

CLEARANCES AND SPECIFICATIONS FOR HEAVY DUTY SERVICE

302 CU. IN. V-8 CHEVROLET ENGINE

To build a 302 cu. in. engine for heavy duty service, it is easiest to start with an RPO Z-28 engine assembly #3923217 (1967 engine #3916355). This engine is of high performance design featuring: Forged high compression pistons for 4-inch bore, 3-inch stroke specially heat treated crankshaft with 8-inch harmonic balancer, (for 1968, main and connecting rod journal sizes were increased on all small block Chevrolet engines), selected high quality connecting rods, large port cylinder heads with 2.02" dia. inlet valves and 1.6" dia. exhaust valves, aluminum tuned runner design inlet manifold, 800 CFM Holley 4-barrel carburetor, special oil pan baffling, deep groove belt pulleys, and a .455" lift mechanical lifter camshaft with special push rods and rocker arms. Partial or short block engine numbers for the 302 are #3917263 (1967) and #3933047 (1968).

In addition a 302 cu. in. engine may be built using any 327 cu. in. (4" bore) crankcase and a 283 cu. in. (3" stroke) crankshaft and the various component parts described in the following text.

RECOMMENDED CLEARANCES

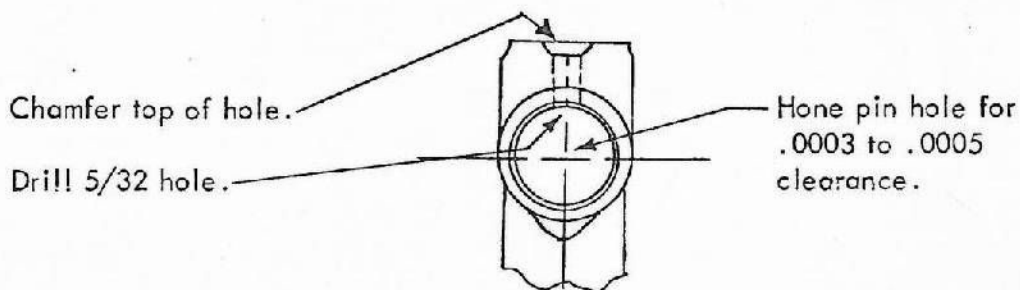
Piston to Bore:	.0055-.0065 measured at centerline of wrist pin hole, perpendicular to pin. Finish bores with #500 grit stones or equivalent (smooth).
Wrist Pin:	.0004-.0008" in piston, .0003-.0005" in rod (for floating pin).
Rod Bearing:	.002-.0025", side clearance .010-.020.
Main Bearing:	.002-.003", minimum preferred, .005-.007 end play.
Piston to Top of Block (Deck Height):	.010-.015" average below deck. No part of piston except dome to be higher than deck of block. Deck height specified is for a .025" steel head gasket. If thicker head gasket is used, deck height may be reduced accordingly.
Valve Lash:	.030 int., .030 exh. for production cam #3849346. .022 int., .024 exh. for optional service camshaft #3927140.
Valve to Piston:	.010 Intake, .020 Exhaust checked at zero lash during valve overlap cycle. These are absolute minimum clearances to allow for heat expansion only and will not accommodate valve float from over-revving.

PREPARATION OF COMPONENTS

Cylinder Block: Inspect, clean, de-burr. Normal procedures except smooth bore finish. Main bearing caps should fit tightly into case notches to prevent cap misalignment. Additional main bearing bulkhead durability may be achieved by using studs instead of bolts in the 3 intermediate main bearing caps. Studs should fit snugly the full length of the block threads and may be installed with Loc-Tite for better retention.

Crankshaft: Remove any burrs from oil holes and passages and polish journals with #400 sandpaper. The production 302 crankshaft is "Tuftride" heat treated to improve journal hardness and give greater fatigue strength for high performance durability. This feature is an improvement to any high performance forged crankshaft and should be included in any engine build.

