CT400 Circle Track Racing Engine (88958604) Specifications

Specifications Part Number 88960586

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This publication provides general information on components and procedures that may be useful when installing or servicing a CT400 circle track crate engine. Please read this entire publication before starting work.

The information below is divided into the following sections: package contents, component information, CT400 engine specifications, additional parts that you may need to purchase, torque specifications, a service parts list, and a baseline chassis set-up.

The CT400 engine is manufactured on current production tooling; consequently you may encounter dissimilarities between the CT400 engine assembly and previous versions of the small block V8. In general, items such as motor mounts, accessory drives, exhaust manifolds, etc. can be transferred to a CT400 engine when it is installed in a race car originally equipped with a small block V8 engine. However, as noted in the following sections, there may be minor differences between a CT400 engine and an older small block V8 engine. These differences may require modifications or additional components not included with the CT400 engine.

It is not the intent of these specifications to replace the comprehensive and detailed service practices explained in the GM service manuals.

Observe all safety precautions and warnings in the service manuals when installing a CT400 engine in any vehicle. Wear eye protection and appropriate protective clothing. When working under or around the vehicle support it securely with jackstands. 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 this conversion safely, this work should be done by a professional.

DATE	REVISION	AUTH
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Legal and Emissions Information

This publication is intended to provide information about the CT400 engine and related components. This manual also describes procedures and modifications that may be useful during the installation of a CT400 engine. It is not intended to replace the comprehensive service manuals and parts catalogs which cover General Motors engines and components. Rather, it is designed to provide supplemental information in areas of interest 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.

Many of the parts described or listed in this manual are merchandised for off-highway application only, and are tagged with the “Special Parts Notice” reproduced here:

Special Parts Notice

This part has been specifically designed for Off-Highwayapplication only. Since the installation of this part may either impair your vehicle’s emission control performance or be uncertified under current Motor Vehicle Safety Standards, it should not be installed in a vehicle used on anystreet or highway. Additionally, any such application could adversely affect the warranty coverage of such an on-street or highway vehicle.

Package contents:

Item	Description	GM Part Number	Quantity
1	Engine Assembly	88960585	1
2	Specifications	88960586	1

Component Information:

Cylinder Heads:

The CT400 engine is equipped with Fast Burn 23-degree small-block GM cylinder heads, GM Part Number 12464298. These cylinder heads are equipped with 2.00" intake and 1.55" exhaust valves, 210cc intake ports and 78cc exhaust sports, and 62cc combustion chambers. They are also drilled for both perimeter bolt and center bolt valve covers. These heads are also drilled for dual bolt patterns for both Vortec design and early model intake manifolds.

Intake Manifold:

The 88958604 engine comes with a GM Performance Parts Single plane intake manifold GM Part Number 12496822. This intake manifold has a standard flange Holley carburetor mounting pad, and uses the Vortec style intake bolt pattern, four bolts per cylinder head.

Rocker Covers:

The CT400 engine comes equipped with center hold-down bolt rocker covers designed for circle track racing. The left hand rocker cover, GM Part Number 25534358 is manufactured with two 1-3/8” tall tubes and two baffles. Mounted on top of these tubes are breathers, GM Part Number 25534355. The cover on the right hand side, GM Part Number 12555266, is stamped without any holes. Included on the right hand valve cover is an engine tune-up decal, GM Part Number 88960589.

Rocker Arms, Nuts / Valve Lash:

The CT400 engine comes equipped with aluminum roller tip rocker arms, GM Part Number 12367345. These rocker arms are self-aligning style, full roller design. The rocker arm nuts used on this engine include a positive locking screw to prevent the rocker arm nut from loosening during use. The recommended valve lash for this engine is zero lash plus 1/4 to 1/2 turn. After the lash has been set, rotate the rocker arm nut 1/3 to 1/2 turn counterclockwise and then snug the set screw. Tighten the nut and snugged set screw combination clockwise 1/3 to 1/2 turn back to the original lash point.

Crate Engine Bolt Sealing System:

A key part of the GM Performance Parts Circle Track crate engine program is the sealing of the engines at the assembly plant. When the engines are assembled, eight (8) tamper-proof bolts are installed to ensure the engines have not been modified after initial assembly. Two bolts are used on the oil pan, two on the front cover, two on the intake manifold, and one on each cylinder head. These bolts cannot be purchased through your local GM dealer. You must contact your local track in the event that you decide to rebuild your engine in the future.

