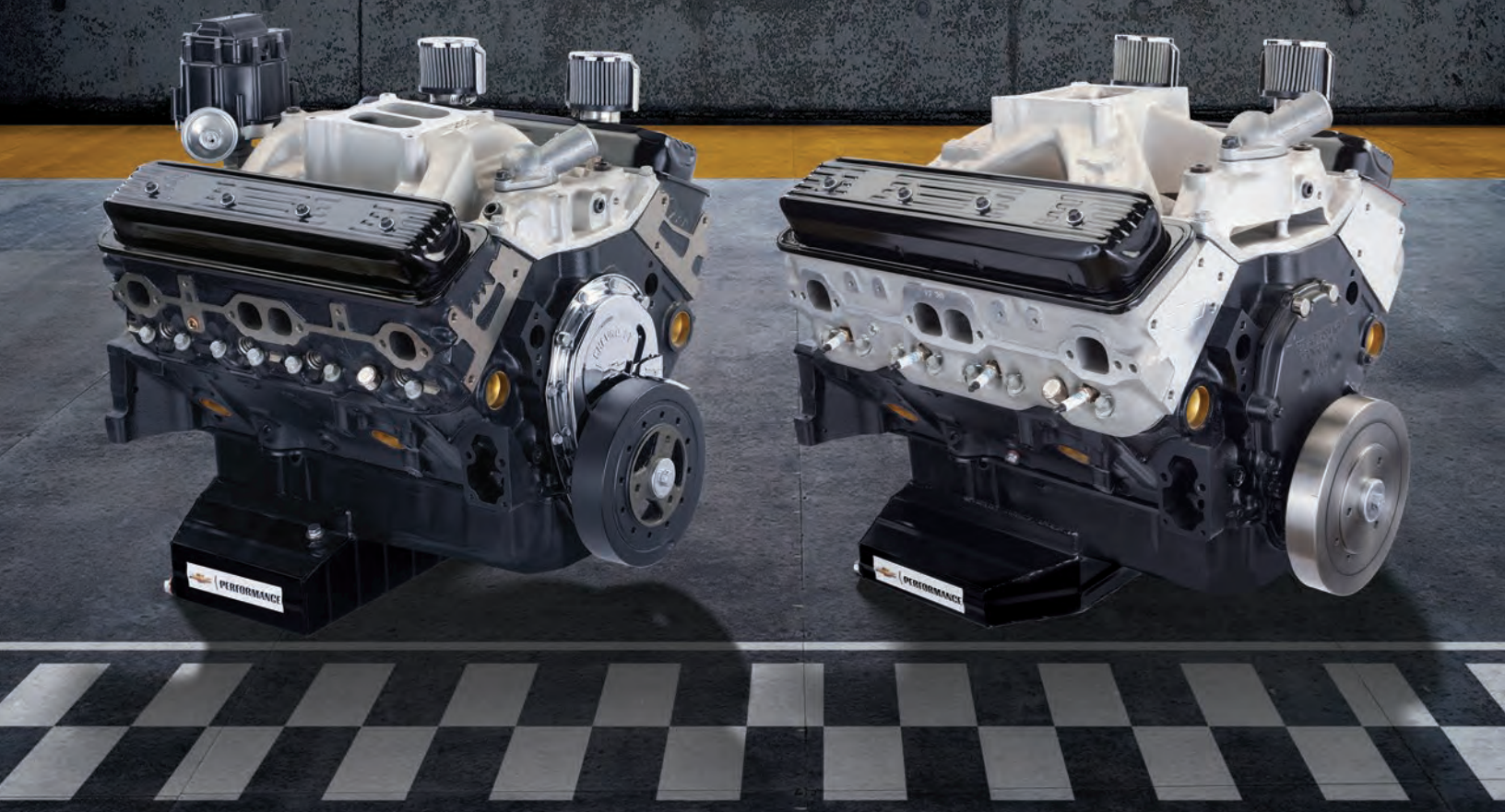
CHEVROLET

PERFORMANCE
VEHICLES / PARTS / RACING

CT350 & CT400
CIRCLE TRACK RACING ENGINE TECHNICAL MANUAL



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This Technical Manual is dedicated to the memory of

Robert E. (Bob) Cross

1957-2010

INTRODUCTION

Chevrolet Performance is committed to providing proven, innovative performance technology that is truly More than just Power. Chevrolet Performance Parts are engineered, developed and tested by the factory to meet your expectations for fit and function. Visit our website at www.ChevroletPerformance.com for the Chevrolet Performance Parts authorized Center near you.

This book provides general information on components and procedures that may be useful for engine break-in and technical inspection. Observe all safety precautions and warnings as needed. Wear eye protection and appropriate protective clothing. When working under or around the vehicle support it securely with jack-stands. Use only the proper tools. Exercise extreme caution when working with flammable corrosive, and hazardous liquids and materials. Some procedures require special equipment and skills. If you do not have the appropriate training, expertise, and tools to perform any part of the installation then contact a professional.

LEGAL INFORMATION

This publication is intended to provide information about your circle track engine and related components. The publication also describes procedures and modifications that may be useful during the installation. It is not intended to replace the comprehensive service manuals or parts catalogs which cover General Motors engines and components. Rather, it is designed to provide supplemental information in areas of interest and to do-it-yourself enthusiasts and mechanics.

This publication pertains to engines and vehicles which are used off the public highways except where specifically noted otherwise. Federal law restricts the removal of any part of a federally required emission control system on motor vehicles. Further, many states have enacted laws which prohibit tampering with or modifying any required emission or noise control system. Vehicles which are not operated on public highways are generally exempt from most regulations. As are some special interest and pre-emission vehicles. The reader is strongly urged to check all applicable local and state laws.

HISTORY

Chevrolet has a long history of providing the engine of choice for circle track racing. The introduction of the small block Chevy in 1955 started it all. Production parts were durable and the engines were plentiful. In the 1960's, Chevrolet started producing HD parts for racing activities and a whole industry was started.

Over time, the competitive nature of racing drove costs continually higher and sanctioning bodies found it increasingly difficult to police the competitors. In the 1990's, several tracks and individuals took Chevrolet's successful crate engines designed for the street and adapted them for circle track applications. The potential for cost savings was tremendous.

Based on the success of those racers, Chevrolet Racing and Chevrolet Performance Parts engineers spent time in 2001 developing several circle track engine packages based on their proven small block Chevy crate engines. That development led to three engines released in 2002: (88958602, 88958603, and 88958604). Commonly known as the 602, 603 and 604 (the last three digits of the part number), these three engines fit easily into most existing racing classes with minor adjustments to the rules (typically weight breaks).

Each engine is assembled with all new parts on a production line to keep costs down. The engines then are up-fitted with special oil pans, valve covers and sealing bolts. Factory sealing of the engines are one of the keys to the success of the program as this makes it difficult to tamper with the engine and helps maintain equality among the competitors. If used as directed, the engines should provide several seasons of use with minimal maintenance.

CIRCLE TRACK ENGINES — POSITION STATEMENT

General Motors does not endorse nor encourage any internal engine repairs or modifications to any sealed racing engine in the field. Due to the competitive nature of the intended application, any maintenance or repairs that require the sealing bolts to be removed for any reason deem the engine non-factory assembled and the competitiveness becomes questionable. Some sanctioning bodies or racing groups may allow rebuilding or modifications but that sanctioning body or group is solely responsible for verifying the integrity of the engine from that point forward.

Circle Track racing engines from Chevrolet Performance Parts are equipped from the factory with tamper-resistant seals. Chevrolet Performance does not endorse nor encourage any internal engine parts replacement, repairs or modifications to any sealed racing engine. If the GM-supplied engine seals are removed for any reason, Chevrolet Performance cannot ensure engine equality and consistency for performance or durability. In the event where internal repairs become necessary, Chevrolet Performance encourages the engine owner to consult with the local promoter/presiding track official to determine if the engine must be replaced with a new, factory-sealed engine. Replacement is the Preferred/Recommended process in order to maintain the integrity of a “Sealed Crate Engine Program".

Chevrolet Performance does not supply seals for a rebuilt factory engine, nor does it endorse or approve independent engine rebuilders as “GM-authorized” engine rebuilders.

All Chevrolet Performance crate engines, including circle track, are manufactured with all new components. A non-firing cold test is conducted as part of end of assembly line testing on all crate engines. During this test the engine is spun at low speed and various parameters, including compression, are checked against established standards to ensure that quality requirements are met.

Chevrolet Performance requires proper “break in” procedures to be followed, as outlined in owner's manuals or instruction sheets. Diagnostic testing such as “leak down” tests are not a reliable indication of engine output or durability to perform as promoted.

Chevrolet Performance crate engines are tested to generate advertised power and torque values are representative of engines in series production. Observed results vary.

WHERE TO BUY

Circle track crate engines can be purchased from any GM Dealer in the USA, Canada and other countries. Our recommendation is to contact an authorized Chevrolet Performance Parts dealer who is more familiar with GM’s high-performance parts line. Contact 1 (800) 468-7387 or www.chevroletperformance.com to find a dealer near you.

WARRANTY

Circle track crate engines have no warranty. They are intended for off-road racing activities only.

ENGINE SEALS

(CONTINUED)

Starting in November of 2017, CT350 (602) and CT400 (604) engines are assembled with seal caps (shown below) that employ Signa-Key technology applied to a single-use locking cap over the bolt head. This unique encrypted marking is provided for tech inspectors to quickly identify genuine GM-installed seals on a Chevrolet Performance circle track engine to verify that the engine has not been tampered with.

Similar to the previous design, round-head bolts with Info-Glyph encryption, the design is intended to be a single-use installation only. The cap will be destroyed or severely damaged if an attempt is made to remove it and it cannot be re-installed. Chevrolet Performance does not provide replacement caps for damaged or missing seals.

If an engine is disassembled for any reason, we recommend that you contact your sanctioning body tech inspector for direction in replacing the GM factory seals. Many sanctioning bodies have adopted their own secondary seals for this situation.

Chevrolet Performance does not condone the rebuilding of these engines. Check with your Sanctioning Body or promoter for recommendations.

Seal caps with encrypted data provides quick identification and verification that the engine has Genuine Chevrolet Performance seals and has not been tampered with.

This photo shows the GM Logo and Info-Glyph dot-matrix.

Note: Old style Break off bolts were discontinued in 2017 and replaced with new encrypted seal caps.

CHEVROLET CIRCLE TRACK RACING ENGINES

This section is a brief overview of the two engine packages that are available from Chevrolet. The following pages outline the highlights of each engine including torque and horsepower figures. The final page has a chart that covers the technical specifications of each engine.

CT350 “(602)”

The CT350 (602) is rated at 350 hp @ 5400 rpm and 396 ft lbs of torque @ 3800 rpm. It fits well in lower level introductory classes that are looking for affordable horsepower; such as factory stock, modified, and truck. It comes complete intake to pan and includes an HEI distributor. It does not include a flywheel or water pump. The engine uses a 4 bolt main block, cast iron crank, powdered metal rods, and cast pistons. The 9.12:1 nominal compression ratio with iron Vortec heads offer a good balance of power and durability. The 8 1/2" deep oil pan holds 8 quarts including the filter. The engine has a dual-plane, high-rise, aluminum intake. This engine weighs 451 lbs as delivered.