Connecting Rods: Connecting rod #3927145 (1967) and #3923282 (1968) are higher quality production parts with improved surfaces between rod and cap. In addition, they are heat treated to a higher hardness and magnaflux inspected to be sure they are free of flaws. All other rods should be magnafluxed before using. Connecting rod durability can be improved by performing the following operations: Round all sharp edges of I-beam of rod and grind off excess flash where forging dies came together along sides of rod. It is not necessary to remove all this flash or polish the rod, but all grinding should be lengthwise of the rod and finish ground very smooth. Round all sharp edges around the rod bolt head and nut seats, and smooth out any nicks in the radius of the bolt and nut seats with a small grinder. Have entire rod, including bolt and nut seats, shot peened. Have big end of rod carefully reconditioned in a Sunnen rod reconditioner. Install with new magnafluxed bolts and nuts. Torque 1967 or earlier rods with 11/32" bolts to 35 - 40 ft./lb. Torque 1968 rods with 3/8" bolts to 45 - 50 lb. If elimination of production pressed-in wrist pin design is desired, rework connecting rods for full floating pin assemblies as follows:



Pistons: Smooth sharp edges off domes. For installation of rods using pressed-in wrist pins it is necessary to heat the rod small end and install the pins quickly in a fixture. Most automotive machine shops and Chevrolet dealers are equipped to make this assembly. It is necessary to have at least .001" or preferably .0012" press fit between wrist pins and rods to insure that pins will not loosen and move during running. If you are going to floating pins, you may want to buy a service pin with machined flat ends, or grind the ends of production pins to form a larger bearing surface against the pin retainers. Install Spirolax or Tru-arc pin retainers. If Tru-arcs are used, install with square edge of retainer facing away from the end of the pin towards the cylinder wall. This sharp edge will tend to bite into the piston groove better and resist being pushed out. Make sure there is a few thousandths end play with retainers installed. Run the production Moly groove type piston rings for best blowby control and minimum friction.

Camshaft: OK as is, use nylon toothed cam sprocket. Production Z-28 camshaft is #3849346 with .455" lift and is to be hot lashed at .030" for both intake and exhaust valves. Optional camshaft #3927140 is a long duration .473" intake and .492" exhaust lift higher performance cam and is not recommended for use on the street. It should be installed with #3927142 valve springs and hot lashed .022" inlet and .024" for exhaust valves. It is recommended "Molykote", or other molydisulfide based EP lubricant be used on camshaft lobes for proper break-in. In addition, valve lifters will be more compatible with the camshaft if you polish the contact surface with #600 grit sandpaper before installing them. Good used lifters that still retain some crown or convex curvature across the bottom are very satisfactory.

Valve Train: Production high performance push rods have a hardened steel inserted tip in one end, and should be installed with this end up. The high performance rocker arm has a raised letter "O" forged in the pallet end and a polished pallet. Valve springs should be installed at 1.70" height, and should have 110 lb. load at installed height for camshaft #3927140. New rocker arms and balls will burn sooner than run-in parts. If necessary to change a rocker and ball, always install a good used run-in rocker and ball. If no good used ones are available, move an intake rocker and ball over to the burned exhaust position and install the new parts on an intake position which runs cooler.

Oil Pump: Weld pickup tube into body of pump. On lower end of pickup tube, some sort of flat round pickup shield similar to production should be used to keep from picking up air along with oil.

Oil Pan: Modify as necessary for increased capacity. Run semicircular or flat Corvette tray baffle and some sort of horizontal baffle attached to the lower step of the oil pan to retard oil sloshing on brake stops. Corvette high performance oil pans have excellent baffling already built in, including a trap door to retard oil slosh under braking. If available, a magnetic drain plug should be installed.

Oil Cooler: If desired, an oil cooler can be plumbed into engine using #3157804 cooler available from Chevrolet Parts and Accessories. Adaptors to go in place of production oil filter and remote oil filters to take off, filter, cool and return oil to engine are available through high performance and marine parts manufacturers. In all installations, at least 1/2 inch ID line should be used and the oil filtered just before it is returned to the engine to prevent contamination of engine bearings.

Oil Pressure Gauge: Oil pressure gauge line should be minimum of 3/32 inch to get good gauge response and help detect any oil pressure losses quickly.

Cylinder Heads: Production high performance cylinder heads come equipped with 1.6 inch OD exhaust valve and 2.02 inch OD inlet valves. Improvements in overall performance can be obtained with the following head rework: Increase the circumference of valve seats to the outer edge of the valve face and narrow the seat by increasing the inner seat diameter with a 35° stone or cutter for exhaust and 25° cutter for inlet, leaving a .030" inlet seat and .050" exhaust seat. Remove the unused portion of the valve seat on the valve itself with a 20° cut off the underhead of the valve, narrowing the valve face to match the seat width in the head. Remove all ridges from combustion chambers. Port exhaust port out to maximum size and narrow and streamline the exhaust valve guide boss that protrudes into port. DO NOT shorten valve guide. Do the same for inlet ports. Use valve spring #3927142 at 1.7" installed height for cam #3927140. Use steel head gasket with aluminum paint for sealer, or composition gasket without sealer. Torque head bolts to 65 ft./lb. It is recommended that rocker arm studs be pinned to keep them from pulling out or replaced by screw in studs.