Oil Pan:

Installed on the CT400 engine is oil pan, GM Part Number 25534354. This oil pan was designed for circle track racing, and is a dual “kick out” design. It has an eight (8) quart capacity. The pan is 7” deep and incorporates 6 trap doors, 3 crankshaft scrapers, an oil temperature fitting, and oil check plug.

CT400 Circle Track Crate Engine Specifications:

Displacement:	350 Cubic Inches
Bore x Stroke:	4.00 Inch x 3.48 Inch
Compression:	10.0:1
Horsepower:	400 HP @ 5500 RPM
Torque:	400 ft. lbs. Torque @ 4500 RPM
Block:	Cast Iron, Four-Bolt Intermediate Mains
Cylinder Head:	Cast Aluminum,
Valve Diameter (Intake/Exhaust):	2.00”/1.55”
Chamber Volume:	62cc
Crankshaft:	Forged Steel, 1 Piece Rear Seal
Connecting Rods:	Forged, Powdered Metal, 3/8” Bolts
Pistons:	Cast Aluminum
Camshaft:	Hydraulic Roller Tappet
Lift:	.474” Intake, .510” Exhaust
Duration:	208° Intake,221° Exhaust @ .050” Tappet Lift
Lobe Centerline:	112° ATDC Intake, 112° BTDC Exhaust
Valve Lash	See Valve Lash Procedure
Rocker Arm Ratio:	1.5:1 - Aluminum Roller
Oil Pan:	8-Quart, Baffled Pan with Dual “Kick-Outs”
Oil Pressure (Normal):	40 psi @ 2000 RPM
Recommended Oil	15W50 Synthetic Mobil One
Oil Filter:	AC Delco Part # PF1218
Fuel:	Premium unleaded - 92 (R+M/2)
Maximum Engine Speed:	5800 RPM
Spark Plugs:	AC Delco Part # MR43LTS
Spark Plug Gap	.045"
Spark Timing:	32° BTDC @ 4000 RPM
Firing Order:	1-8-4-3-6-5-7-2

Information may vary with application. All specifications listed are based on the latest production information available at the time of printing.

Additional parts that may be needed:

Ignition System:

GM recommends the HEI distributor, GM Part Number 1104067, for use on this engine package. The HEI distributor is properly curved for this application and comes with a melonized drive gear. You must use a hardened (melonized) drive gear that is compatible with a steel camshaft. Use of a non-hardened distributor gear will result in excessive wear.

The HEI system requires a 12-volt power supply for proper operation. The HEI ignition system should be connected directly to the battery with 10 or 12 gauge wire through a high quality ignition switch. If you are installing an HEI ignition in an early-model vehicle originally equipped with a point-type ignition, be sure to remove or bypass the resistor in the wiring harness to ensure the HEI receives 12 volts continuously. Use distributor connector package GM Part Number 12167658, which includes connectors and wires for the HEI's tachometer and 12 volt terminals.

Set spark timing at 32º before top dead center (BTDC) at 4000 rpm with the vacuum advance line to the distributor disconnected and plugged. This setting will produce 32º of total advance at wide-open throttle (WOT). NOTE: While the HEI distributor also has vacuum advance capability, the vacuum advance canister should be plugged for racing applications.

Carburetor / Air Cleaner:

A model 4150 HP, 650-cfm Holley four-barrel carburetor p/n 80541-1 is recommended for use on the CT400 engine. The recommended carburetor jetting for this application is #73 primary jets, and #73 secondary jets. NOTE: GM Performance Parts does not recommend using a 2 barrel carburetor on its circle track crate engines. Using a two-barrel carburetor will impact the fuel distribution. As a result, the carburetor tune-up must be closely monitored to prevent engine damage.

A minimum air cleaner height of 3 inches tall and diameter of 14 inches, GM Part Number 12372079, is recommended for carbureted circle track applications. A 4 inch tall filter element, GM Part Number 8997189, is also available, if enough hood clearance exists.

Water Pump & Cooling System

Two different water pumps are recommended for use on the CT400 engine, depending on the application. A long leg, cast iron water pump is available as GM Part Number 88894341. A short leg, cast iron water pump is available as GM Part Number 12458924. To ensure the durability of this circle track crate engine, the engine operating temperature should be kept between 180° and 200° F.

Flywheel / Flexplate:

Like all small block V8 engines produced since 1986, the CT400 engine has a 3.00" diameter flywheel flange bolt pattern. Small block V8 engines produced from 1958 through 1985 had a 3.58" diameter flywheel flange bolt pattern. This change in bolt circle diameter was made to accommodate a leak-resistant one-piece rear main seal. Due to revisions in the crankshaft design, a CT400 engine must have a counterweighted flywheel or flexplate for proper balance. Flywheels and flexplates are available from the chart below.