CT400 “(604)”

The CT400 is rated at 404 hp @ 5800 rpm and makes 406 ft lbs of torque @ 4600 rpm. It fits well in late models and other classes that run on longer tracks. The engine comes complete intake to pan. It does not include distributor, flywheel, or water pump. The 4 bolt main block, steel crank, powdered metal rods, and high-silicon pistons make a great foundation. The 9.72:1 nominal compression ratio with “Fast Burn” aluminum heads and roller rockers make great power and lots of torque. The 7" deep oil pan holds 8 quarts including the filter. This engine has a high-rise, single plane, aluminum intake manifold. This engine weighs 466 lbs as delivered.

INSTALLATION INSTRUCTIONS

Each engine comes with detailed instruction sheets. This section includes some of the information that is included in those instruction sheets. It is imperative that the startup procedures are followed before starting the engine. Failure to do so may result in catastrophic engine failure. These procedures are designed to ensure engines are properly broke in for maximum engine life. Two key factors affect engine life; proper valve lash and keeping rpm's within specified limits.

Valve Lash

Valve lash is critical. Read the procedures closely. To ensure that a sufficient amount of oil is available to cool the valve springs and pull heat from the valves, restrictors are not installed into the oil galleries.

Break-In Procedures

Chevrolet has detailed break-in procedures to help ensure the life of your engine is maximized. Failure to follow these break-in procedures will reduce the life of the engine. Make sure you read these instructions completely before attempting to start your new engine.

Tune Up Specifications

Tune up specifications are provided for each engine to insure that they are tuned to factory specifications. Altitude, humidity, and other factors will affect performance. Do not increase timing more than factory recommendations. The CT engines have had extensive dyno & track testing to maximize horsepower and durability using these parameters. Optimal performance can be achieved if you keep the tune-up within factory recommendations.

RPM Limits

RPM limits are critical to engine life. **Catastrophic engine failure** can occur if the engines are run above the factory recommended limits. Extensive dyno & track testing has determined the limits of the engine. Under no circumstances is it recommended to exceed these limits. Chevrolet recommends that all sanctioning bodies, track operators or promoters have rev-limits written in their rule book.

Maximum limit for 602 engine is 5500 rpm.

Maximum limit for 604 engine is 5800 rpm.

VALVE LASH PROCEDURE

It is imperative to set lash properly on circle track crate engines. The recommended lash is 1/2 to 3/4 when the engine is at normal operating temperature. To properly set the valve lash, warm up the engine to normal operating temperature (180°-190°F) and follow the procedure below. Remove the valve covers and disconnect power to the Distributor.

Set the valve lash as follows:

1. Loosen the rocker arm adjusting nut until the pushrod rotates easily.
2. Loosen/back off the set screw inside the rocker arm nut 1/2 turn (counter-clockwise).
3. Then, set the valve lash by tightening the rocker arm adjusting nut while rotating the pushrod between your fingers until you feel it stop rotating. When it stops rotating easily, you are at “zero” lash. NOTE: It is critical to ensure that the tip of the pushrod is seated in the pushrod cup in the rocker arm and the valve stem tip is located in-between the self-aligning roller tip of the rocker arm.
4. Next, turn the rocker arm adjusting screw 1/2 turn clockwise.
5. Then, tighten the set screw inside the rocker arm nut against the rocker arm mounting stud.
6. Next, rotate the rocker arm adjusting nut and the set screw (clockwise) at the same time 1/4 turn maximum. This will allow the set screw to lock properly at hold the valve lash at 1/2 to 3/4 turn (total).
7. Use the sequence below to adjust each rocker arm. NOTE: It is critical that the lifter is on the base circle of the camshaft to ensure that the lash is set properly.

Valve Lash Adjustment:

1. Position engine at Top Dead Center (TDC) on # 1 cylinder in firing position.
   Adjust Intake valves on # 2 & # 7 cylinders.
   Adjust Exhaust valve on # 4 & # 8 cylinders.
2. Rotate Crankshaft 1/2 Revolution Clockwise.
   Adjust Intake Valves on # 1 & # 8 cylinders.
   Adjust Exhaust Valves on # 3 & # 6 cylinders.
3. Rotate Crankshaft 1/2 Revolution Clockwise to #6 cylinder in firing position.
   Adjust Intake Valves on # 3 & # 4 cylinders.
   Adjust Exhaust Valves on # 5 & # 7 cylinders.
4. Rotate Crankshaft 1/2 Revolution Clockwise.
   Adjust Intake Valves on # 5 & # 6 cylinders.
   Adjust Exhaust Valves on # 1 & # 2 cylinders.
5. Reinstall valve covers, connect distributor and start engine to check for loose valve lash.

RECOMMENDED BREAK-IN PROCEDURE

Start-up is critical to help ensure engine life. This procedure was written with the intent to provide a quick reference and guideline to starting a new or rebuilt engine if a dyno is not available. If you are using a dyno, refer to the dyno operator's guidelines for startup and initial break in of the engine.

Chevrolet Performance recommends the use of an established Dyno facility/Engine supplier for best results.

1. **Safety First! Make sure you have proper tools as well as eye protection.** If the car is on the ground, be sure the wheels are chocked and the transmission is in neutral.
2. Be sure to check the oil level in the engine and prime the oil system. The engine should be primed with oil prior to initial startup. To prime the engine, first remove the Distributor to allow access to the oil pump drive shaft. Install the oil priming tool (part #141-955 from our licensed partner www.factoryperformanceparts.com) and follow the instructions included with the tool. Using a 1/2" drill motor, rotate the engine priming tool clockwise for three minutes. While you prime the engine, have someone else rotate the crankshaft clockwise to supply oil throughout the engine and to all of the bearing surfaces before the engine is initially started. This will ensure that oil gets to all of the bearings before you start the engine for the first time. Also, prime the engine if it sits idle for an extended period of time. Install the Distributor as follows: (1) Locate cylinder #1 Top Dead Center (TDC). (2) Rotate the engine to 12 degrees before Top Dead Center (BTDC). (3) Align the Rotor with the cylinder #1 terminal on the Distributor.
3. Run the engine between 2,000 and 2,500 rpm with no-load for first 30 minutes.
4. Refer to valve lash procedure and lash valves.
5. Adjust the distributor timing to recommended specifications.
6. Adjust Carburetor settings. Idle mixture screws, base idle, floats, etc.
7. After first 30 minutes of the engine running, re-set ignition timing and carb adjustments.
8. Drive the vehicle at varying speeds and loads for first 30 laps. Be sure not to use a lot of throttle or high rpm's.
9. Run 5-6 medium-throttle accelerations to about 4500 rpm and closing the throttle (letting off the gas) in gear and coasting back down to 2000 rpm.
10. Run a couple of hard-throttle acceleration to about 5000 rpm then closing the throttle (letting off the gas) in gear and coasting back down to 2000 rpm.
11. Change the oil and filter with Mobil 1 Synthetic oil (P/N 12347284) and AC Delco oil filter PF1218 (P/N 25160561 or 19431429) or PF454 (P/N 12708762 or 19432234).
12. Drive the next 25 laps without high rpm's (below 5000 rpm), hard use, or extended periods of high loading.
13. Change the oil and filter again.
14. Your engine is now ready for racing.

TUNE UP SPECIFICATIONS

Tune Up Specifications		
Description (Engine)	**CT350 (602)**	**CT400 (604)**
Firing Order:	1 - 8 - 4 - 3 - 6 - 5 - 7 - 2	
Recommended Fuel:	92-93 Octane Unleaded	
Spark Advance (Ign. Timing):	32 deg @ 4000	36 deg @ 4000
Recommended Carburetor:	Holley 650 HP p/n 80541-1	
Baseline Jetting: Front / Rear	73 / 73	73 / 73
Spark Plugs:	MR43LTS	MR43LTS
Spark Plug Gap:	.045"	.045"
Recommended Oil:	Mobil 1 Racing 0W-50 or Mobil 1 Racing 15W-50 (12347284)	
Recommended Filters:	AC PF-454	
Recommended Valve Lash:	1/2 to 3/4 turn past 0 lash	
Recommended Header Size:	1-5/8" or 1-3/4" dia. header with 3-1/2"collector 33" total length.	

Notes:

Carburetor & Adjustments

The Holley 80541-1 carburetor is rated at 650 cfm. Track testing showed the 650 HP series is the best carburetor choice for most applications. A 750 cfm HP series carb was also tested.

Because both engines make power well before 5500 rpm, the larger carburetor can actually hurt performance. The Holley HP series is designed with most racing modifications done. There are other very good high performance aftermarket carburetors available as well that may be used with proper testing and tuning.

After installing your carburetor, make sure the float levels are set properly, the idle mixtures adjusted, and idle rpm set. Depending on the weather and altitude you may have to change the jet size up or down. Do not make large jumps in jet sizes without consulting the carburetor manufacturer or an engine builder. Most of the time only a couple of jet sizes is all that is necessary for proper performance. Make sure you take care of the carburetor when the season ends. Drain the fuel and put the carburetor in a plastic bag or sealed container. Do not leave it on the engine, the fuel will evaporate and leave a residue in the metering galleries.

Ignition Timing (Spark Advance)

A maximum of 32 degrees of advance is recommended for the CT350 and a maximum of 36 degrees of advance is recommended for the CT400. The combustion chambers are very efficient so it doesn't take much timing to make power. Don't run more than the recommended maximum spark advance as detonation can occur.

Fuel Requirements

91-93 Octane Unleaded fuel is recommended. It is not beneficial to run leaded fuel or 101-104 octane. Leaded fuel contaminates the oil and can foul the spark plugs. All three engines have compression ratios of 10:1 or less, so the higher octane is of little value. The valve seats are designed to run on unleaded fuel. Some of the tracks & sanctioning bodies add traces of lead for "Off Road Use" which should not affect performance.

Headers

As part of Chevrolet's dyno testing, the engines were tested with both 1-5/8" or 1-3/4" diameter primary tube headers. The total length was approximately 33" with a 3 1/2" collector.

Recommended Oil

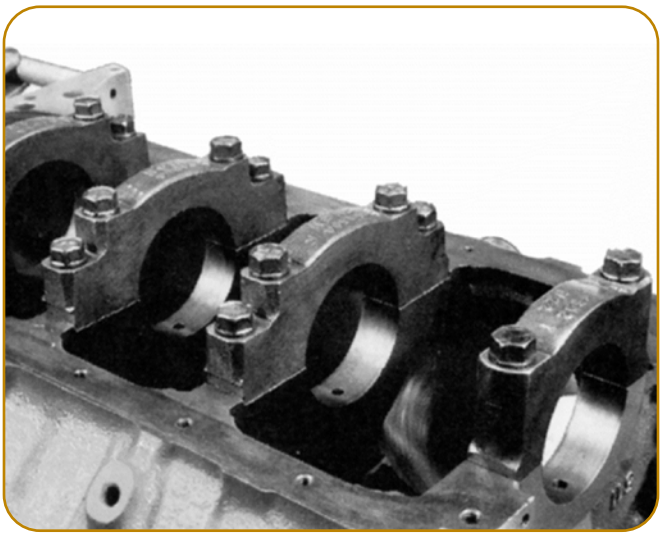
Chevrolet conducted dyno testing of the engines with Mobil 1 Racing 0W-50 or Mobil 1 Racing 15W-50 (12347284) synthetic oil. Extensive testing has proved that synthetic oil provides better lubrication qualities under extreme conditions and has a longer life between oil changes.

