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The Chevrolet 350 engine is an iconic powerhouse known for its durability, versatility, and performance. It’s a small-block V8 that has powered countless muscle cars, trucks, and hot rods. Before diving into the rebuild process, it’s essential to understand what makes this engine special. The 350 Chevy features a 4-bolt main design, an iron block, and a distinctive bore and stroke configuration. This engine’s popularity stems from its relatively straightforward design, making it a favorite among enthusiasts for rebuild projects. Familiarity with the basic components—such as the cylinder heads, pistons, crankshaft, and camshaft—helps ensure you’re well-prepared for each step. Whether you’re restoring an old classic or boosting a daily driver, knowing the core structure will make the rebuild smoother and more successful. Remember, patience and careful attention to detail can make all the difference when reviving a Chevy 350 to its former glory. Tools and Parts You’ll Need for Rebuilding a 350 Chevy Engine Getting ready to rebuild your Chevrolet 350 engine means gathering the right set of tools and parts. You’ll need basic hand tools like socket sets, screwdrivers, and wrenches, but don’t forget specialty items such as a harmonic balancer puller, torque wrench, and an engine hoist. A parts washer or cleaning station is a game-changer for thorough cleaning. For parts, ensure you have new pistons, piston rings, gaskets, seals, bearings, valves, valve springs, and a timing chain set. You might also need replacement cylinder heads or valve guides depending on their condition. It’s wise to invest in an engine overhaul kit that includes several essential components bundled together, saving you time and money. Clear planning for the parts you’ll need before starting reduces downtime and prevents last-minute scrambles. Additionally, using high-quality parts based on your rebuild goals—whether it’s for daily driving or high-performance use—can dramatically impact engine longevity and performance. Proper preparation guarantees a smoother rebuild process and a more reliable, powerful engine once complete. Step-by-Step Guide to Disassembling Your Chevrolet 350 Engine Disassembling your Chevy 350 engine begins with draining all fluids—oil, coolant, and transmission fluids—so no mess sneaks up on you. Remove the engine from the vehicle if it’s still installed, then secure it on an engine stand. Start by removing external components: the intake manifold, valve covers, and timing cover. Next, detach the cylinder heads carefully, noting any signs of damage or warping. When removing the pistons and connecting rods, be mindful to keep everything organized to match parts during reassembly. A critical step is to mark or label components as you go, especially the crankshaft, camshaft, and timing components, to ensure proper reinstallation. Use the appropriate tools to loosen the bolts and nuts gradually to prevent damage. During disassembly, inspect each part for cracks, excessive wear, or scoring. This meticulous approach saves you time later when identifying parts that need replacement or repair. Patience is key—taking your time during this step guarantees a thorough and safe teardown, setting the stage for a successful rebuild. Cleaning and Inspecting Each Engine Component Once you’ve disassembled your Chevrolet 350 engine, the next step is to clean each component thoroughly. Dirt, oil sludge, and carbon buildup are common culprits that can hide cracks or wear. Use an industrial parts washer, degreaser, or ultrasonic cleaner to remove grime from the engine block, pistons, valves, and other parts. Pay extra attention to the cylinder bores, oil galleries, and valve seats—these areas are critical for engine health. After cleaning, carefully inspect each part for damage. Look for scoring, pitting, cracks, or warping that could compromise performance or longevity. Magnetic or dye penetrant inspections can help detect cracks hidden to the naked eye. Measure tolerances with a micrometer or dial gauge to check for excessive wear. This step helps determine whether parts are reusable or need replacement. Being meticulous here pays off; a clean and inspected engine guarantees a solid foundation for the rebuild and prevents surprises down the road. Plus, clean components make reassembly easier and result in a professional-looking finish. Identifying Worn or Damaged Parts for Replacement After inspecting each component, it’s time to decide what stays and what goes. Worn-out or damaged parts can cause engine failure down the line if not replaced—so take your time. Pistons with deep scoring, cracked or leaking valves, or a warped cylinder head are clear signs they need to go. The crankshaft should be checked for scoring or bend; if it’s damaged or the bearings show heavy wear, replacing it is a good idea. Similarly, old piston rings often lose tension, reducing compression and power, meaning fresh rings are a must. Bearing surfaces should be smooth; any scoring indicates the need for parts replacement. If the timing chain or gears show significant wear or slack, swap them out to keep timing accurate. Sometimes, you’ll need new valve guides, springs, or seals if the old ones are compromised. Remember, staying honest about the condition of each part ensures your rebuilt engine performs reliably and lasts longer. When in doubt, replacing a suspect part is a small price to pay for peace of mind and engine longevity. Choosing the Right Replacement Parts for Your 350 Chevy Engine Selecting quality replacement parts is crucial for your rebuild’s success. Invest in parts that match or exceed OEM specifications—budget parts may save you money initially but can cause headaches later. High-performance or forged pistons, for example, are great if you plan on pushing your engine for more power, but stock replacements work well for everyday driving. When choosing gaskets and seals, go for brands with proven durability to prevent leaks and overheating. You’ll want to match valve sizes and seats to your desired performance level, especially if you’re doing a valve job or upgrading for racing. It’s also wise to consider the condition and brand reputation of bearings, rings, and other wear components. Keep in mind that some parts may require machine work—like grinding or resurfacing—to ensure perfect fit and sealing. Buying from reputable suppliers guarantees the quality and compatibility needed for a successful rebuild. Remember, the right parts make all the difference in running smoothly and lasting longer—don’t skimp here. Rebuilding the Cylinder Head: Valve Jobs, Cleaning, and Resurfacing The cylinder head is the heart of your engine’s breathing system, so careful attention is needed here. A valve job involves removing the valves, cleaning their seats, and grinding or lapping them to the seats for perfect sealing. This process