CT400 Engine - Manual Transmission Flywheels

GM Part Number	Outside Diameter	Clutch Diameter	Starter Ring Gear Teeth	Notes
10105832	14"	11.0,11.58"	168	For one-piece crank seal
14088646	12¾"	10.4,11.0"	153	Lightweight nodular iron flywheel, weighs approximately 15 lbs.;for one-piece crank seal
14088650	12-3/4"	10.4"	153	Standard weight flywheel; for one-piece crank seal

CT400 Engine - Automatic Transmission Flexplates

GM Part Number	Outside Diameter	Convertor Bolt Diameter	Starter Ring Gear Teeth	Notes
14088765	12-3/4"	10.75"	153	For one-piece crank seal
12554824	14"	11.50"	168	Heavy-duty flexplate with increased thickness for one-piece crank seal
14088761	14"	10.75,11.50"	168	For one-piece crank seal

Pilot Bearing:

You must install a pilot bearing in the rear of the crankshaft if the engine will be used with a manual transmission. The pilot bearing aligns the transmission input shaft with the crankshaft centerline. A worn or misaligned pilot bearing can cause shifting problems and rapid clutch wear. A roller pilot bearing, GM Part Number 14061685, is recommended for this engine. This heavy-duty bearing adds an extra margin of reliability to a high performance drivetrain.

Starter:

The recommended starter for the CT400 engine is GM Part Number 10455702. This is a lightweight gear reduction starter that was originally used on the 1988-1991 Corvette. This starter is for use with 12 ¾" flywheels. Use GM Part Number 14097278 (long) and 14097279 (short) when installing this starter on this engine.

Oil Filter / Adapter:

An offset oil filter adapter may be installed to provide additional clearance for headers, clutch linkage, and suspension components. This offset oil filter adapter uses a small diameter spin-on filter element.

12556204	Offset oil filter adapter
88893990	Gasket and seal, oil filter adapter
120392	Washer, oil filter adapter (2 required)
14092398	Bolt, oil filter adapter (2 required)
AC PF52	Filter to fit adapter, spin-on

Fuel Pump:

A fuel pump is not included with this engine. However, the fuel system must be capable of supplying adequate fuel volume at a minimum of 6 p.s.i. pressure when the engine is operating at wide open throttle (WOT). A high volume mechanical fuel pump is available from GM Performance Parts as GM Part Number 12355613. It should be used with regulator number 10185094. This heavy-duty pump flows 115 gallons per hour at 9 p.s.i. outlet pressure.

Fuel:

Use 92-93 Octane Unleaded Fuel Only. DO NOT USE LEADED RACING FUEL. Lead based fuels will cause premature failure of the valves and seats. On track testing during the development of this package proved that poor engine performance would result if leaded racing fuels were used due to the slow burn rate.

Headers:

A CT400 engine can be equipped with a header exhaust system for maximum performance. The recommended header configuration is 1 5/8" diameter primary pipes, stepped to 1 ¾" 10 inches from the exhaust port, 32 to 36 inches long primaries, with 3" diameter collectors. Some headers and exhaust manifolds do not properly match the GM Performance Parts Fast Burn cylinder head exhaust ports. Mismatch in this area will cause excessive heat build-up in the cylinder head. Be sure you specify "Fast Burn" head when choosing the header for your vehicle.

Spark Plugs / Spark Plug Wires:

ACDelco spark plugs, MR43LTS, are recommended for this engine package. The recommended gap is .045".

High performance 8 mm diameter spark plug wire sets with the Chevrolet Bow-Tie logo or with the GM Performance Parts logo are available for this application. The GM Performance Parts logo wire sets are available as GM Part Number 12361057 (90° sparkplug boots) and GM Part Number 12361056 (135° sparkplug boots). The Chevrolet logo wire sets are available as GM Part Number 12361051 (90° sparkplug boots) and GM Part Number 12361050 (135° sparkplug boots).

Crate Engine Valve Lash Procedure:

It is imperative to set lash properly on the Circle Track Crate Engine packages 88958602, 88958603, and 88958604. Recommended lash is Zero to 1/4 when engine is at normal operating temperature. To properly set the valve lash, warm up the engine to normal operating temperature (180°-190°) and follow the procedure below. Remove valve covers and disconnect power to the distributor.

IMPORTANT
When lashing valves, it is best to loosen the rocker arm nut slightly while rotating the pushrod with your other hand between two fingers. When you feel the pushrod stop rotating easily, you are then at zero lash. Tighten the set screw against the rocker arm stud and rotate the rocker arm nut and set screw at the same time 1/4 turn maximum. This will allow the set screw to lock properly and hold the valve lash.