ENGINE COMPONENTS

The engines are subjected to grueling dyno durability testing. Quality control standards are maintained during assembly of each engine. This section covers some of the differences between the major components in the two engines.

Engine Blocks

Both engines are assembled with brand new 4 bolt main blocks with cast iron caps. The main caps have in-line bolts. They are machined to factory specifications and tolerances. The blocks are designed to use a 1 piece rear crankshaft seal. The photo to the right below shows the 1 piece rear seal adapter that was designed to reduces oil leaks. A flywheel that is balanced correctly require for these applications.



P/N 14088556 rear seal retainer

Pistons

The piston on the left (below) is installed in CT350 (602) engines. This piston has a grafal coating on the skirt. It's a cast aluminum dished piston with 4 valve reliefs.

The piston on the right (below) is installed in CT400 (604) engines. It’s a flat top piston with 4 valve reliefs made from high-silicon aluminum.

Crankshafts

In 2010, the CT400 Circle Track engine began being built with a second design crankshaft. This change was due to a material change the crank was being manufactured with and does not affect engine performance. To maintain rotating assembly balance without having to change any other parts of the rotating assembly, the ends of the connecting rod throws have been clipped [machined]. The new and old crankshafts will look different during inspection.

Below left [Fig A] is an image of the original crankshaft. This crankshaft was used from 2002 until mid-year 2010. Note the As-Cast appearance of the rod end throws as compared to the new crankshaft below right [Fig B] with machine rod end throws. This new crankshaft was first used in mid 2010 and replaced in 2021.

Starting in 2021 CT350 and CT400 both use a Forged steel Crankshaft.

Fig A

Fig B

Harmonic Balancer / Torsional Damper

ZZ6 and CT400 Engine Balancer

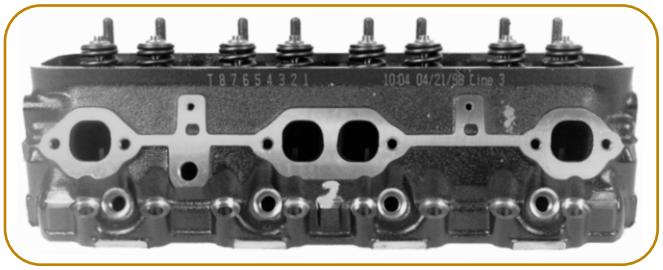
The current balancer has timing marks on both edges of the outer ring. This allows for the use of different timing pointers and may assist in reading the timing light pulses in installations where clearance is minimal. The balancer is 8 inches and sold under P/N 19301706.

Intake Manifolds

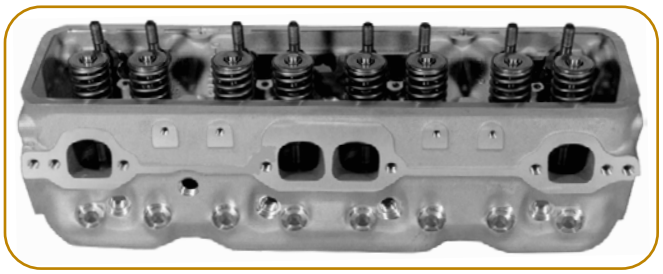
P/N 12366573 intake manifold (above) is used on CT350 (602) engines. It's a dual-plane, high-rise intake. It has the 8 bolt Vortec mounting pattern.

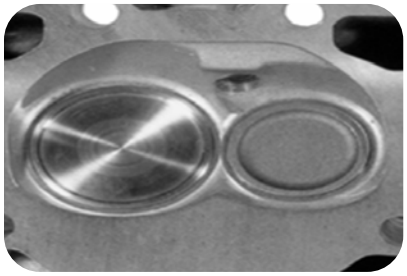
P/N 12496822 intake pictured (above) is used on CT400 (604) engines. It is single-plane, high-rise intake. It has the 8 bolt Vortec mounting pattern.

Cylinder Heads



P/N 12691728. The pictures above show the cast iron cylinder head & combustion chamber used on the CT350 (602) engine. Head casting number is 10239906 or 12558062. Valve sizes are 1.94" intake & 1.50" exhaust.





P/N 19417592. The pictures above show the aluminum “fast burn” cylinder head and combustion chamber used on the CT400 (604) engines. Head casting number is 19417568. Valve sizes are 2.00" intake & 1.55" exhaust.

In early 2014, the cylinder head assembly was updated to utilize the LS3 Beehive conversion kit which resulted in a more robust valvetrain which typically does not need to be replaced for an entire season or more of racing.

Push Rods

GM uses part number 14044874 HD .075" wall pushrods in the CT350 (602) engines. The pushrod is 7.724" long and 5/16" diameter.

P/N 10241740 is used in CT400 (604) engines. It is a HD pushrod that has a 0.060" wall and 7.122" long and 5/16" diameter.

CT400 (604) INTAKE MANIFOLD GASKET REVISION HISTORY

Below is a an image of the original intake gasket P/N 89017465 (kit includes 2 gaskets). This gasket was used from 2002 until mid-year 2012. Pictured below is the replacement gasket P/N 12497760 which was used since mid-year 2012 and was re-instated in the Fall of 2021 (see below). China wall sealant used with this gasket could be any of 3 different colors, Light Gray, Dark Gray, or Black.

Picture below is the replacement gasket P/N 12497760 that was used from mid-year 2012 until the Fall of 2013. This P/N was superseded to P/N 19301685 (See below). This P/N 12497760 is again sold as a kit with 2 gaskets included. China wall sealant used with this gasket could be any of 3 different colors, Light Gray, Dark Gray, or Black.

Beginning Fall of 2013, a redesigned intake manifold gasket went into production on the CT400 (604). This gasket is designed to closely match the intake ports of the Fastburn Aluminum cylinder heads. This gasket also incorporates the print-o-seal sealing beads around the port for increased sealing. Below is a picture of the new gasket kit P/N 19301685 (kit includes 2 gaskets). This new gasket was the suggested replacement gasket to be used for all repairs and or rebuilding/refreshing of all 604's until the Fall of 2021. This gasket was found to be difficult to maintain placement during build and a return to the original gasket 89017465 was implemented in the Fall of 2021.

In October of 2015, Chevrolet Performance began to apply a thin bead of RTV (Loctite 5900) to the cylinder head around the coolant and intake port openings to mirror the print-o-seal sealing beads on the gasket. This was implemented to ensure that the intake manifold gasket remains in the installed position and improves the sealing of the intake ports under high manifold vacuum conditions.

ENGINE COMPONENTS *(CONTINUED)*

Front Covers

Chevrolet uses two different types of front covers on the two engines. The photo on the right shows a stamped steel cover that is installed on CT350 (602) engines. The photo on the left shows the plastic cover that is installed on CT400 (604) engines.

12562818 plastic cover

12342089 steel cover

Rocker Arms

The 2 photos above show the stamped steel rockers and the 2 different kool nuts (positive locking nuts) that have been installed on the CT350 (602) engines. The 2 kool nuts are slightly different in appearance but performance is identical. Valve Lash/Rocker arm adjustment is critical. (See page 9)

This photo shows the aluminum roller rocker arms that are installed on CT400 (604) engines.

CT350 (602) engines use stamped steel rocker arms.

Valve Lash/Rocker arm adjustment is critical. (See page 9)

Oil Pans

The CT350 (602) engine uses an 8 quart pan (including filter) that is 8" deep. The sump is 9 1/2" long and 11" wide. It fits stock front subframe cars (with stock engine location). The right side of the pan is kicked out 3 1/4" and has 3 trap doors to control oil. It has a built-in crankshaft scraper and comes with a louvered windage tray.

The CT400 (604) engine uses an 8 quart pan (including filter) that is 7" deep. The sump is 12" long and 14" wide. It fits stock Camaro front subframe and most fabricated subframe (with stock engine location). It has 6 trap doors for oil control, 3 crankshaft scrapers, oil temp fitting and a louvered windage tray. Below is a photo of the louvered windage tray.

Photo of the CT400 (604) oil pan.

Photo of the louvered windage tray.

ENGINE SPECIFICATIONS

This section covers recommended rebuild specifications. Both engines are assembled with brand new parts. The engines are assembled to tight tolerances to ensure the horsepower differences between the engines is minimal. Customers typically are able get 2 seasons of service from each new engine.

Chevrolet does not recommend rebuilding engines. We recommend purchasing a new engine. This will ensure 100% integrity of the program.

If rebuilds are allowed, it is up to the track owner or sanctioning body to manage the rebuilders and closely monitor the rebuilt engines.

The key to maintaining close competition between new engines and rebuilt engines is to make sure rebuild specifications are kept close to factory tolerances. These specifications are only guidelines. If the engine is rebuilt to these specifications minimal horsepower differences should be noticed. These specifications also provide a reference point for inspection of suspected modifications to the factory engine.

The machining of the valve seat angles and depths are critical to the valve durability and the performance of the engine. In addition to the effect on airflow, the contact area between the valve and the valve seat is the primary method of removing heat from the valve. Excessive valve temperatures negatively impact the durability of the valves.

Exceeding the maximum recommended engine speed (RPM) can significantly damage the valvetrain components. The maximum engine speed limits were established through extensive valve train testing. Do not exceed the recommended RPM limits.

The following page covers the details of the valve seat area. These are the factory machining specifications. Anytime the valve seat and valve is “touched up” it may affect the height of the valve in the combustion chamber.

Refer to the page on valve spring specifications for physical parameters of a new spring. Valve springs will typically lose stiffness (rate) during operation of an engine. The major factor in reducing valve spring life is heat, therefore, no oil gallery restrictors are installed in the engine. Oil restrictors are not necessary when the engine speeds are kept within factory recommendations. Both engines have excellent provisions for draining oil back to the pan. As long as the breathers are functioning properly and the engine has minimal ring blow-by, oil drainage to the pan will be good.

Some engine builders have learned from experience the negative effects that improper valve seat machining has on the engine. Make sure your engine re-builder follows these specifications.

ENGINE SPECIFICATIONS *(CONTINUED)*

Factory Engine Specifications - New		
Description	**CT350 (602)**	**CT400 (604)**
Engine Weight (As Sold)	517 Lbs	470 Lbs
HP	350 @ 5400 rpm	404 @ 5600 rpm
Torque	396 @ 3800 rpm	406 @ 4600 rpm
Bore	3.998" - 4.001"	3.991" - 4.001"
Compression Ratio	9.12:1	9.72-1
Block Type	Cast iron	Cast Iron
Casting Number	See Note Below	10243880
Deck Height	9.025" +/- .001"	9.025" +/- .001"
Crankshaft Type	Forged Steel	Forged Steel
Crankshaft Casting Number	12691722	12670965
Crankshaft Rear Seal Type	1 pc	1 pc
Crankshaft Weight	55.30 lbs	55 lbs
Piston Type	Cast Aluminum	Hi-Silicon Alum
Diameter	3.996"	3.998" - 3.999"
Valve Relief Type	4 reliefs	4 reliefs
Dished or Dome	Dished	Flat
Piston Weight	594 Grams	533 Grams
Connecting Rod Length	5.7"	5.7"
Connecting Rod Weight +/- 10.0 grm	604.15 Grams	604.15 Grams
Camshaft Type	Hyd	Hyd Roller
Camshaft Lift (int / exh measured @ valve)	.435" / .460"	.474" / .510"
Camshaft Lobe Lift: (int / exh)	.290" / 306"	.316" / .340"
Duration @ .050" (int / exh)	212 / 222	208 / 221
Camshaft Lobe Centerline	112.5 degrees	112 degrees
Rocker Arm Type	Stamped Steel	Roller Rocker
Rocker Arm Ratio	1.5	1.5
Head Gasket Type	Composite / Steel	Composite
Thickness	.028"	.051"
Cylinder Head Type	Iron Vortec	Aluminum
Casting Number	12558062	19417568
Valve Sizes	1.94" / 1.50"	2.00" / 1.55"
Combustion Chamber CC's (+/- 1-2 cc)	64	62
Intake Port CC's (+/- 1-2 cc)	170	205
Exhaust Port CC's (+/- 1-2 cc)		77
Normal Oil Pressures	40psi @ 2000 rpm	40 psi @ 2000 rpm
Note: * signifies 19258602 engine part specification		
No Deck Surfacing after 1st Rebuild		
No Angle Milling of Cylinder Heads to Increase Compression Ratio.		
No Modifications to: Crank, Rods or Pistons.		