restores compression and prevents oil leaks. During cleaning, remove carbon deposits and deposits that have accumulated on the valves and seats. Resurfacing the head ensures it’s flat to prevent gasket leaks and maintain proper compression ratios—a crucial step for engine longevity. Replace worn valve springs and retainers, and consider new guides if the old ones are worn or damaged. When reinstalling, check valve clearances and set the timing properly. Everything should fit snugly but operate freely. Don’t forget to double-check the camshaft and timing components as they sync with the head’s valves. A well-maintained and properly rebuilt cylinder head can significantly improve your engine’s performance, efficiency, and lifespan, giving you that satisfying feeling of a job well done. Reconditioning the Pistons, Crankshaft, and Connecting Rods Reconditioning the pistons, crankshaft, and connecting rods involves cleaning and inspecting each to ensure they’re in shape for reassembly. Pistons that show scoring, cracks, or excessive wear should be replaced; otherwise, reconditioning might involve honing the piston tops or replacing rings. The crankshaft must be checked for straightness, balance, and journal wear—any imperfections can lead to engine vibration or failure. If scoring or damage exists, grinding or polishing might be necessary, or a replacement might be the best route. Connecting rods should be measured and checked for bending or twisting; any deformation requires replacing or professional straightening. This step is like giving your engine’s core a physical, making sure everything is tight and true before it goes back inside the engine block. Proper reconditioning guarantees smooth operation and prevents premature failure. Taking the time to carefully inspect and restore these fundamental parts can turn a tired engine into a powerhouse that runs like new. Assembling the Engine Block: Crankshaft, Pistons, and Rings Time to bring all the parts together with precision assembly. Start by installing the crankshaft into the engine block, ensuring it’s properly lubricated and torqued to manufacturer specs. Fit the main bearings and check clearances; proper oil circulation is vital. Next, install the pistons onto the connecting rods, making sure to set the piston rings with correct gaps to prevent oil leaks and loss of compression. Carefully slide the pistons into the cylinders, aligning them with the crankshaft’s journals, and install the piston pin retainer clips or locks. Once all pistons and rods are in place, set the rings on each piston with precise gaps to avoid compression loss. Every part must be assembled with clean hands and proper lubrication. Sealant or gaskets should be applied where necessary to prevent leaks. As this process requires careful attention, double-check your torque specifications and clearances. When completed, your engine block will be a cohesive, high-performance unit ready for the next steps. Installing the Cylinder Head and Valvetrain Components Reattaching the cylinder head is a critical phase that demands patience and precision. First, place a fresh head gasket onto the engine block, making sure it aligns perfectly. Carefully position the head and tighten the head bolts in the sequence specified by the manufacturer to ensure even compression. Once installed, fit the valves, springs, and retainers into the head, checking clearances and setting valve lash if necessary. Use quality lubricants and sealants during assembly to enhance sealing and prevent leaks. Reinstall the rocker arms and pushrods, making sure everything moves freely and is correctly adjusted. Proper valve timing is essential here—set the camshaft and crankshaft to the proper alignment according to your engine’s specifications. This ensures tidy operation of the valvetrain and optimal airflow into and out of the cylinders. When finished, verify each component’s fit, and double-check torque settings. Proper installation of the head and valvetrain is the foundation for an engine that runs smoothly, quietly, and reliably. Timing and Setting Up the Camshaft in a Chevy 350 Engine Setting up the timing on your Chevy 350 is like tuning a fine instrument—precision equals performance. Begin by installing the camshaft in the correct orientation, aligning the timing marks on the cam and crank gears. Typically, to set the timing properly, you’ll need to rotate the crankshaft until the #1 piston reaches Top Dead Center (TDC) on the compression stroke. This puts all the valves in the right position and allows you to align the timing chain and gears accordingly. Once aligned, tighten everything to the specified torque, making sure to use a brand-new timing chain if you’re upgrading or replacing worn parts. Installing a timing cover with a new gasket seals the setup. With the timing in place, you can also install a timing pointer or degree wheel for further fine-tuning. This setup is crucial because it directly affects engine power, fuel efficiency, and smooth operation. Don’t rush this step—double-check your marks, and ensure everything moves smoothly without interference. Proper timing transforms your engine from a simple mechanical device into a finely tuned machine. Adding the Final Touches: Gaskets, Fluids, and Tuning Tips Almost there! Now is the time to make everything airtight and ready for the road. Place fresh gaskets on all sealing surfaces—valve covers, intake manifold, oil pans, and timing covers—and tighten bolts in proper sequence to prevent leaks. Fill the engine with the right combination of fluids—high-quality oil and coolant suited for a Chevy 350—and check for leaks or spills. Before firing up, spin the engine by hand or with a starter to ensure everything turns smoothly. Once started, allow the engine to idle and check for abnormal noises, leaks, or overheating. At this stage, tuning the carburetor, adjusting the ignition timing, and verifying valve clearances will optimize your engine’s performance. A thorough break-in period—typically about 20 to 30 minutes at varying RPMs—ensures the new rings and bearings seat properly. Regular maintenance—changing fluids, inspecting belts, and keeping things clean—will keep your freshly rebuilt engine humming smoothly for miles to come. Remember, this isn’t just about running; it’s about making your engine live a long, happy life. Tips for Breaking In and Maintaining Your Rebuilt Chevrolet 350 Engine Breaking in your rebuilt Chevrolet 350 engine is like establishing a good relationship—patience and consistency pay off. During the initial hours of operation, avoid high RPMs and heavy loads. Instead, vary the engine speed frequently to allow the rings to seat properly against the cylinder walls. Keep a close eye on engine temperature, oil pressure, and any unusual noises—these are your early warning signs. Changing the oil after the first 500 miles ensures any loose debris or metal shavings