Valve Lash Adjustment

1. Position engine at top dead center (TDC) on #1 cylinder in firing position.

   Adjust intake valves on #2 and #7 cylinders.

   Adjust exhaust valves on #4 and # 8 cylinders.

2. Rotate crankshaft 1/2 revolution clockwise.

   Adjust intake valves on #1 and #8 cylinders.

   Adjust exhaust valves on #3 and #6 cylinders.

3. Rotate crankshaft 1/2 revolution clockwise to #6 cylinder in firing position.

   Adjust intake valves on #3 and # 4 cylinders

   Adjust exhaust valves on #5 and #7 cylinders.

4. Rotate crankshaft 1/2 revolution clockwise.

   Adjust intake valves on #5 and #6 cylinders

   Adjust exhaust valves on #1 and #2 cylinders

Reinstall valve covers and connect power to the distributor. Start engine to check for loose valve lash.

Recommended Break-In Procedure:

Start-up is critical to 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 start up and initial break in of the engine.

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.
3. Run the engine between 2,000 and 2,500 rpm, with no-load for the first 30 minutes.
4. Refer to the Valve Lash Procedure (pg 8) 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 followed by letting off in gear and coasting back down to 2000 rpm.
10. Run a couple of hard-throttle accelerations to about 5000 rpm followed by letting off in gear and coasting back down to 2000 rpm.
11. Change the oil and filter with Mobil 1 Synthetic oil (P/N 12347284 and PF1218) and ACDelco oil filter (P/N 25160561).
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!

CT400 Engine Torque Specifications:

Camshaft sprocket bolt/screw	18 ft.-lbs. / 25 N·m
Connecting rod nut	.006" bolt stretch preferred 20 ft.-lbs. + additional 55º (45 ft.-lbs. if no angle gauge is available) / 27 N·m + additional 55º (61 N·m if no angle gauge is available)
Crankshaft balancer bolt/screw	63 ft.-lbs. / 85 N·m
Crankshaft balancer pulley	35 ft.-lbs. / 47 N·m
Crankshaft bearing cap bolt/screw and stud	Inner: 70 ft.-lbs. Outer: 65 ft.-lbs. Inner: 95 N·m Outer: 88 N·m
Crankshaft rear oil seal housing nut/bolt/screw	11 ft.-lbs. / 15 N·m
Cylinder head bolt /screw	65 ft.-lbs. / 88 N·m
Distributor bolt/screw	25 ft.-lbs. / 34 N·m
Drain plug	15 ft.-lbs. / 20 N·m
Engine block oil gallery plug	15 ft.-lbs. / 20 N·m
Engine front cover bolt screw	97 in.-lbs. / 11 N·m
Flywheel bolt/screw	65-70 ft.-lbs. / 88-95 N·m
Intake manifold bolt/screw and stud	11ft lbs / 15 N·m
Oil filter adapter bolt/screw	18 ft.-lbs. / 24 N·m
Oil pan assembly	
Corner nut/bolt/screw	15 ft.-lbs. / 20 N·m
Side rail bolt/screw	97 in.-lbs. / 11 N·m
Oil baffle nut	30 ft.-lbs. / 40 N·m
Oil pan drain plug	15 ft.-lbs. / 20 N·m
Oil pump bolt/screw to rear crankshaft bearing cap	66 ft.-lbs. / 90 N·m
Oil pump cover bolt/screw	80 in.-lbs. / 9 N·m
Spark plug	15 ft.-lbs. / 20 N·m (tapered seat)
Starter motor bolt/screw	35 ft.-lbs. / 48 N·m
Valve lifter guide retainer bolt/screw	18 ft.-lbs. / 24 N·m
Water pump bolt/screw	30 ft.-lbs. / 40 N·m