ENGINE SPECIFICATIONS *(CONTINUED)*

Recommended Rebuild Specifications & Tolerances		
Description	**CT350 (602)**	**CT400 (604)**
Maximum Bore Allowed:	Maximum of .008” all Bores	
	Otherwise new block required	
Standard Block Deck Height +/-.001"	9.025"	9.025"
Maximum Deck Surfacing of Block	.005"	.005"
Minimum Block Deck Height +/- .001"	9.020"	9.020"
Minimum Crank Bearing Size:	.010" under	.010" under
Minimum Rod Bearing Size:	.010" under	.010" under
Minimun Rod Weight:	595 grams	595 grams
Crankshaft Balancing:	Factory External	Factory External
Maximum / Minimum Crank Stroke:	3.48"	3.48"
	No offset grinding of crank during rebuild	
No Modifications Allowed to:	Crank, Rods or Pistons	
Maximum Deck Surfacing of Head:	.005" to Square Surface During 1st rebuild	
	No Deck Surfacing After 1st Rebuild.	

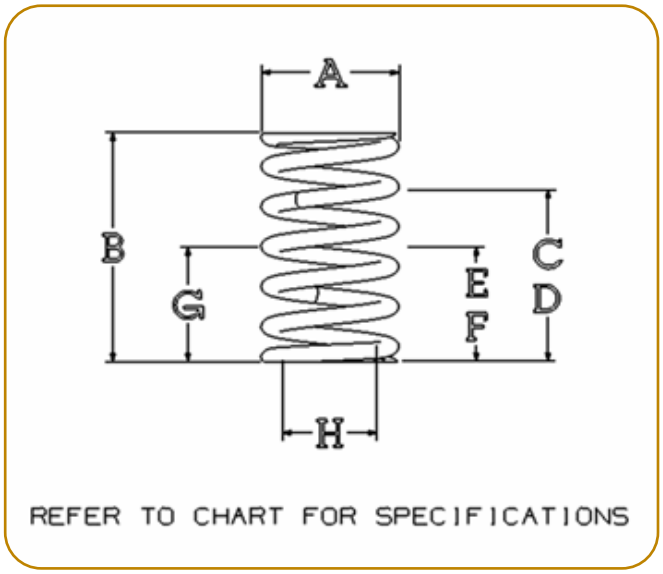
Rebuild Sealing Bolts:

Contact your local track and/or the track’s authorized rebuilder when you need to have your engine serviced. They will be responsible for resealing the engine for competition and may wish to incorporate their own sealing methods.

NOTE: GM does not provide RM bolts for resealing rebuilt engines. If your track is going to allow rebuilds, they should use an alternate sealing method .

Valve Spring Specifications

Below is illustration of a typical valve spring. Match up the locations and engine part number with the chart below for the correct specification.



Note: These specifications are for new valve springs. The specification chart shows free height, installed height, spring o.d., installed pressure, open pressure, etc.

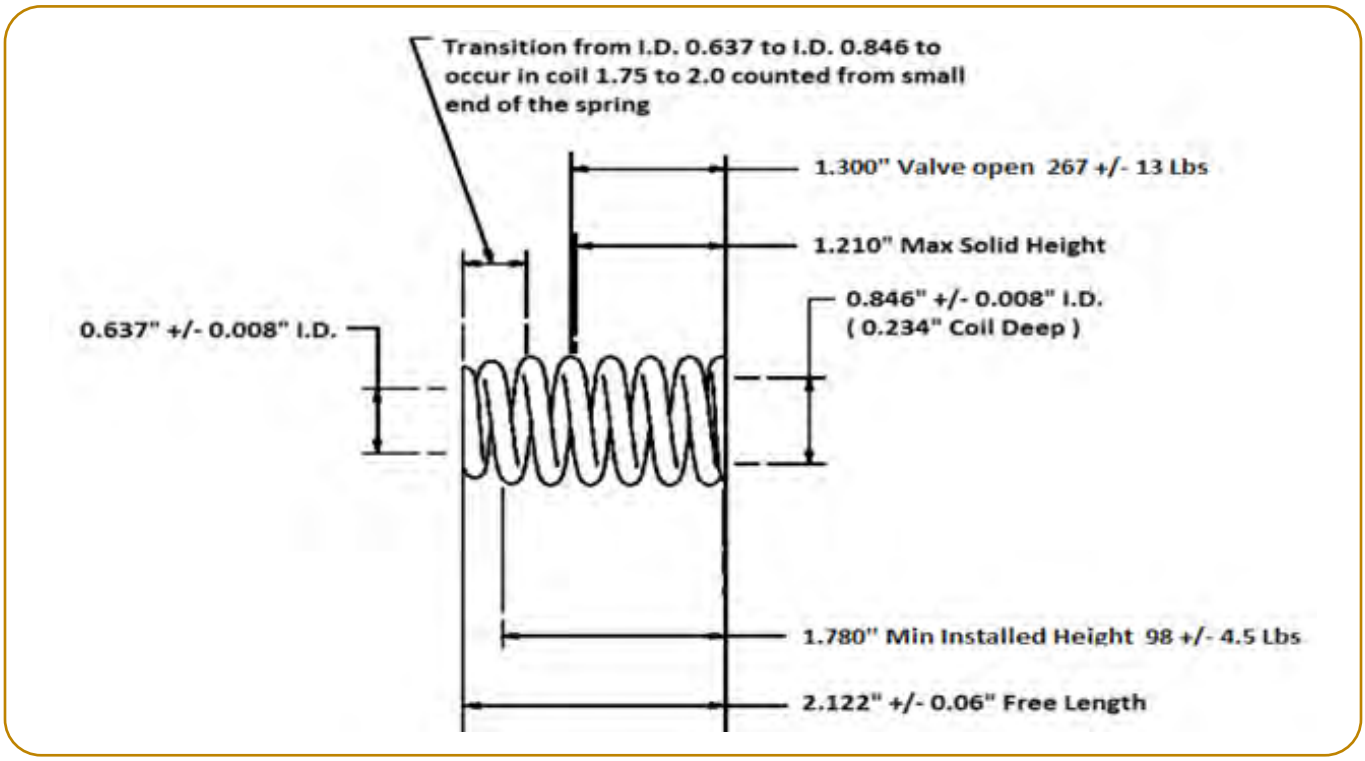
Keep in mind that new spring pressures have some variances. The chart notes the two important variances. Installed pressure & open pressure.

Valve spring pressures will change depending on length of time engine is in service, temperature during that period, and if the engine has been excessively over-revved. It is acceptable to add maximum of a .020" shim when valve seats are recut or to get spring pressures back to proper factory specifications. Care must be taken to make sure retainer to guide clearance is adequate. No Titanium Retainers Allowed.

Description		CT350 (602)	CT400 (604)
Valve Spring P/N		10212811	12551483
Diameter	(A)	1.250"	1.32"
Free Height	(B)	2.021"	2.154"
Installed Height	(C)	1.70"	1.78"
Lbs @ Installed Height (+/- 4 lbs)	(D)	80 lbs	101 lbs
Open Height	(E)	1.270"	1.300"
Open Pressure (+/- 8 lbs)	(F)	195 lbs	260 lbs
Coil Bind	(G)	1.20"	1.21"
Wire Diameter		.177"	.178"

CT400 - Beehive Valve springs

The more recent versions of the CT400 (604) engine utilize Beehive style valve spring which is superior to other type springs for this application. It is lightweight and adds stability to the valve train. It is 1.27" in diameter at the bottom, 1.06" at the top and 1.780" installed height. Spring pressures are 98lb +/- 4.5 lb. installed and 267 lb. +/- 13 lb. at .480 valve lift (1.300 open height). Spring retainers, keepers, and seats are unique to this valvetrain and must all be used together. P/N's listed in graph below.



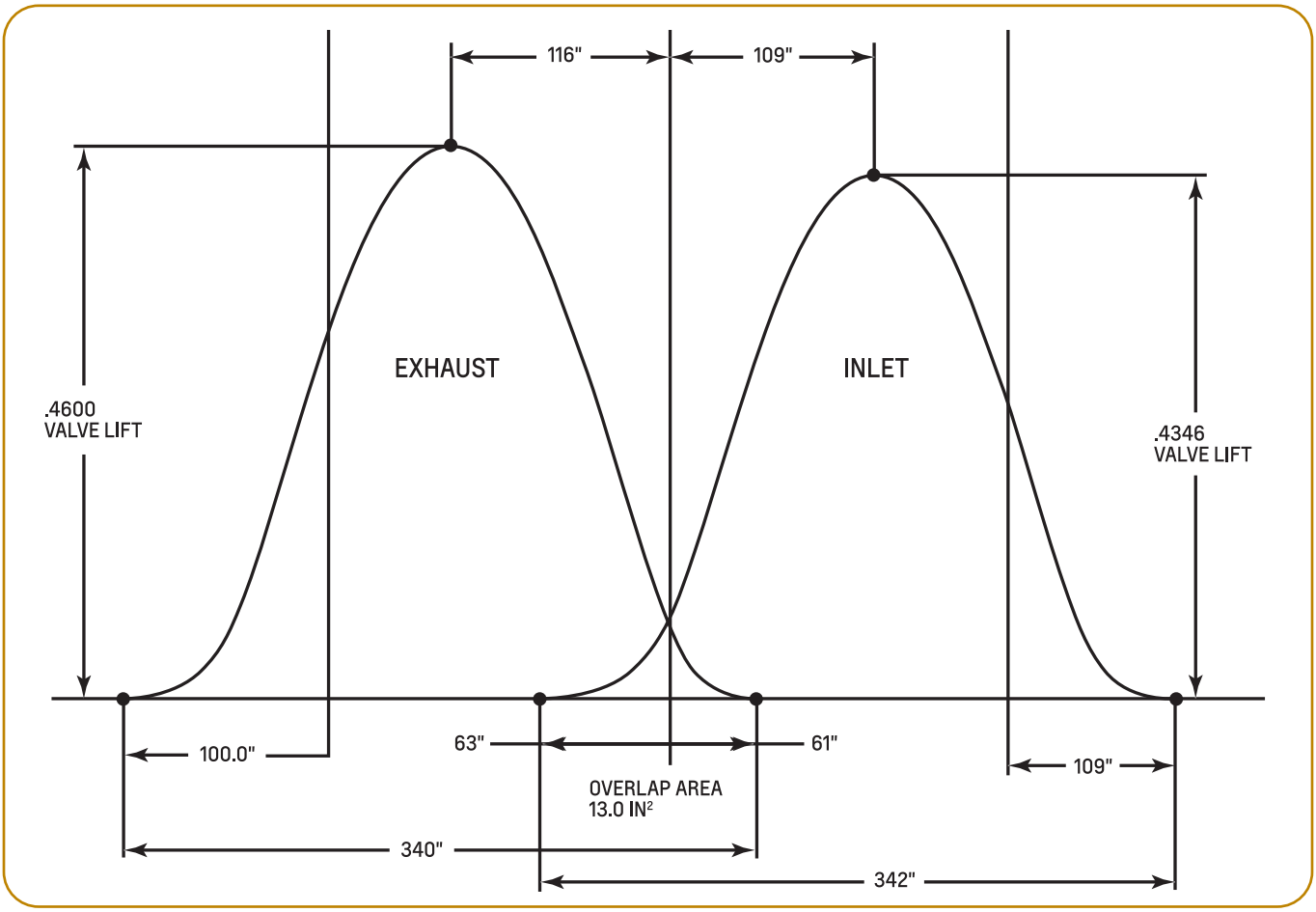
CT 400	Beehive Springs for Fastburn Heads
Valvespring P/N	12713265
free ht.	2.122"
inst. ht.	1.780"
Lbs. @ installed ht. (+/- 4lbs)	98 +/- 4.5 lbs.
open ht.	1.300"
open pressure (+/-8lbs)	267 +/- 13 lbs.
coil bind	1.210"
wire diameter	Ovate [4.29 x 5.37]
Retainer 19303149 (8 Pk)	mass 11.9g
Keeper 19302868 (16 Pk)	mass 3.9g
Spring seat 19303150 (8 Pk)	
Valve spring service 12499224 (16 Pk)	