are removed, preserving vital engine parts. Regular inspections and fluid changes will keep your engine running smoothly, while paying attention to signs of leaks or vibrations can preempt major issues. Proper maintenance extends beyond the first few miles; sticking to a routine schedule for oil, filter, spark plugs, and belt checks keeps everything running like clockwork. A well-maintained rebuild isn’t just about making power; it’s about sustaining it. Keep tools handy and your ears open—your engine’s performance will thank you for it in the long run. A well-known expert was asked what he could learn about the “past life” of an engine during disassembly. He responded, “Everything!” Removing each bolt was his equivalent of turning a page in a book titled “A Detailed History of this Engine.” While you may not have the experience to “read” this much detail, the disassembly steps in this chapter (and the inspection steps in Chapter 3) will act as your “expert” guide. They’ll provide insights and tips that an expert might tell you if he was guiding you through the entire process. To get the most out of this book, take your time, read each of the upcoming steps thoroughly, and think through the procedure before you begin. If this is your first engine rebuild, it’s essential to take the extra time to become familiar with the components you’re removing. If you already have a good deal of experience with tools and engines, you can move along more quickly. However, regardless of your experience, don’t lose your patience and begin skipping steps; you won’t gain full benefit from the “resident expert” you’re holding in your hands. This Tech Tip is From the Full Book “SMALL-BLOCK CHEVROLET: STOCK AND HIGH-PERFORMANCE REBUILDS“. For a comprehensive guide on this entire subject you can visit this link: LEARN MORE ABOUT THIS BOOK HERE SHARE THIS ARTICLE: Please feel free to share this post on Facebook / Twitter / Google+ or any automotive Forums or blogs you read. You can use the social sharing buttons to the left, or copy and paste the website link: Engine Disassembly can tell you a great deal about the “past life” of your engine. Be sure to keep your parts organized during disassembly so you can inspect them further. Keep an Organized Workspace One of the best ways to ensure that your rebuilt engine will provide both top performance and long-term reliability is to establish a comfortable workspace and keep it organized. Don’t even attempt this project if you plan on rebuilding your engine while you roll it around on your driveway. You need a well-lit, clean, and relatively dust-free environment. You need a place where you won’t be distracted by telephones, blasting radios, TVs, or a pack of your best friends. You need a clean workbench, a quality engine stand, the proper tools, and most important, you need patience and the unbending will to “do it right.” Rebuilding an engine involves working with hundreds of components. Each part must be properly removed, reconditioned or replaced, and reinstalled. You can make the job considerably easier and stay more organized by obtaining several plastic storage bins from your local hardware store (warehouse stores such as Menard’s, The Home Depot, and Lowe’s, etc. are excellent sources). Use small bins for small-part storage; use large bins to keep exhaust manifolds, oil pans, cylinder heads, and other large components off your shop floor. Plastic bins can easily be cleaned to store reconditioned parts, and they can be stacked to take up less space. Use small bins for small part storage and large bins to keep pans, cylinder heads, and other large components off your shop floor. Use plastic zipper bags to keep bolts and other small components sorted and identified. Use plastic zipper bags to keep bolts and other small components sorted and identified (the freezer bags even have a printed panel where you can label the parts with a felt-tip marker). Many bolts look very much alike but are not interchangeable. If you’re not intimately familiar with your engine’s hardware, organizing fasteners can save you a lot of time and frustration during reassembly. Make sure to use the Work-A-Long Sheet when instructed in the upcoming steps. It will not only help you keep track of your engine’s “particulars,” it will become a valuable permanent record of your engine rebuild. Having it neatly and accurately filled out can even add value to your engine in the eyes of a potential buyer. Finally, many engine accessory brackets, hoses, and wires can become a confusing jumble later on. To avoid this problem, an upcoming step instructs you to take detailed notes and take a couple of photos before and during the disassembly. Don’t limit your picture taking to these specific steps! Take shots at any point during the rebuild that will help maintain an accurate record. A digital camera is perfect, since there are no processing costs and you can take as many as you need, then file them away on your computer along with any accompanying notes about the photos. Remember, in engine building neatness and organization count, big time! Tools and Supplies Aside from an organized workspace, plastic bins and bags, and basic hand tools (see Chapter 1, “Before You Begin,” for more information on basic tools), you’ll need a few specialized tools and supplies to properly disassemble an engine. In addition to the standard array of hand tools, engine disassembly requires several specialized tools. Line wrenches (used to remove air-injector and other metal lines), a 3-bolt puller (required to remove the vibration damper), and rod bolt protectors (to prevent the crankshaft from being damaged) are just a few. Rust Penetrant. To loosen rusted-on exhaust manifold bolts and other stuck fasteners, penetrating lubricants such as WD-40, CRC 5-56, PB Blaster, and others are a big help. These lubricants often make the difference between a broken or rounded-off fastener and successful disassembly. Heavy-Duty Line Wrench. Line wrenches (box end with a slot that allows it to pass over tubing) are required to remove the air-injector lines on exhaust manifolds and the fuel lines from the carb and pump. We recommend Snap-on part RXS18 for the 9/16- inch wrench, or part RXS608 for a complete set. See Sidebar “Snap-on Tools” on page 10 for more info. Some heavy-duty equipment is also needed to rebuild your engine. The most important is a quality engine stand as well as an engine hoist, to lift the engine onto and off of your engine stand. Valvetrain Organizer. If you’re reusing the rocker arms, valves, springs, and other valvetrain components, you must keep them in order. We recommend a plastic organizer tray, like one from Goodson or Eastwood. You can also quickly make one from a cardboard box (punch 16 holes, label it for front and back, then use the valvestems to “skewer” the springs, rockers, etc.). Vibration Damper Puller. If you try to remove the vibration