape the combustion chamber surfaces.

Do not gouge or scratch any engine-sealing surface during the cleaning process.

The appearance of the gasket surface is not critical- the feel is. There is a possibility that there will be some indentations from the gasket left in the cylinder head after all the gasket material is removed. The new gasket will fill these small indentations when it is installed.

Initial startup break in and maintenance

- **Check exhaust back pressure**
 - **How to do it:**
 - Verify back pressure thru scan tool or manual gauge ensure scan tool shows barometric pressure when the engine is off. SCT does not allow for correct back pressure.
 - Warm up the engine and run it at a steady 2200 rpm, then read the gauge.
 - Why checking the back pressure is important?
 - A restricted exhaust system means that the exhaust system is not functioning properly which can lead to premature engine failure including but not limited to burnt valves, scored pistons, or blow head gaskets. Engine failure caused by a restricted exhaust system is not covered under your warranty (no matter who you buy the engine from!) so it is in everyone's best interest to measure back pressure when installing
 - Record back pressure results on your warranty registration card
- **Never** add cold water to the cooling system while the engine is running. The engine should be allowed to run at normal operating temperature.
- Start the engine, let idle and monitor oil pressure and oil temperature. Record oil pressure when cold and again at 180 degrees of oil temp. Both recordings are to be taken at idle. approximately 1500 RPM, and check the oil pressure. Run the engine for 30 minutes even
- Never use "Tap" water as it will cause rust to the engine block. Distilled water with the correct coolant mixture that is required by manufacturer.
- though coolant may rise to operating temperature in a few minutes. If applicable, adjust tappets. If the coolant should "boil over," stop the engine and allow it to cool, then start the process over.

Extremely Important:

If the engine is a 6.4 Powerstroke or a 6.6 Duramax at this time remove the dipstick and check oil level. Because of the design the fuel lines run under the valve cover. Fuel can enter the crankcase damaging the lower bearings which would NOT BE COVERED under warranty. Be sure to verify the oil is not “growing” on the dipstick. Checking multiple times over the course of the next few weeks can save an engine! This is a MAJOR issue that can easily be resolved if found soon enough.

- Retorque cylinder heads and manifold if required by manufacturer.
- Start the engine again and make a test run on the road at 30 MPH in “drive” range or select the proper gears for standard transmissions. Periodically accelerate to 50 MPH and decelerate rapidly. Repeat this procedure at least 10 times. Applying loads to the engine for short periods of time causes increased ring pressure against the cylinder walls and helps to seat the rings. This is especially important because you are “breaking-in” the engine. The rapid deceleration increases vacuum and gives extra lubrication to the piston and ring assemblies.
- **For the first 500 miles:**
 - For the first oil change BR-1 Driven oil – 15w-40 for 6.4 and 5w-30 for 6.7 Ford Powerstroke should be used.
 - Do not drive at continuous speeds for long periods; always vary your speed.
 - Do not tow a trailer or put any heavy load on the vehicle to avoid “lugging”.
 - It is recommended to check oil and coolant levels daily or ever 100 miles.
 - Avoid idling long versions which can lead to cylinder “glazing”.
- **After 500 miles:**
 - Do not use full synthetic oil for the first 20,000 miles.
 - Partial synthetic oil is approved.

- **Do not use any GF-S oils. The use of this oil will void all warranty.**
- Schaeffer's 7,000 Series CK-4 oil is recommended.
- Use of Rotella oil is not recommended as of December 2016.
- **Change the engine oil and oil filter.**
- Check fuel and cooling system components.
- *If applicable or recommended by manufacturer*, adjust valves and retorque cylinder heads and manifolds
- **Don't forget to complete your warranty registration**
- Perform scheduled maintenance as outlined in your vehicle's owner manual. If you are unsure or have questions on routine maintenance call the manufacturer.
- **Failure to perform routine maintenance can result in engine damage that may not be covered under your warranty.** Retain all records (invoices, receipts, repair orders, etc) related to service or maintenance performed on your engine or engine support system.
- **In the event of a product failure you will be required to provide copies of maintenance records and installation invoice.**

About your warranty

The warranty information provided below is a general overview. For complete warranty details please refer to the actual 'Limited Warranties' document provided with the sale. If you did not receive a copy of the Limited Warranty and warranty registration information call your supplier immediately. Warranty registration card must be returned to the manufacturer within 45 days of installation and manufacturer must have warranty registration information on file or warranty is void.

Except as noted warranty coverage is on parts and labor when product is installed at an APPROVED repair facility only; no labor coverage is provided on self-installed items. Labor will be reimbursed based upon the ALLDATA labor time guide at a maximum of \$50 per hour or shop rate, whichever is lower.