CT350 (602) Engine Camshaft Specifications

P/N 24502476 camshaft is installed in a CT350 (602) engines. It is a flat tappet camshaft and uses standard hydraulic lifters. See section on valve lash for proper lash procedure.

Valve Lift: .435 intake and .460 exhaust.
Duration @ .050": 212 degrees intake and 222 degrees exhaust.
Cam lobe centerline is: 112.5 degrees.
Intake lobe lift .290". Exhaust lobe lift .307"
Intake base circle radius: .633" Exhaust base circle radius: .616"
Dowel pin hole: Retarded 5 degrees from centerline of # 1 cylinder exhaust lobe, advanced 107.5 degrees from centerline of # 1 cylinder intake lobe. (107.5 +5 = 112.5 degrees lobe separation.)
Note: +/- .010" all dimensions and +/- 5 degrees angularity.

Shown below is a graph of the cam profile for cam p/n 24502476 as used in CT350 (602) engines.



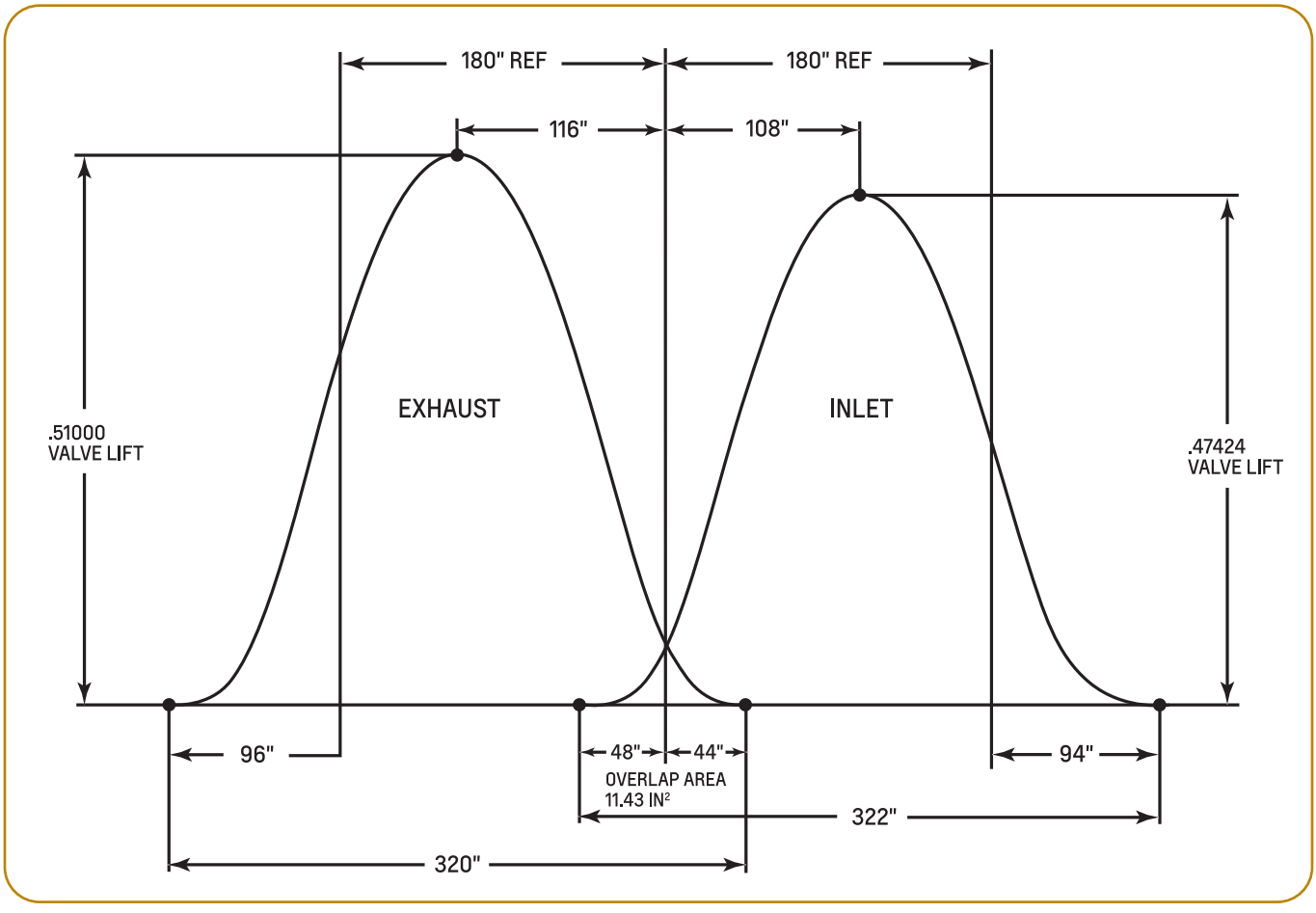
24502476 camshaft specifications

CT400 (604) Engine Camshaft Specifications

P/N 10185071 camshaft is installed the CT400 (604) engines. It is a roller camshaft design and uses hydraulic roller lifters. This camshaft has a red dab of paint located near the camshaft gear for identification. See section on valve lash for proper lash and procedure.

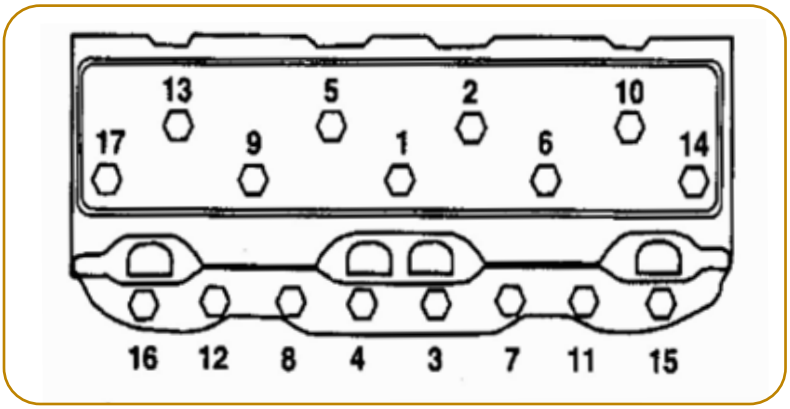
Valve Lift: .474" intake and .510" exhaust.
Duration @ .050": 208 degrees intake and 221 degrees exhaust.
Cam lobe centerline is: 112 degrees.
Intake lobe lift .316". Exhaust lobe lift .340".
Intake base circle radius: .60684" Exhaust base circle radius: .583".
Dowel pin hole: Retarded 5 degrees from centerline of # 1 cylinder exhaust lobe, advanced 107 degrees from centerline of # 1 cylinder intake lobe. (107 +5 = 112 degrees lobe separation)
Note: +/- .010" all dimensions and +/- 5 degrees angularity.

Shown below is a graph of the cam profile for cam p/n 10185071 as used in the CT400 (604) engines.



10185071 camshaft specifications

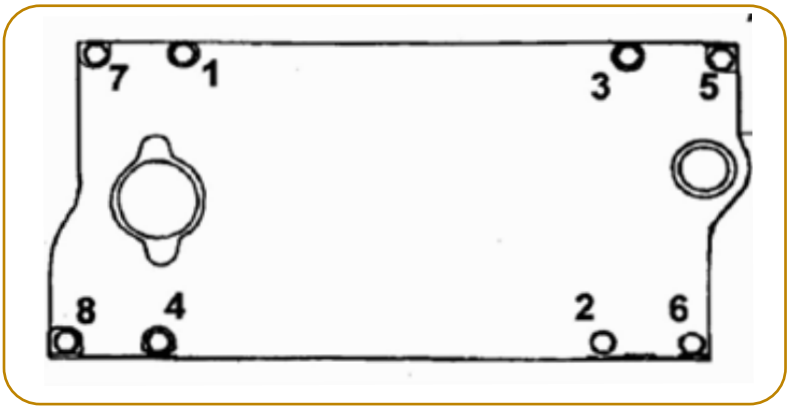
Cylinder Head Torque Sequence



The diagram to the left shows the proper torque sequence for both engines.

Torque bolts to 65 ft lbs. (Torque @ 40 ft .-lbs., then 50 ft.-lbs. and 65 ft.-lbs. final pass.) Use 19333512 Teflon sealer on all bolts unless new.

Intake Torque Sequence for CT350 (602) and CT400 (604) Engines



The torque sequence to the left is for intakes used on CT350 (602) and CT400 (604) engines

Torque all bolts to 10 ft.-lbs. Then torque all bolts to 18 ft.-lbs. Use 19333512 Teflon sealer on bolts unless new. Let intake set for a short period of time and re-torque to 18 ft.-lbs.

FLYWHEEL & TRANSMISSION COMPONENTS

This section is intended to identify the flywheel components that GM recommends. The aftermarket has designed small clutch packs that fit smaller bell housings used in some applications. This section will also will help clarify the confusion between 1-pc & 2pc rear seals and flywheel balance.

Both circle track crate engines use 1pc rear seals. It's a much better seal and was introduced in production engines in 1986. When using a 1pc rear seal, the flywheel must have a counterbalance. All three engines are "internal/external" balanced. It's not like the old 400 engines. They had both a counterbalanced flywheel and balancer. You cannot use a 400 flywheel on circle track engines. The balance is in a different location and the bolt pattern is different. You must use the correct, balanced flywheel.

The front balancers on the circle track crate engines are zero balanced. Therefore the internal components of the engine are zero balanced like a pre 1986 engine. The only difference is the rear flywheel has a counterbalance. This is because the rear of the crankshaft is machined for the 1pc seal. One-piece rear seal engines do not have the counterbalanced flange like pre 1986 engines.