damper without the right tools, you’ll ruin it. For removal, you’ll need a simple centerbolt puller with three attaching bolts (see Step 32 on page 35). Rod Bolt Protectors. Exposed rod bolts can damage the crank journals during disassembly and reassembly. Short lengths of 3/8-inch rubber hose or plastic protector boots slipped over the bolts are absolutely essential to protect the crankshaft. Goodson and others offer inexpensive protectors. Rod Removal Tool (optional). A tool that attaches to a rod bolt and guides the rod down the bore when removing the pistons is very helpful. B&B Performance offers an inexpensive Pro model or you can make one yourself (see Step 48 on page 38). Engine Stand and Cherry Picker Hoist. These items are a bit expensive but absolutely essential—avoid “cheap” models that don’t roll well or barely hold the engine. Seeing your newly assembled engine lying on the floor is no fun! You can rent a cherry picker, but when you consider how long you’ll need an engine stand, it makes sense to buy one of your own (or borrow one from a patient friend). Generous Supply of Clean Rags. Rags can be purchased from home and business supply warehouses. You’ll need about 25 pounds of “lint-free” cotton rags to complete your engine project. Taking photos of your engine (in addition to marking components) before removing it from your car and during the rebuilding process is a great idea. It will help you maintain an accurate record of your project, plus it can be a big help when you are trying to distinguish one mounting bracket from another. Safety First, Always! Like most jobs, engine disassembly isn’t difficult. All you need are the right tools, patience, and a willingness to learn and think ahead. If you start rushing the job, you’ll make mistakes that will cost you time and money, and you’ll be sorry. If you ignore this particular facet of engine building, you’ll be more than sorry; you could be seriously injured. There isn’t a professional engine builder that can’t tell you at least one story about an inexperienced “over-enthusiast” losing a finger, toe, or eye, or winding up with other mutilations. An engine weighs several hundred pounds; you can’t catch it when it falls! A crankshaft propped up in your garage can tip over easily and cut off a toe. Without proper safety glasses or aface shield, metal shavings, solvent, or other debris can wind up in your eye.Without gloves, you can expose yourself to cancer-causing chemicals. The list is endless. Read the Sidebar, “Shop Safety,” on page 28 before you begin. Think about safety during your entire project. If you know you don’t have the personality to rebuild an engine using the right tools and in a thoughtful and safe manner, you should not start the job. Instead, take your engine to a qualified enginebuilding shop; you’ll get the job finished faster, maybe even cheaper, and certainly safer. Step-by-Step Engine Disassembly Step 1: Ready to Begin Before we pulled the engine for rebuilding, we noted the different brackets and accessories. Note that this AC bracket goes over the valve cover. If we swap to taller valve covers, chances are that this bracket won’t fit anymore. Also, the two intake bolts are a little longer to secure this bracket. Step 2: Record Engine Observations This is a 283 out of a 1966 Chevy II. There are many subtle variations in small-block Chevy engines and their accessories. However, there are more similarities than differences and most of the disassembly steps that follow are applicable to all small-blocks. Regardless of whether your engine has all the accessories attached or is partially stripped, your first step should be to use the Work-A-Long Sheet. Record your knowledge of the engine, including previous operational notes. Also, check off the attached accessories and note any damaged or missing components. This basic information will begin the permanent record of your rebuilding project. Step 3: Record Engine Observations Note the way the alternator bracket mounts to the intake manifold (where the wrench is). If you use an aftermarket intake, be sure there is a mounting hold in the same location. This is why it is a good idea to take photos and notes before disassembly. Step 4: Before Mounting on Stand Several components must be removed (or are easier to remove) before you mount the engine on an engine stand. To prevent the engine from falling over while you perform the next few steps—and to prepare to lift the engine onto an engine stand—use a “cherry picker” hoist. Attach a lifting chain to the engine. Raise the hoist just enough to take the slack out of the chain. Chain tension will keep the engine upright. Step 5: Remove Crank Center Bolt Locate the large centerbolt holding the damper and front pulley onto the crankshaft. Note: Some engines do not use a centerbolt; indicate its presence or absence on the Work-A-Long Sheet. If your engine does not have a centerbolt, skip to Step 6. Loosen and remove this bolt with a 1/2-inch-drive breaker bar (or impact wrench). The crankshaft will probably rotate as you attempt to loosen the bolt. Lock the crankshaft by inserting a pry bar or large screwdriver through one of the flexplate holes or in between the ring gear and starter housing (see Step 4). If there is no flywheel or flexplate on your engine (and you don’t have an impact wrench), leave the centerbolt in place, we’ll remove it later. Step 6: Remove Flywheel or Flexplate Make sure the engine is not resting on the ring gear. Loosen and remove the six bolts that retain the flywheel or flexplate. These bolts are also very tight; use a 1/2-inch-drive socket and a long breaker bar. Be careful as you remove the flywheel; don’t let it fall on your fingers! Note that the flywheel bolts use star-type lockwashers and have fine threads. Keep them together in your parts bins or bags. If your engine is equipped with a flywheel and clutch assembly, the pressure plate and clutch disk must be removed first. There will be six bolts holding the clutch disk in place and the bolts should be loosened evenly before being removed. Use care not to drop the pressure plate or clutch disk as you remove it. Step 7: Remove Rear Oil Gallery and Water Jacket Plugs In this step we’ll remove three oil gallery (pipe) plugs and two water jacket core plugs installed in the rear of the block (the large cam plug will be removed later). Note: If you can’t remove any of these core plugs, ask your machine shop to remove them before they clean your block. The gallery plugs: They are extremely tight and often must be drilled and removed with an extractor. However, they can sometimes be loosened with a special 1/4-inch square-drive pipe-plug socket (Snap-on set 211PPPMY). Never use a 1/4-inch drive ratchet or extension; it will break off and remain jammed in the plug! The core plugs: Remove the two core plugs by first driving them in the water jacket with a large 1/2-inch-drive socket (11⁄16 inches usually works). Then work the plugs to one side, grab them with a Vise-Grip or adjustable pliers, and lever them out. This Tech Tip is From the Full Book “SMALL-BLOCK CHEVROLET: STOCK AND HIGH-PERFORMANCE REBUILDS“. For a comprehensive guide on this entire subject you can visit this link: LEARN MORE ABOUT THIS BOOK HERE SHARE THIS ARTICLE: Please feel free to share this post on Facebook / Twitter / Google+ or any automotive Forums or blogs you read. You can use the social sharing buttons to the left, or copy and paste the website link: Step 8: Mount Engine on Stand You cannot build a quality engine if you have to roll it around on your garage floor! A heavy-duty engine stand is an essential part of your engine-building project. Use a “cherry picker” to lift the engine into position, then attach the engine to the stand using at least grade-5 bolts that thread into the block no less than 1/2 inch. Be sure to get the engine secured and put the lock pin in to hold it steady or tighten the lock bolt/setscrew on the stand. Step 9: Drain Oil Make sure the engine is securely mounted on the engine stand. Remove the lift point and/or attaching chains. Before you proceed, consider placing a drip pan on or under your engine stand. If you don’t, engine oil, antifreeze, grease, dirt, rust, and other unpleasant gunk will wind up under foot as you tear your engine apart. Now, drain engine oil from the pan and remove the oil filter. Remember, used engine oil is a toxic waste; keep it off your hands (latex gloves available at most paint stores work nicely) and dispose of it in an environmentally appropriate manner. Step 10: Remove Accessories and Mounting Brackets If your engine is so equipped, begin accessory removal by unbolting the air-conditioning compressor and its mounting bracket. Next, remove the fan, smog pump, power steering pump, and alternator. Unbolt all remaining mounting brackets located on the front of the engine. Step 11: Remove Distributor/Spark Plugs Distributors are positioned to optimize engine-compartment clearance. Record its general position on your Work-A-Long Sheet before you loosen it. Start by removing all spark plug wires. Then unbolt and remove the distributor hold-down clamp. Remove the distributor by twisting and lifting it by the bottom of the housing. Note that, as you lift up, the rotor turns. This is due to the helical gear. Don’t apply excessive force to the rotor, cap, or vacuum-advance housing. Finally, remove the spark plugs. Since the appearance of the insulators can help diagnose some engine malfunctions, you may want to number the spark plugs (masking tape works well) for future reference. While you’re working on top of the engine, strip the intake manifold of the EGR valve, carb, and thermostat housing. Step 12: Apply Penetrant Before you attempt to remove any exhaust system bolts and fittings, apply a liberal amount of rust penetrant to each fastener and allow it to soak in for at least 10 minutes. See Sidebar “Removing Stubborn Fasteners” on page 24. If any of the bolts don’t break loose, don’t apply excessive force. STOP! Apply more penetrant, and try again. Step 13: Remove Exhaust Manifolds and Air-Injection Lines Before you remove the exhaust manifolds, mark them with an “L” or “1” (left bank) or an “R” or “2” (right bank). Some stock manifolds are already marked (as ours was). Now bend back any locking tabs on the exhaust manifold bolts, and remove the bolts and manifolds. If your engine has them, remove the spark plug heat shields that are attached to the top edge of the block. If you have AIR tubes to remove from the manifold (if using the same manifolds, leave them in place), soak them in penetrant. Then, use a quality 9/16-inch line wrench, such as this thickheaded Snap-on model (part RXS18), to remove the lines. If an injector tube starts to twist with the nut, STOP! Apply more penetrant and work the nut back and forth until it turns freely Step 14: Remove Motor Mounts and Starter Some motor mounts/brackets may be left/right interchangeable, while others are not. If you feel there may be any confusion during reassembly, mark each bracket with a tag or stamp. Remove the front motor mounts and/or mounting brackets from each side of the cylinder block. Next, remove the starter support bracket (if your engine has one). Then remove the two starter attaching bolts. The starter is heavy, so be careful as you remove the final bolt. Step 15: Remove Fuel Pump and Pump Support Plate Remove any fuel lines still attached to the fuel pump. Unscrew the two 3/8-inch pump attaching bolts and remove the fuel pump. Next, remove the two 1/4-inch bolts holding the pump mounting plate to the block. Use a gasket scraper or screwdriver to pry the mounting plate loose. Finally, slide the fuel-pump pushrod out of the block. Set these components aside in your parts bins. Step 16: Remove All Topside Accessories Remove all remaining accessories from the intake manifold, including the carburetor and choke bi-metal housing. Also, remove the oil pressure sender from the rear of the block. Snap-on and other manufacturers offer special sockets for “idiot light” and gauge-type units. However, a deep socket, open-end wrench, or adjustable pliers will remove most types. Don’t apply force to the plastic on small senders, or to the “can” on larger sending units. Step 17: Remove Water Pump Remove the water pump by removing the four bolts that secure it to the engine block. When the bolts are removed, you may need a small pry bar or large screwdriver to break the pump loose from the block, but don’t pry against the timing chain cover— you could easily damage it. Chevrolet used two different length water pumps through the 1960s and early 1970s: a short pump (on the left) and a long pump (on the right). The short pumps were used on engines in Corvettes, Novas, and other engines that were short on space between the pump and the radiator. Be sure to use the same style that you had before, or your brackets and pulleys will be all wrong. Step 18: Remove Valve Covers Remove all remaining components that may still be attached to the valve covers. Then remove the cover bolts and covers. If you have to pry the covers loose, take your time because excessive force can easily bend them. In about 1986, Chevy changed the retaining arrangement of their valve covers. No longer were the four bolts on the outer edge of the cover and head. The bolts were actually moved to the center of the valve cover (such as the grungy model shown). These were much less prone to oil leaks over time. Step 19: Remove Intake Manifold Remove all Remaining bolts attaching the intake manifold to the cylinder heads. Most manifolds will come loose after prying with a screwdriver inserted between the manifold and the end-rails of the block. If your manifold seems to be “really stuck,” STOP! Make sure all the manifold bolts have been removed. When the manifold has