The manufacturer's warranty is intended to provide coverage for defects in the arts and workmanship of the part provided by the manufacturer only. The manufacturer's warranty is **not** intended to cover:

- Normal wear
- Improper maintenance
- Failure caused by parts that are not supplied by manufacturer failure resulting from overheating (usually but not limited to burnt/leaking head gaskets, burnt/melted/broken piston or piston rings, damaged cylinder heads, faulty injectors, oils seals from turbo faulty containments in intercooler, dirty or improperly installed air filters, non-approved air filters, "dusting" of engine, etc.)
- Repair or replacement of engine support system including belts, hoses, filters, cooling, fuel, etc.
- Repair or replacement resulting from an accident
- Products used in competition, racing, off-road or modified applications
- Failure resulting from abuse or misuse
- Failure resulting from electrolysis
- Products installed in applications not originally equipped with the product purchased
- Crankshaft thrust surface failure (caused by excessive forward pressure on the crank)
- Repairs performed or attempted without authorization
- Damage to the engine caused by stale, contaminated or deteriorated fuel
- Failure caused by lack of lubrication
- Failure or damage caused by dirt or debris
- Failure caused by excessive vibration
- Failure or component failure caused by use of alternant fuels

Any product repaired or replaced under an approved warranty claim will carry the remainder of the original warranty (the warranty does not start over).

Manufacturer is not liable for loss of profits, sales, income, injury to person or property, towing charges, rental car expenses, storage fees, telephone expenses, freight, substitute transportation, lodging, fluids, filters, shop expenses or unauthorized repairs. Manufacturer will (at their discretion) repair, replace or refund the product once manufacturer determines the product is defective. All warranty claims are pending the analysis of the failed product. **See actual Limited Warranty document for full details of coverage and restrictions.**

Daily Drive use	5 year/100,000 miles 2 years on parts and labor 3 years on parts \$50 labor
Commercial use	1 year/20,000 miles *Extended warranty can be purchased for \$1500.00 3 year/ 60,000 miles
Cylinder Heads	12 months or 12,000 miles, whichever occurs first. Cylinder heads have a maximum labor allowance of \$300, if applicable.

Addendum 7/7/2020:

Many failures of the engine that are seen are not in direct correlation of the engine at all. Much like a domino effect, the following domino falls due to the initial inertia. The thrust bearing is one of the most commonly seen failures of the bottom end of an engine. Most times it is wrongfully attributed to the machinist, or bearing manufacturer. But nothing could be farther from the truth. We personally have seen engines that have had repeat failures, and the cycle continued with an angry customer at a costly expense. The most common causes of thrust bearing failure are thus. (1) Spline locked converters. This is caused by more often than not on diesel trucks, being lifted with the incorrect driveshaft angle. Or the wrong length drive shaft. Many times this problem also can lead to the tailshaft of the transmission or transfer case failure. The spline locking of the shaft forces the drivetrain into the engine, and the thrust bearing is now compromised. (2) Also causes of a failed thrust bearing have been seen by micro welding. Most times this is caused by a painted engine block not receiving a sufficient ground. This in turn can cause the starter to attempt to return current thru the nearest machined surface that allows for electrons to travel. The fourth main journal on most V8 engines of the diesel world are where the thrust bearing resides. This can lead to micro welding of surfaces and premature failure of the engine. It is highly advised to thoroughly clean the block where the ground is to be mated. (3) Lower bearing failure many times are a result of fuel contamination of the oil. This is most commonly seen in engines that use fuel rails under the valve cover. Such as the LB7 and 6.4 Powerstroke, as well as many HPCR Cummins as seen in the 5.9 03-07 and 6.7 07.5 to present. It is highly recommended to monitor the level of oil on the stick. If it appears to be "growing" then contamination exists. These are a few of the most common causes for thrust bearing failure. We do not cover all of them in this manual. Proper block preparation and installation of all fuel components are a must for engine longevity.

Product Maintenance Log

For your convenience you can use this log for a quick reference to document maintenance/service performed on your engine or engine support system. Keep your original records, invoices, receipts or repair orders as well. They may be required in the event of a warranty.

Date	Mileage	Work Performed	Shop name or location	Invoice/Repair Order Number

NOTES

Installation Checklist

- Reviewed all installation instructions, core policy, and warranty information
- Read all warning tags and products bulletins, and researched all manufacturer TSBs
- Found out what caused the old engine to fail. The previous engine failed from: _____ and I fixed it by: _____.
- Replaced the engine oil cooler.
- Inspected, cleaned, and replaced as necessary the:
 - Pickup tube & Screen
 - Oil pump drive
 - Oil pan
 - Thermostat and seal
 - Radiator cap
 - Water pump
 - Fuel pump
 - Intake manifold
 - Exhaust manifolds
 - Oil filter
 - Fuel filter
 - Air filter
 - Crankcase filter
 - PCV valve
 - Radiator hoses
 - Belts
 - By-pass hose
 - Pulleys
 - EGR
 - Motor and Transmission mounts
 - After Treatment Systems- such as: DPF, SCR, DOC
- **Ensure that fuel galley plugs are installed in rear of heads!!**
- **Valve covers are placed for shipping purposes only. Gaskets are not included!**
- Check for engine interference
- Primed engine and verified oil pressure with a manual gauge
- Filled oil, coolant and all necessary fluids to the manufacturers recommended levels
- Pull vacuum on coolant systems to insure all air is evacuated from systems.
- Adjust valve lash where required
- Checked exhaust back pressure and recorded on warranty registration card
- Completed proper engine break in as outlined in the guide
- Filled out and sent back warranty registration card to manufacturer

**Choate Engineering
Performance
DIESEL DOCTOR**

**30 MORRIS STREET
WHITEVILLE, TN**

CONTACT US AT:

**(901)-553-9847
OR
OFFICE@DIESEL911.COM**