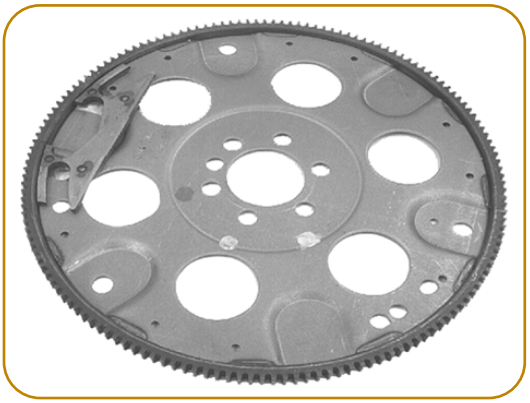


Photo to the left shows a flexplate that fits the CT engines.

The counterweight is shown in the 10 o'clock area of the photo. It is welded in the proper location which makes sure the engine balance is correct.

Make sure whatever flywheel you use has a counterbalance on it or the engine will have a vibration.

This photo shows an aftermarket drive hub.

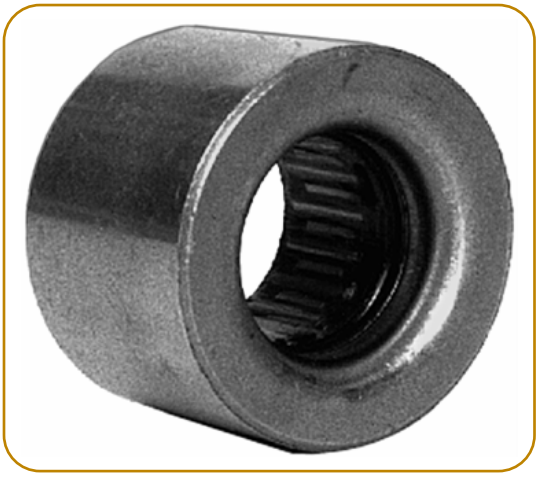
It combines the ring gear, transmission input spline and proper counterbalance location.

This is a great photo of how one aftermarket manufacturer address's the external balance required at the rear of the engine.

When the one piece seal was introduced, GM implemented a change to the bolt pattern diameter. The bolt pattern diameter changed from 3 1/4" to 3". This was done to ensure that older flexplates would not be installed by mistake and cause imbalance issues. Make sure if you are using an aftermarket component, it has the correct balance.

FLYWHEEL & TRANSMISSION COMPONENTS

Description	CT350 (602)	CT400 (604)
Transmission Installation Components		
Flexplate 12-3/4" 153 tooth Automatic	14088765	14088765
Flexplate 14" 168 tooth Automatic HD	12554824	12554824
Flexplate 14" 168 tooth Automatic	14088761	14088761
Flywheel 12-3/4" 153 tooth standard	14088650	14088650
Flywheel 14" 168 tooth Std	14088648	14088648
Flywheel 14" 168 tooth lightweight	14088646	14088646
	Note: 14088646 weighs approximately 15 lbs.	
Pilot Bearing	14061685	14061685
Pilot Bushing	10125896	10125896
Dowel Pin, Bellhousing	(2) - 12720455	(2) - 12720455
Starter, Standard Duty	1876552	1876552
Starter, 153 tooth 93-97 F body LT1	10465143	10465143
Bolt, Starter Long (fits 10465143)	14097278	14097278
Bolt, Starter Short (fits 10465143)	14097279	14097279
Bolt, Flywheel	(6) - 12337973	(6) - 12337973
Bolt, Flexplate (Automatic)	(6) - 03727207	(6) - 03727207
Torque Specifications		
Flywheel Bolts	65-70 ft lbs	65-70 ft lbs
Starter Bolts	35 ft lbs	35 ft lbs



The photo to the left shows a p/n 14061685 crankshaft bushing. Install this roller bearing bushing in the rear of the crankshaft to minimize friction losses.

Info-Glyph Inspection Procedure:

Info-Glyph is a process developed for anti-counterfeiting in which an encrypted message is placed within with a series of dots. GM introduced this technology in late 2005 on circle track sealing bolts. You only need 40-60% of the dots visible to decode the encrypted message. With the proper software, inexpensive digital notebook camera and laptop, the Info-Glyph can be decoded.

Additional Sealing & Tracking Methods:

There are several other ways to seal and track engines. Some are simple, and some are more complex. By adding another level of seals, this reduces chances the engine is modified.

Tracking engines by serial numbers is the best way to understand who has what engine and when it is serviced. The local track can issue serial numbers and stamp them on the block and heads. That engine will be required to be registered on the track web site. This will allow the track to determine how long an engine is in service and who owns it. A registration fee maybe required to cover overhead costs.

Shown is Drill bolt fixture,
stainless wire & safety wire pliers.

Drilled bolt seals

You can install additional seals by installing a couple of drilled bolts in key locations (intake, front cover & oil pan) then run a stainless wire between the bolts and use a crimp seal. The crimp seal can be as simple as the track logo on a pair of vice-grips where you crimp a large fishing sinker. Some bolts can be purchase off the shelf already drilled, making installation easier.

Shown is a Wire lock seal.
www.vmsproducts.net
www.stoffel.com

Wire Lock Seals.

One of the major sanctioning bodies uses seals that involve a seal that locks the wire inside preventing removal. It also has enough area on the lock to serialize and/or add a logo. This sanctioning body has tough rules regarding rebuilds does extensive tech inspections. There resealed engines are monitored closely. They also use the cup plug as shown below as a secondary seal. Both seals are marked, serialized and registered.

Cup plug seals

This method uses a special base that is secured by the bolt. A cap is pressed on to the base and encapsulates the bolt head. Fingers on the base grab the outer rim of the cup and prevent removal without signs of damage. These seals can be serialized and/or a logo added. They are simple to use when a standard size bolt is required. It is more difficult when you have specialty bolts or in tight areas. www.americancasting.com

Cup plug system that can be serialized and track logo installed

One of the earliest series to embrace the circle track crate engine program was the USPRO Series, now known as the ASA Late Model Series. GM Racing and Chevrolet Performance Parts has worked with them to provide some of the procedures listed below. Refer to the actual instructions from each manufacture for 100% accuracy of the test procedures. These are only guidelines.

P&G Procedure:

www.precisionmeasure.com

The P&G tester is one of the best "on site checks" of checking engine displacement. It provides a means to check engine displacement without tearing down the engine.
Note: Engine temperature is critical with this test.

Whistler Procedure:

www.katechengines.com

The Whistler is used to check compression ratio. It's a tool used to check compression ratio of completely assembled engines at the track. Note: Engine temperature is critical with this test.

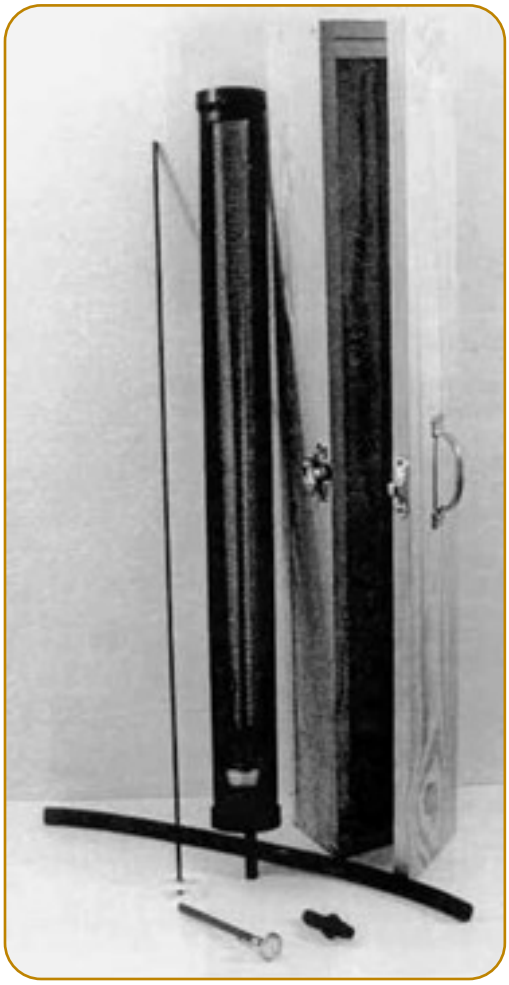
Valve Spring Inspection:

www.moroso.com

Valve springs are an area that teams try and increase the spring pressure to increase RPM limits of the engine. This sheet covers a quick way to check spring pressures on the engine. Refer to the spring chart for proper specifications. Moroso P/N 62391 spring rate checker.

P&G TEST PROCEDURE

The P/G tester is used to check engine displacement. This is a quick on-site tool for checking displacement to determine if it is in the allowable cubic inch range.



Important Information

The P/G tester must be kept clean. Before each use, lubricate the nylon piston, tube and o-ring with fine oil. If tester is to be used for continuous testing, it should be oiled after every tenth (10th) engine is checked.

Engine Preparation

- Remove all spark plugs.
- Select the cylinder number to be checked.
- Have the crew chief remove the both rocker arms and both push rods from selected cylinder.

Testing Procedures

- Insert the spark plug screw adapter into the selected cylinder. If this operation is done by the crew chief, make sure that no washers or spacers are added to the adapter.
- Make sure that the nylon piston is bottomed out in the tester tube. Insert the push rod gently into the tube and slide the piston to the bottom of the tube.
- Note the engine temperature as this will be needed to determine the total cubic inch displacement and for the Whistler Test.

- Important – If the engine is cold, use the same temperature as the outdoor temperature to read the listed cubic inch number adjacent to the temperature. If the engine temperature is warmer than the outdoor temperature read the % correction factor on the chart.
- With the ignition off, crank the engine, at cranking speed for approximately 2 seconds or until the engine has been spun at cranking speed approximately 10 times.
- Read the number where the nylon piston stops. Convert this number to cubic inch displacement using the P&G Conversion Chart.
- Maximum allowable cubic inch displacement for Chevy is: 350.0
  - If on conversion from P&G Conversion Chart is larger than maximum allowable reading, retest immediately. If reading is still over the legal maximum allowable limit, the Whistler Test or cc testing of the heads is necessary.

WHISTLER PROCEDURE

The Whistler measures combustion chamber volume. Using the volume achieved with the tester along with the chart provided by the company, you will know the correct engine displacement.

Measuring Combustion Chamber Volume for Engine Displacement

Requirements

- 110v Power supply
- Portable Air Tank or Compressor

Engine Preparation

- Remove spark plug
- With ignition off and distributor unplugged, crank engine to locate Top Dead Center (TDC) of piston in selected cylinder.
- Purge any remaining gas vapors from selected cylinder using compressed air.
- Insert Whistler adapter into spark plug hole.
- When selecting cylinder to test, be aware that some engines require the removal of the header to accommodate the insertion of the whistler probe.
- Check water temperature via gauge or thermometer.