been removed, note the heat-riser passage configuration (providing it hasn’t been burned out) of the intake gaskets on your Work-A-Long Sheet for future reference. Step 20: Remove Rocker Arms and Pushrods Remove each of the rocker arms by unscrewing the self-locking nuts. It is recommended that you replace these lock nuts, but try to keep the old ones for your visual inspection. Goodson offers a helpful tray just for valvetrain disassembly. Lift the rocker arm off the stud and pull out the pushrod. Roll each pushrod on a clean, flat surface to make sure none are bent. Mark or label them and note any damage in your Work-Along Sheet for future reference. This Tech Tip is From the Full Book “SMALL-BLOCK CHEVROLET: STOCK AND HIGH-PERFORMANCE REBUILDS“. For a comprehensive guide on this entire subject you can visit this link: LEARN MORE ABOUT THIS BOOK HERE SHARE THIS ARTICLE: Please feel free to share this post on Facebook / Twitter / Google+ or any automotive Forums or blogs you read. You can use the social sharing buttons to the left, or copy and paste the website link: Step 21: Remove Head Bolts First, make sure the lock-bolt on the engine stand that prevents block rotation is tight. Use a long, 1/2-inchbreaker bar and a 5/8-inch 6-point socket. Break all the head bolts loose, then go back with a short-handled ratchet and remove all but two bolts in each head. Leave one bolt near each end of each cylinder head (four bolts). Unscrew these four remaining bolts only two or three turns. Step 22: Remove Cylinder Heads In most cases, the cylinder head will be stuck to the block with sealing compound and corrosion. To coax it loose, insert a breaker bar or pry bar into one of the intake ports and smoothly apply pressure until the head pops up against the two remaining head bolts. If the head resists prying loose, STOP! Make sure all but two bolts have been removed and the two remaining bolts are loose. After the head is loose, mark it with an “L” or “1” (left bank) or an “R” or “2” (right bank). Now remove the two remaining bolts and lift the head onto your workbench. Use the same technique to remove the other cylinder head. Step 23: Remove and Tag Head Gaskets/Remove Dowel Pins Remove the cylinder head gaskets—they usually remain stuck on the cylinder block. Tag each gasket “LEFT” or “RIGHT” and note its type on your Work-A-Long Sheet. The cylinder heads and gaskets are located on the block by two dowel pins on each deck surface. Most machine shops remove and replace these pins as a matter of course when machine work is performed. If you have the proper tools, you can remove them now. But don’t drive them into the water jackets. They can become stuck below the deck surface or you may even crack the block and render it useless. The best way to remove them is to first tap them with a hammer and brass drift, and then use a 5/16-inch collet-type puller, such as this tool from Goodson. Step 24: Remove Lifters If you’re considering reusing the camshaft and lifters, each lifter must be reinstalled in the same lifter bore, or you will doom the cam to destruction. Label each part upon removal or use a disassembly tray like those from Goodson or Crane Cams. Remove each lifter by using a hooked probe to pull it up, then grasp and remove the lifter body with your fingers and/or needle-nose pliers. Some lifters may also be so worn (mushroomed) that they will not slide out of their bores. If you find any, just pull the lifter up as much as possible, and leave it in the bore. We’ll remove it later. Note the location of any suspect lifters on your Work-A-Long Sheet. Step 25: Remove Oil Pan and Dipstick Before you rotate the engine on your engine stand, remove the fourteen 1/4-inch and four 5/16-inch pan bolts (the larger bolts are located at each end of the pan). If the pan is stuck to the block (most are), insert a gasket scraper or screwdriver between the block and pan rails, but try not to bend the pan. Gently pry on both sides until the pan comes loose. Also, remove the dipstick and dipstick tube by twisting it back and forth by hand. If it doesn’t come out, insert a 5/16 x 1-inch bolt into the tube and use a pair of adjustable pliers to twist it out. This Tech Tip is From the Full Book “SMALL-BLOCK CHEVROLET: STOCK AND HIGH-PERFORMANCE REBUILDS“. For a comprehensive guide on this entire subject you can visit this link: LEARN MORE ABOUT THIS BOOK HERE SHARE THIS ARTICLE: Please feel free to share this post on Facebook / Twitter / Google+ or any automotive Forums or blogs you read. You can use the social sharing buttons to the left, or copy and paste the website link: Step 26: Remove Crank Pulley Remove the 3/8-inch bolts that hold the crank pulley to the vibration damper. Before you toss the bolts into a bin, carefully inspect them, and indicate whether they have fine (NF), like the bolt on the left, or coarse (NC) threads (right) on your Work-A-Long Sheet. Fine threads are used more often, but there is no way to predict what you’ll find. Step 27: Install Damper Puller You must use a 3-bolt puller to remove the vibration damper. This puller is used in a variety of applications so adding one to your toolbox is a good idea. We got ours from Snap-on. Before you begin, check three important things. First, make sure you’re using the correct puller. Don’t use a puller that grabs the outer ring—you’ll pull the ring right off the damper! Second, make sure the puller draw bolt does not damage threads in the nose of the crankshaft. If you have any doubts, reinstall the crank bolt—without the washer—and allow the draw bolt to push against the head of the crank bolt. Third, make sure the threads on the three attaching bolts match the threads in the damper and that the bolts have been screwed into the damper at least 3/8 inch. Step 28: Remove Vibration Damper When you’re sure the puller is properly installed, tighten the draw bolt. To prevent the crank from turning, insert a wood handle between the crank and the block. The damper will usually break loose with a “pop.” If the draw bolt gets very tight and the damper won’t budge, STOP! Make sure the draw bolt is properly contacting the crank and that the three attaching bolts are not pulling out of the damper (you should have screwed them in at least 3/8 inch). If everything looks okay, continue tightening until the damper comes loose. Step 29: Remove Timing Chain Cover Now, remove the 10-1/4-inch timing chain cover bolts—they often use separate star type lockwashers. Place the bolts and lockwashers in your parts bin. If the top dead center (TDC) timing indicator plate is held on with two cover bolts, indicate the attaching bolt locations on your Work-A-Long Sheet. Pry the cover loose by inserting a gasket scraper or screwdriver between the cover and the block; gently pry until the cover comes free. Step 30: Remove Crank Key Remove the vibration-damper locating key in the crank snout by using a 5/16-inch (maximum) non-tapering drift punch. Drive the key toward the front main. As the key moves back in its slot, it will climb out of the crank. When two-thirds of the key is visible, use pliers to pull it free. Note: If the crank slot is enlarged or the key is loose, the crank may be unusable (more on this in Chapter 3). Step 31: Remove Timing Chain and Sprockets Loosen and remove the three bolts that hold the upper sprocket to the camshaft. The sprocket will usually come off with a slight “tug.” If it’s stuck, gently pry each side of the gear with a screwdriver wedged between the sprocket and the block face. The timing chain will come off with the upper sprocket. Sometimes the lower sprocket will slide off of the crankshaft with little effort; however, it is often firmly attached. If yours is tight, a gear puller will be needed to remove it. If you don’t have the proper tool, don’t worry about it; your machine shop will remove the lower sprocket for you (usually at no charge) when they inspect or regrind your crank. Step 32: Remove Camshaft Removing the camshaft is easier if you install a “handle” like the ones offered by Goodson. You can also use a long, 3/8-inch NC bolt, or temporarily reinstall the cam sprocket as a handhold. Twist the cam back and forth, as you remove it. Keep the cam centered and prevent it from “falling” against the bearings as it slides out of the block. Step 33: Rotate Engine in Stand Most engine short blocks Contain residual coolant, dirt, rust, and other debris that will fall to your garage floor when you rotate the block upside down. If you don’t have a drip pan under your engine stand, spread rags on the floor to catch as much of the spillage as possible. Turning the engine slowly will also help keep the mess contained. Note: If the pump driveshaft falls out, just set it aside for now. Step 34: Remove the Oil Pump If you are planning to install a new or special oil pump (see Sidebar “Oil Pumps” on page 44), now is a good time to remove the pickup from the pump body. If you will be reusing the old pump, do not remove the pickup and skip to Step 35. First, make sure that the pickup tube has not been welded or brazed to the pump cover. If it has, remove the weld with a small die grinder before you proceed. Insert a pry bar into the pickup pipe loop as shown. Twist once or twice while pushing the pickup away from the pump cover. The tube should quickly loosen up enough to be removed by hand. Remove the single bolt holding the oil pump to the rear main. Wiggle the pump while you’re pulling upward to free the pump from the two dowel pins in the cap. When loose, continue lifting straight up. In most cases, a plastic attaching sleeve will keep the short pump driveshaft attached to the oil pump. If the shaft separates from the pump, it may fall through the distributor hole and to the floor; this may have happened already when you rotated the engine upside down. Set the pump and driveshaft aside. Step 35: Remove Oil Filter Adapter Remove the two 1/4- or 5/16-inch bolts that hold the oil filter adapter to the block. Note: Your filter adapter may look different from the one pictured here. When the bolts have been removed, lift the adapter free, note the adapter type on your Work-A-Long Sheet, and set it aside in your parts bin. Step 36: Turning the Crankshaft In the following steps, you’ll need to rotate the crankshaft to continue disassembly. You can use a handy crank socket, such as this Snap-on example, which allows you to turn the crank in either direction. In a pinch, you can reinstall the crank centerbolt with a spacer (bottom photo), then use a standard 5/8-inch socket and breaker bar. Step 37: Number Rod and Main Caps Before you begin bottom-end disassembly, it is essential that you number the rod and main caps. They are not interchangeable, and mixing the caps is a sure road to bearing failure. Don’t skip this step even if you notice that the caps are already numbered; some engines come with duplicate numbers! You can use center-punch marks. However, a set of 1/8- or 3/16-inch steel number stamps do a nice job. Regardless of the method you choose, don’t stamp the caps across the parting lines. Position your numbers or punch marks only on the flat areas adjacent to the parting lines. Stamp both halves of the rods, and to ease assembly, stamp the main caps and the block. Number the rods 1 through 8 and the mains 1 through 5. Step 38: What to Do About Excessive Cylinder Ridge If your block has a ridge in the bores deeper than about .008 inch, it will catch the rings during assembly. You can use a ridge reamer to remove the ledge and save the pistons, but this may be false economy (especially when you consider that more good blocks are scrapped by the incorrect use of a ridge reamer than any other single mishap). When a deep ridge has been worn into the bores, the pistons are usually worn out too. So the best solution is simply to drive the pistons out. While the rings or ring grooves may break, the block will not be damaged. To save the pistons, use a top-quality reamer, such as Snap-on’s (part WR30A) or have your machine shop cut the ridge. Step 39: Beg

balancer from the crankshaft. The next part to remove is the oil pan. There are seventeen bolts holding on my oil pan. After removing all the bolts, remove the oil pan. Now it is time to remove the timing cover. There are two bolts and two studs holding on my timing cover. After removing the bolts and studs, I remove the timing cover. You will need to remove the bolt holding the fuel pump eccentric to the cam shaft. Now you can remove the two gears and the timing chain. If your lifters are still stuck, place the upper gear (without the chain) back on the camshaft and rotate it, so you can get your lifters to move.If your distributor is still stuck you will want to remove the oil pump's two bolts, and then use a rubber hammer to hit the oil pump drive shaft. This drive shaft is connected to the bottom of the distributor and should knock the distributor loose. Now it is time to remove the camshaft. Start by removing the two bolts that hold on the camshaft thrust plate. After removing the plate your should be able to pull the camshaft out. There are camshaft bearings that help the camshaft rotate, but we will let the machine shop remove and install those so that we do not damage the block. If you have not already, go ahead and remove the two bolts holding the oil pump. After removing the oil pump, remove the oil pump driveshaft. Next, remove the oil pan baffle, or windage tray, which is secured with four bolts. The lower dipstick tube is also connected to the tray. Make sure to inventory the tube so you do not lose it. The next step is a very important step. It is time to remove your pistons. You will want to remove your connecting rod caps and pistons one at a time so that you do not get them mixed up. Start by removing the connecting rod cap nuts. Then you will need