Service Parts	Quantity	GM Part Number
Block assembly, engine		Not Serviced Separately
Plug, engine block core hole	AR	3826504
Pin, cylinder head locator	2	585927
Bearing, cam #1	1	12453170
Bearing, cam #2&5	2	12453171
Bearing, cam #3&4	2	12453172
Bolt, main bearing inner	10	12561388
Bolt, main bearing outer	10	3877669
Plug, block drain	2	3889330
Bearing, crankshaft #1-2-3-4	4	12531215
Bearing, crankshaft #5	1	12528826
Head, cylinder (complete)	2	12464298
Head, cylinder (bare with studs)	2	12497186
Valve, inlet	8	12555331
Valve, exhaust	8	12551313
Spring, valve	16	12551483
Seal, valve stem	16	10212810
Cap, valve spring	16	10212808
Key, valve stem	32	24503856
Stud, rocker arm	16	12552126
Gasket, cylinder head	2	12557236
Bolt, cylinder head, long	14	10168525
Bolt, cylinder head, medium	4	10168526
Bolt, cylinder head, short	16	10168527
Crankshaft	1	12556307
Pin, rear crankshaft	1	3701679
Pin, rear seal locator	1	9441003
Housing, rear seal (includes studs and seal)	1	14088556
Stud, rear seal housing	1	14080362
Nut, rear seal	1	9439915
Gasket, rear seal housing	1	12555771
Bolt, rear seal	1	14088561
Bolt, rear seal	1	14088562
Deflector, crankshaft oil	1	12554816
Nut, crankshaft oil deflector	AR	9442946
Balancer	1	12555879
Key, balancer	2	106751

Service Parts	Quantity	GM Part Number
Connecting rod	8	10108688
Bolt, connecting rod	16	461372
Nut, connecting rod	16	225854
Piston, with pin (standard)	8	10159436
Piston, with pin (0.001 oversize)	AR	10159437
Piston, with pin (0.030 oversize)	AR	10159438
Ring Kit, (standard)	1	12528817
Ring Kit, (0.030 oversize)	1	12528819
Bearing, connecting rod, (standard)	8	12523924
Bearing, connecting rod, (0.001 undersize)	AR	12523925
Bearing, connecting rod, (0.010 undersize)	AR	12523926
Pan, oil	1	25534354
Plug, oil drain	1	24100042
Gasket, oil pan	1	10108676
Stud, oil pan	AR	14080362
Nut, oil pan	AR	1359887
Bolt, oil pan (1/4-20x5/8)	AR	9440033
Reinforcement, pan LH	1	25534360
Reinforcement, pan RH	1	12553059
Sealer, oil pan corners	AR	12346141
Plug, engine oil level hole	1	25534356
Pump, oil	1	14044872
Shaft, oil pump drive	1	3998287
Retainer, oil pump drive	1	3764554
Bolt, oil pump to main cap	1	10046007
Pin, oil pump locator	1	12554553
Plug and pin kit, engine block	1	12495500
Cover, engine front	1	12562818
Bolt, engine front cover	AR	10213293
Gasket, engine front cover	1	10108435
Pointer, timing	1	12342011
Seal, crank front oil	1	10228655
Sprocket, camshaft	1	12552129
Sprocket, crankshaft	1	14088784
Bolt, camshaft sprocket	3	9424877
Chain, timing (roller)	1	14088783
Plug, rear cam bearing	1	10241154

Service Parts	Quantity	GM Part Number
Push rod	16	10241740
Lifter	16	17120735
Rocker arm	16	12367345
Nut, rocker arm	16	12367347
Camshaft	1	10185071
Valve cover assembly, kit	1	25534359
Gasket, valve cover	2	10046089
Bolt, valve cover	2	12338092
Decal, engine tune-up	1	88960589
Breather kit, engine	1	25534355
Pin, bell housing	1	12338119
Manifold, intake	1	12496822
Gasket kit, intake manifold	1	12529094
Bolt, intake manifold	6	24504713
Balancer assembly, crankshaft	1	12555879
Bolt, balancer assembly	1	3815933
Washer, balancer assembly	1	14001829
Housing, thermostat	1	10108470
Thermostat	1	10202456
Gasket, thermostat housing	1	10105135
Bolt, thermostat housing	2	10198997

All components may vary due to running production changes.

88958604 Baseline Chassis Set-up

The below chassis set-up is provided for a starting point when using the CT400 engine package in a Limited Late Model chassis. This set-up was derived from testing on a 1/2 mile asphalt oval track with 14 & 17 degree banking.

It is very important that proper gearing is selected to keep the engine RPM between 5800-6000 at the end of the straight. The rear gear used was a 5:14 ratio ring & pinion.

Please note this is just a baseline. Set-ups vary depending on driver preference, chassis, tire and track. This set-up is only provided as a starting point. Numbers below were based on total car weight of 2750 lbs. Shocks used were Carrera Hyper Shock brand.

FRONT OF CAR

LF Weight Spring: 1000 Shock: 76	RF Weight Spring: 1200 Shock: 77

Front 50%

Cross 57%

Left: 57%	Right: 43%

Rear 50%

LR Weight Spring: 250 Shock: 94	RR Weight Spring: 225 Shock: 95