Testing Procedures

- Plug Whistler into 110 volt power supply.
- Turn on Whistler
- Adjust display as follows:
  - Re-Set the 3 switches as follows.
    - Left hand switch – set for numbers 4-6-8.
    - Center switch has 3 functions.
      - Center position – Set Temperature of engine.
      - Bottom position – Set displacement as determined by P&G test.
        - Maximum Reading for Chevy: 350.0
    - Top Position – this is where the actual reading will appear.
  - Right hand switch is used to set reading – either up or down to change readings.
- Once the engine temperature and engine cubic inches have been entered – move the center switch to top.
- Insert whistler probe into adapter in selected cylinder.
- Make sure that the piston is at TDC.
- Hook up air line to portable air tank.
- Adjust air flow to 20 SCFH.
- Rotate engine slowly in either direction to determine if TDC has been reached.
- At TDC note the highest compression ratio reading. Rotate the engine slowly in the other direction to determine the highest reading. Maximum allowable static reading is 10:1 as shown on the readout. If the reading is larger, cc the heads to determine the legality of the engine.

VALVE SPRING INSPECTION PROCEDURE

This section helps identify those teams that have changed valve springs in an effort to gain additional rpm's. It is important to keep rpm's within GM recommended numbers. Engine life and wear is severely reduced for every 100 rpm's that an engine is over-revved.

Purpose

Check for proper stock valve spring specifications.
Use Moroso p/n 62390.

Step 1. Have the crew chief remove all debris in and around the engine.

Step 2. Have the crew chief remove the valve cover being careful not to contaminate the cylinder head.

Step 3. Have the crew chief remove both rocker arms from the selected cylinder & make sure piston is at BDC.

Step 4. Slide the Moroso valve spring tester into position so that intake valve spring sits in tester pocket.

Step 5. Pull the handle to compress the valve spring to full compression and note the reading. Repeat the test for the exhaust valve spring and note the reading.

Step 6. Refer to chart in rebuild section for correct valve spring pressures for the intake & exhaust. Use the space below to reference the numbers for your application.
Int._____ Exh._____

ENGINE PARTS LIST

Description	CT350 (602)	CT400 (604)
Engine Block Components		
Short Block Assembly	Not Serviced	12561723
Cylinder Block	19431835	19431835
Main Caps	Not Serviced	Not Serviced
Rear Seal Retainer	14088556	14088556
Dowel Pin, Rear Crank Retainer	9441003	9441003
Dowel Pin, Front Cover	(2) - 12554553	(2) - 12554553
Stud, Rear Adap.	(2) - 14101058	(2) - 14101058
Nut, Rear Adap	10108645	10108645
Bolt, Rear Adap.	(2) - 14088561	(2) - 14088561
Bolt, Rear Adap.	14088561	14088561
Rear Cam Plug	10241154	10241154
Cam Bearings	Use p/n 12453170 for 1 &4. P/n 12453171 for #2,3,5	
Dowel Pin, Bellhousing	(2) - 01453658	(2) - 01453658
Crankshaft	12691722	12670965
Connecting Rod. Powdered Metal	10108688	10108688
Piston (Std)	88894280	10159436
Balancer, 8" diameter	19260269	19260269
Cylinder Head Components		
Cylinder Head Assembly	12691728	
Cylinder Head Bare	12691728	N/S
Intake Valve	10241743	12555331
Exhaust Valve	12550909	12551313
Valve Spring	10212811	12551483
Retainer, Valve Spring	14003974	19169661
Key, Valve Retainer	24503856	24503856
Shim, Valve Spring	N/A	10212809
Stud, Rocker Arm	N/S	12552126
Rocker Arm (1 per package)	10089648	19432297
Kool Nut Kit	88961233	N/A
Push Rod	14095256	10046173
Dowel Pin, Cylinder Head	(4) - 585927	(4) - 585927
Intake Manifold Components		
Intake Manifold	12366573	12496822
Distributor	19432312	N/A
Distributor Hold Down	19433111	19433111

ENGINE PARTS LIST *(CONTINUED)*

Description	CT350 (602)	CT400 (604)
Camshaft Components		
Camshaft	24502476	10185071
Lifter	5232720	5234890
Camshaft Gear	340235	12552129
Timing Chain	14087014	14087014
Crankshaft Gear	10128346	14088784
Camshaft Thrust Retainer	N/A	10168501
Timing Cover	12342088	12562818
Timing Tab 8" Balancer	3991436	3991436
Timing Tab 6 3/4" Balancer	3991435	3991435
Oil Pan Components		
Oil Pan	25534353	25534354
Oil Pan Gasket One Piece Design	10107676	10108676
Oil Pump	93442037	14048272
Shaft, Oil Pump Drive	19434251	3998287
Retainer, Nylon oil pump drive	3764554	3764554
Oil Pan & Screen	25534353	25534354
Reinforcement, Oil Pan LH	25534360	25534360
Reinforcement, Oil Pan RH	12553059	12553059
Adapter, Oil Filter	19299222	19299222
Bolt, Oil Filter Adapter	3951644	3951644
Engine Dress Items		
Rod, Fuel Pump	3704817	3704817
Cover, Fuel Pump Opening	14094069	14094069
Water Pump Cast Iron (Long)	12685965	12685965
Water Pump Alum (Long)	12495826	12495826
Water Pump Alum (Short)	19418012	14011012
Valve Cover Kit	25534359	25534359
Valve Cover Breather Kit	25534355	25534355
Miscellaneous Parts		
Balancer, 8" Diameter	19260269	19260269
Balancer, 6 3/4" Diameter	12551537	12551537
Key, Crankshaft Woodruff	(2) - 106751	(2) - 106751
Key, Balancer Woodruff	(2) - 106751	(2) - 106751
Thermostat 180 degree	12555290	12555290
Spark Plug Wires, 135 degree boot	12361050	12361050
Spark Plug Wires, 90 degree boot	19433385	19433385
Spark Plug MR43LTS	19355201	19355201

ENGINE PARTS LIST *(CONTINUED)*

Description	CT350 (602)	CT400 (604)
Factory Rebuild Components - In Kit Form		
Main Bearing All STD	12499102	12499102
Main Bearing Rear (.001 U/S)	N/A	89060460
Main Bearings 1-4 (.0006 U/S)	N/A	12531215
Rod Bearings (Std) (8 req)	17800761	17800761
Ring Package	(8) - 88894219	(8) - 12528817
Ring Package Set (.005" O/S)	(8) - 12507985	(8) - 12528818
Piston Set (8 pcs)	N/S	N/S
Piston High limit (1 pc)	12514102	10159437
Connecting Rod Set (8 pcs)	12495071	12495071
Valve, Intake (8 req)	10241743	12555331
Valve, Exhaust (8 req)	12550909	12551313 set
Valve Spring Set	(16) 10212811	12495494 (Note 1)
Valve Spring Retainer	(16) - 24503856	19169661 (Note 2)
Push Rod Kit (16 pcs)	12495491	12371041
Lifter Kit (16 pcs)	12371044	12371042
Rocker Arm Kit	12495490 (note 3)	19432298 (note 4)
Cylinder Head Bolt Kit	12495499	12495499
Factory Rebuild Gasket List		
Head Gasket (each)	10105117	12557236
Intake Gasket Set	89017465	89017465
Oil Pan Gasket One piece gasket	10108676	10108676
Oil Drain Plug Gasket	N/S	N/S
Rear Main Seal	12554314	12554314
Rear Crank Seal	10088158	10088158
Rear Crank Adapter Gasket	12555714	12555714
Front Timing Cover Seal	10243247	10243247
Valve Cover Gasket	10046089	10046089
Front Timing Cover Gasket	10108435	RTV
Seal, Intake Valve	10212810	10212810
Seal, Exhaust Valve	12564852	12564852
Distributor Gasket	10108445	10108445
Water Outlet Gasket	10105135	10105135
Water Pump Gasket	3754587	3754587
Gasket, Fuel Pump Cover Opening	12560223	12560223
Gasket, Fuel Pump	10114141	10114141
Oil Filter PF-454	19432234	19432234
Note 1. 12495494 contains 16 of 12551483 springs		
Note 2. Requires 16 pcs of 19169661 HD retainers.		
Note 3. 12495490 contains 16 of 10089648 rocker arms		
Note 4. 19432298 contains 16 of 19432297 rocker arms and 16 of 19210730 nuts.		

ENGINE PARTS LIST *(CONTINUED)*

Description	CT350 (602)	CT400 (604)
Factory Service Bolt List		
Factory Sealed Bolt Kit	N/S	N/S
Rebuild Sealed Bolt Kit	N/S	N/S
Bolt, Main Cap Inner	12561388	12561388
Bolt, Main Cap Outer	3877669	3877669
Windage Tray Stud	12561389	12561389
Bolt, Oil Pump	10046007	10046007
Bolt, Oil Pan	(14) - 9440033	(14) - 9440033
Stud, Oil Pan	(2) - 9424877	(2) - 9424877
Nut, Oil Pan Stud	(2) - 12338130	(2) - 12338130
Bolt, Oil Filter Adapter	(2) - 3951644	(2) - 3951644
Bolt, Timing Cover Kit (8 bolts)	12497980	N/A
Bolt, Timing Cover Plastic Cover Short	N/A	(6) - 10213293
Bolt, Timing Cover Plastic cover Long	N/A	(2) - 12551135
Bolt, Head (short)	(16) -10168527	(16) -10168527
Bolt, Head, (medium)	(4) - 10168526	(4) - 10168526
Bolt, Head (long)	(14) - 10168525	(14) - 10168525
Description	CT350 (All 602's)	CT400 (All 604's)
Bolt, Cam Retainer	N/A	(2) - 14093637
Bolt, Valve Cover each	10066008	10066008
Bolt, Flywheel	12337973	12337973
Bolt, Flexplate (automatic)	3727207	3727207
Bolt, Intake	(8) - 12550027	(8) - 12550027
Bolts, Intake 88958603 continued		
Bolts, Intake 88958603 continued		
Bolt, Distributor Hold Down	14091544	14091544
Bolt, Water Outlet	(2) - 10198997	(2) - 10198997
Bolt, Fuel Pump Cover	(2) - 9440033	(2) - 9440033
Bolt, Fuel Pump Holddown	(2) - 88891769	(2) - 88891769
Bolt, Balancer	19355269	19355269
Washer, Balancer	14001829	14001829
Bolt, Water Pump (Short Pump)	(4) - 9424877	(4) - 9424877
Bolt, Water Pump (Long Pump)	(4) - 9442012	(4) - 9442012

NOTES

Catalog Changes.

8-19-11
Page 21 Valve spring free length for 604 engine corrected to 2.145".

April 2013
All references to GM Performance Parts (GMPP) have been changed to Chevrolet or Chevrolet Performance Parts.

November 2017
Updated to include new Intake Manifold installation procedure, new Beehive Valve Springs (on CT400 engines only), new Crankshaft Torsional Damper and new Signakey Sealing Caps. The change in the engine assembly part numbers (CT350 – 88869602 and CT400 – 88869604) were made to reflect the change to the Signakey Sealing Caps.

March 2022
Updated to most recent part numbers on in the system. CT350 crankshaft change to Forged Steel, Main/Rod bearings using Tri-Metal starting in Nov. 2021.

January 2023
Page 6 Added statement "Chevrolet Performance does not condone the rebuilding of these engines..."

Page 10 Added statement recomending use of an established dyno facility/engine supplier under break-in procedure

Page 10 Added statement recommending lighter (5w20) engine oil for initial priming and Breakin Removed description of old style break off bolts (discontinued in 2017)

Removed page on Valve seat Machining

Removed references to Rocker Tool (no longer available from Chevrolet Performance)

8602 Engines Crank and Piston Changes

General Motors has taken great pride in the crate engine program since its inception in 2002 by being able to provide proven, reliable, and affordable engine packages to grass roots racers. The main goal always has been to produce a line of engines that were all built with the exact same parts to keep a level playing field for all competitors. Over the years, the parts content of these engines have remained the same with no significant changes in content.