Intake Manifold: Z-28 intake manifold #3917608 is an aluminum high rise tuned runner type, designed to mount a single Holley 4-barrel carburetor. Any size Holley from 500 - 960 CFM Airflow can be mounted. Stock is a 780 CFM Model 4053 or 3943. No manifold porting is necessary, but opening up of ports to match manifold gasket and head ports is recommended. Do not remove the center divider from the manifold below the carburetor.

Fuel Pump: if possible, use an electric fuel pump to boost the engine mechanical fuel pump. The 1963-65 Corvette high performance fuel pump is the most satisfactory for high performance usage.

Flywheel and Clutch: Optionally available from Chevrolet is a 15 lb. Nodular Iron Flywheel #3866735 and heavy duty 10.5 inch clutch #3886066 (cover) and #3886059 (clutch disc). This flywheel and clutch are presently released for the 427 cu. in. RPO L-88 option so are more than adequate for 302 usage.

Carburetor: Use the #3923289 Z-28 or similar 780 - 800 CFM Holley carburetor. This carburetor has 1-11/16" throttle bores. Satisfactory jetting for most running conditions is #72 jets in both primary and secondaries. If richer or leaner mixture is desired, change all jets up or down in size. If necessary, the 600 Holley from earlier model mechanical cam 327's can be used. Jetting should be similar to production for 327 model. Connect secondaries to operate mechanically by putting a small bolt in the secondary return quadrant on left side of carburetor if mechanical secondaries are desired.

Distributor: Production Z-28 distributor is a conventional breaker point model. Optionally available is transistor system distributor #1111267. Also available is distributor #1111263 which is a ball bearing unit with tach drive included. This distributor is for gear drive camshaft 427's and requires that you change the distributor drive gear to a chain drive model. Do not hook up vacuum advance. Run 38 - 40° maximum advance.

Exhaust System: A satisfactory tuned open exhaust system is mandatory to extract maximum torque and horsepower from these engines. Correct dimensions for such a system are 1-3/4" OD by 34" long head pipes collected in a group into 3-1/4" to 3-1/2" collector tailpipe. 3-1/2" tail pipe is preferred for any installations requiring more than 36" of tailpipe. Several header systems designed to these dimensions are currently being marketed by speed shops and high performance parts manufacturers, as well as Chevrolet under part #3916383 and #3916384.

Operating Conditions: Following are several recommended operating specifications and limits that should insure long and satisfactory service from an engine built to the foregoing instructions:

Oil - 30 to 50 weight aircraft or other ashless high performance oil (DA, Valvoline, etc.). An oil with ashless additives is specified to prevent pre-ignition and burnt pistons.

Fuel - The best super premium available. Examples are 260 Sunoco, 115-130 octane aviation gas, or Pure racing gasoline.

Spark Plugs - AC41 or C42-1 for track racing, 43 for drag racing. Autolite - AT2, A22, A23, or A903 for track racing, AT4, A42 for drag racing. Champion - J61Y, J60R, J86Y, or UJ60P for track racing, J63Y, J6J, or UJ64P for drag racing.

Spark Advance - 14° initial advance giving 38 to 40° at high RPM.

Valve Lash - .030 Intake, .030 Exhaust for production cam #3849346. .022 Intake, .024 Exhaust for service cam #3927140.

Maximum Speed for Optional Cam - 6800 - 7200 RPM for track racing, 7800 RPM for drag racing.

Maximum Oil Temp - 300° in oil pan.

Minimum Fuel Pressure - 4 - 5 PSI at high engine speeds.

In operating conditions where fresh air is ducted to the carburetor (fresh air hoods, plenum air cleaners, etc.), it is necessary that an air cleaner element or low restriction element be used to diffuse the air entering the carburetor. If no diffuser is used, the engine mixture distribution will be upset, causing poor power and misfiring at high engine speeds.