However, in the summer of 2009 the piston supplier for the 8602 engine approached General Motors and explained that they were no longer able to continue to produce the piston. This was a business decision based on the material availability and process used in manufacturing the piston. General Motors (and the supplier) were aware of the implications to the circle track engine program and tried to find an alternative method to make this piston. The results of the investigation soon boiled down to one of two choices: Either change the piston to a more commonly available material or increase the cost of the engine significantly.

Cost is a major factor in the success of the engine program so the only real choice was to change the piston material and leave the cost of the engine unchanged. Due to the piston change, the crankshaft balance also had to change. There was initially a concern that there would be a possible power difference or advantage between the two piston designs so GM began some extensive testing to find out. The results of this testing proved that no perceivable advantage or disadvantage could be measured between engines equipped with either piston design.

General Motors decided that since parts in the engine are slightly different and that these parts of the engine will not interchange with each other, there had to be a part number change to the engine itself. Since the history of the crate engine program has shown that “8602” (the last 4 digits of the original 88958602 GM part number) was so entrenched in the racing community, the unprecedented decision was made to search for an available part number that used the same last 4 digits. Thus the new part number became 19258602.

So no matter what “8602” engine you or your competitor may have under the hood, be certain that the playing field is still as level as it always was.

This technical manual has been modified to show where this change designates a physical difference between the two engine part numbers.

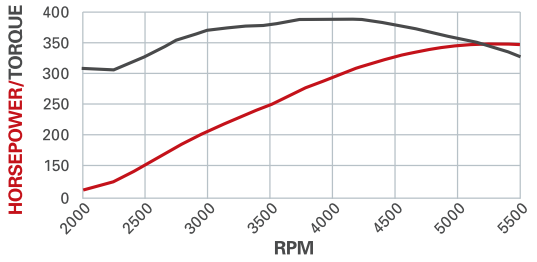
CT350

19434602

350 hp @ 5,400 rpm

396 lb.-ft. @ 3,800 rpm

DYNO CHART



An Affordable, Proven Winner!

Chevrolet Performance's durable CT350 is the budget-conscious crate engine racers can depend on for competitive performance and low maintenance—and with 350 horsepower, it's the perfect match for many short-track series.

The CT350 is based on our popular 350 H0 high-performance street-class crate engine and features a strong four-bolt-main block and iron Vortec cylinder heads. A unique dual-pattern camshaft helps deliver almost 400 lb.-ft. of torque between 2,000 and 5,500 rpm—peaking at 396 lb.-ft. at 3,800 rpm. With that much pulling power, you can hold a gear longer, keeping the engine in its sweet spot for quicker laps.

We assemble the CT350 with an 8-quart circle track racing oil pan, balancer, HEI distributor and an aluminum high-rise, dual-plane intake manifold. Add your carburetor, starter, spark plugs, wires and water pump—all available from Chevrolet Performance—and you'll be ready for the green flag!

INSTALLATION NOTES

- Requires addition of carburetor, starter, water pump, plug wires and exhaust system (not included)
- Requires an externally balanced flywheel (not included).
- The 8-quart circle track oil pan is 8 inches deep at the sump. It will clear most GM rear-steer chassis with stock engine location
- For circle track racing only—not intended for street use
- Circle Track racing engines from Chevrolet Performance include anti-tampering seals installed

Mobil 1 *is the recommended engine oil for all Chevrolet Performance Engines*

TECH SPECS

Part Number:	19434602
Engine Type:	Chevy Small-Block V-8
Displacement (cu in):	350
Bore x Stroke (in):	4.000 x 3.480
Block (P/N 19431835):	Cast iron with 4-bolt main caps
Crankshaft (P/N 12691722):	Forged steel
Connecting Rods (P/N 10108688):	Powdered metal steel
Pistons (P/N 88894280):	Hypereutectic aluminum
Intake Manifold (P/N 12366573):	Dual-plane aluminum
Camshaft Type (P/N 24502476):	Hydraulic flat tappet
Valve Lift (in):	.435 intake / .460 exhaust
Camshaft Duration (@.050 in):	212° intake / 222° exhaust
Cylinder Heads (P/N 12691728):	Vortec iron; 62cc chambers
Valve Size (in):	1.940 intake / 1.500 exhaust
Compression Ratio:	9.12:1 Nominal
Rocker Arms (P/N 10089648):	Stamped steel
Rocker Arm Ratio:	1.5:1
Recommended Fuel:	Premium pump
Ignition Timing:	34° Total @ 4,000 rpm
Maximum Recommended rpm:	5,500
Balanced:	External

***NOTE:** Distributor with melonized steel gear MUST be used with long-blocks and partial engines with steel camshafts, or engine damage will occur.*

This Chevrolet Performance Racing Crate Engine is purpose-built for racing only, and has no warranty.

Chevrolet Performance does not utilize any used or remanufactured parts in this crate engine, except for the starter, alternator and power steering pump.

This part is intended for competition use only.

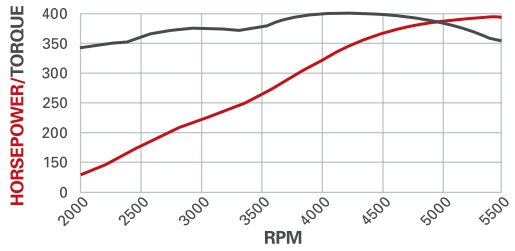
CT400

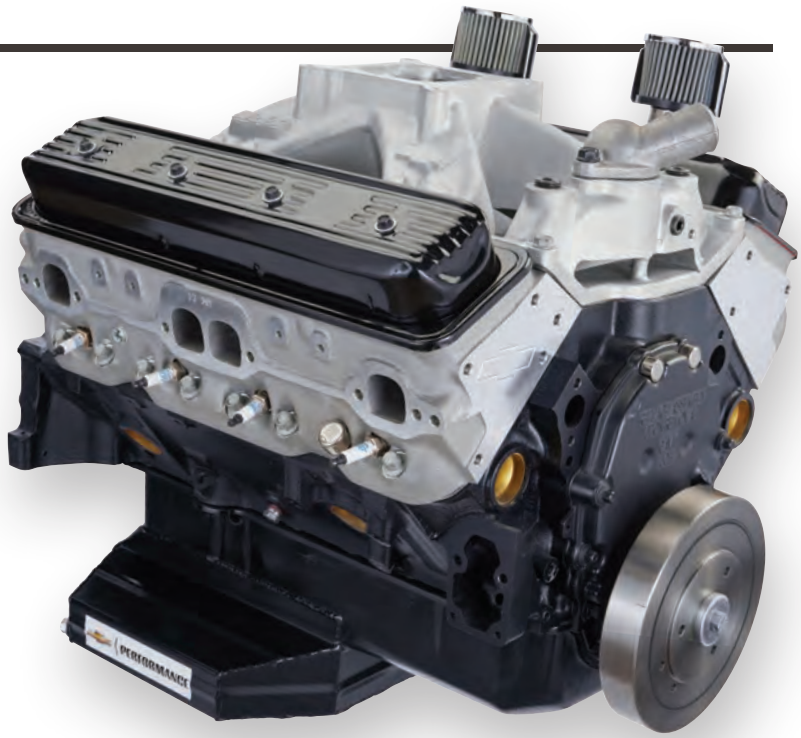
19434604

404 hp @ 5,600 rpm

406 lb.-ft. @ 4,600 rpm

DYNO CHART





High-Revving Performance Lap after Lap

Chevrolet Performance's high-revving CT400 racing crate engine uses aluminum Fast Burn cylinder heads with LS-style beehive valve springs to enable greater high-rpm performance and durability. They allow the engine to rev higher to make the most of every cubic inch of air drawn through it, helping it produce 404 horsepower at 5,600 rpm and 406 lb.-ft. of torque at 4,600 rpm.

The CT400 also has a tough bottom end, anchored by a forged steel crankshaft and strong aluminum pistons installed in a brand-new block with four-bolt mains. It also features a racing oil pan and a single-plane aluminum intake manifold. Add your carburetor and other finishing components to get the CT400 running in your race car, so you can chase the checkered flag!

INSTALLATION NOTES

- Requires addition of carburetor, starter, ignition, plug wires, water pump, distributor and exhaust system (not included)
- Requires an externally balanced flywheel (not included).
- The 8-quart circle track oil pan is 7 inches deep at the sump. It will clear most GM rear-steer chassis with stock engine location
- For circle track racing only—not intended for street use
- Circle Track racing engines from Chevrolet Performance include anti-tampering seals installed

Mobil 1 *is the recommended engine oil for all Chevrolet Performance Engines*

TECH SPECS

Part Number:	19434604
Engine Type:	Chevy Small-Block V-8
Displacement (cu in):	350
Bore x Stroke (in):	4.000 x 3.480
Block (P/N 19431835):	Cast iron with 4-bolt main caps
Crankshaft (P/N 12670965):	Forged steel, shot peened
Connecting Rods (P/N 10108688):	Powdered metal
Pistons (P/N 10159436):	Hypereutectic aluminum
Intake Manifold (P/N 12496822):	Single-plane aluminum
Camshaft Type (P/N 10185071):	Steel hydraulic roller
Valve Lift (in):	.474 intake / .510 exhaust
Camshaft Duration (@.050 in):	208° intake / 221° exhaust
Cylinder Heads (P/N 19417592):	Fast Burn aluminum; 62cc chambers
Valve Size (in):	2.000 intake / 1.550 exhaust
Compression Ratio:	9.72:1 Nominal
Rocker Arms (P/N 19210724):	Aluminum; roller style
Rocker Arm Ratio:	1.5:1
Recommended Fuel:	Premium pump
Ignition Timing:	36° Total @ 4,000 rpm
Maximum Recommended rpm:	5,800
Balanced:	External

***NOTE:** Distributor with melonized steel gear MUST be used with long-blocks and partial engines with steel camshafts, or engine damage will occur.*

This Chevrolet Performance Racing Crate Engine is purpose-built for racing only, and has no warranty.

Chevrolet Performance does not utilize any used or remanufactured parts in this crate engine, except for the starter, alternator and power steering pump.

This part is intended for competition use only.

CHEVROLET | PERFORMANCE

CIRCLE TRACK
CRATE ENGINES

Engines shown from left:
CT400, CT350, CT525

Engineered for Winning

There's more to capturing the checkered flag than horsepower. Week after week and season after season, you need lasting performance—and that's exactly what you can depend on with Chevrolet Performance Circle Track crate engines. Each is built with *brand-new* parts and our 350 engines feature blocks with four-bolt mains—a strength-enhancing feature you won't find on most used blocks. Trust Chevrolet Performance to deliver the durability you need to chase your racing dreams!

***NOTE:** Engines may not come with all the parts shown in photo. See your dealer for more details.*

CHEVROLET

PERFORMANCE
VEHICLES / PARTS / RACING

SAFETY FIRST!
ALWAYS USE PROPER TOOLS AND EYE PROTECTION

CONTACT YOUR LOCAL GM DEALER FOR MORE INFORMATION
DEALERS CAN BE FOUND BY CALLING 1 (800) 468-7387
OR VISITING WWW.CHEVROLETPERFORMANCE.COM

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