to remove the cap and note its orientation. You may need to tap it with a rubber hammer to get them loose. After removing the cap use a long wooden or rubber handle to remove the piston. Then mate the cap back to its connecting rod. The next thing to remove is the main caps. Remove the two bolts on each cap and then remove the cap. After removing all of the caps, go ahead and remove the crankshaft. You will then need to remove the main bearings from the block by pushing on the end opposite of the bearing tang (indent). Your block is now completely disassembled and ready to go to the machine shop. The last thing to disassemble is your cylinder heads. The final part to disassemble is your cylinder heads. You will want to purchase or rent a valve spring compressor. Do not use the overhead valve spring compressor because they do not work. You will want a valve spring compressor like this one. You will also want to take a large socket and hit the spring with it to break it free from the valve spring keepers. Next, you will want to compress the valve spring and remove the keepers using a magnet or a small screwdriver. After releasing the pressure from the valve spring compressor, you can remove the spring, spring shem, and valve. I labeled my valves, springs, keepers, and spring shems just like I labeled my rockers, pushrods, and lifters. The final thing to remove is the sensors that are connected to the cylinder heads. After that, your engine is completely disassembled and ready to go to the machine shop! That is my progress so far, so stay tuned for the next part of this instructable when I take my engine to the machine shop and put it back together. I am seventeen years old and have a part time fast food job in my small town in Ohio. Working on engines is very expensive and when you make minimum wage you don't have very much money to pay for one. I am also planning to restore a 1979 Pontiac Firebird Trans Am. I also plan to finish this instructable and make another instructable about restoring the car. Any donations to the link below are appreciated. Thanks! [Pro OBD2 Scanner] - BlueDriver is the easiest way to scan and understand your vehicle like a professional mechanic. Read and clear your car’s trouble codes and check engine light. Complete A wide variety of fastening applications with 1030 ft-lbs. of max fastening torque and 1400 ft-lbs. of max breakaway torque. PRECISION PERFORMANCE - Help prevent rounding of fasteners with sockets featuring DirectTorque Technology. PRECISE & HIGH QUALITY - Manufactured in Taiwan, our torque wrench is engineered for superior precision. It ships pre-calibrated to +/- 4% accuracy, ensuring dependable results every time. Includes a calibration certificate with a trackable serial number for your assurance. Multi-Functions - It's a practical multi-function OBD2 code reader which helps you determine the cause of the check engine light coming on, quickly read and remove diagnostic trouble codes, read live data & hard memory data, view freeze frame, I/M monitor readiness and collect vehicle information. Instead of taking car to mechanic shop, you can use it to check the trouble code and show code definition by yourself. Wide Compatibility - Supports 9 protocols compatible with most 1996 US-Based, 2000 EU-Based and Asian cars, light trucks, SUVs, as well as newer OBD2 and CAN vehicles both domestic and foreign. Check compatibility with your vehicle model before purchasing. It can also be used for some motorcycle OBD2 system diagnosis. (Note: an additional specific adapter cable is needed. not included with this device) 2.8" LCD Display & Multi-language - Designed with a clear 2.8" LCD screen (128 x 64 pixels) - white backlight and contrast adjustment. No need any battery or charger, OBD reader gets the power directly from your vehicle through the OBDII Data Link Connector. It also supports 6 languages - English,German, Dutch, Spanish, French and Italian. This scanner is enjoyed and highly recommended by the customers worldwide. Compact Design & Easy to Use - It weighs about 12 ounces and measures 6 x 2.75 x 0.9 inches. Equiped with a 2.5 feet long heavy duty cable and the standard 16-PIN OBD connector. 6 buttons for quick operation. The plug and play design makes it user-friendly. Even if you don't have much technical knowledge, you can operate it without any hassle. "Accurate & Fast - Different with other similar scanners, the MP69033 scanner use the brand new ARM micro processor to make sure the ultra high accuracy and fast speed. With the excellent performance of the micro processor, the detailed real-time engine data can be detected and displayed on the screen in seconds. Get codes, fix the problem and turn off the CEL. If you just need a code reader to check your car, it's definitely an affordable and reliable tool. Have you ever thought about giving your classic Chevy a new lease on life? Rebuilding a 350 Chevrolet engine can seem daunting, but it’s a rewarding project that can save you money and boost your car’s performance. Whether you’re a seasoned mechanic or a DIY enthusiast, this guide will walk you through the essential steps to get your engine running like new. Understanding the 350 Chevrolet Engine: This popular small-block engine delivers impressive power and efficiency, making it ideal for various applications, from classic cars to modern trucks. Essential Tools and Materials: Gather a comprehensive set of tools, including socket sets, wrench sets, torque wrenches, and a rebuild kit containing crucial components like gaskets and bearings for a successful rebuild. Step-by-Step Rebuilding Process: Follow the systematic approach of disassembly, cleaning, inspection, and careful reassembly to achieve improved performance and longevity for your engine. Common Challenges and Solutions: Be prepared to identify worn components, maintain proper torque specifications, and ensure clean assembly to avoid issues like leaks and performance failure. Post-Rebuild Maintenance Tips: Regular oil changes, fluid monitoring, and routine inspections are vital for the longevity of a rebuilt engine, alongside engaging with car communities for support and insights. The 350 Chevrolet engine, often celebrated for its balance of power and efficiency, belongs to the small-block family of engines introduced in the mid-1960s. This 5.7-liter V8 engine delivers impressive torque and horsepower, making it a popular choice among enthusiasts for various applications, from classic cars to modern trucks. The engine features a cast iron block and aluminum cylinder heads, contributing to its durability. Its design allows for easy modifications, enhancing its performance capabilities. You’ll find many parts and upgrades available, which cater to both everyday drivers and high-performance builds. Key specifications of the 350 Chevrolet engine include: ARCAN Tools 3-Ton Steel Professional Garage Jack (A20005) CRAFTSMAN 102-Piece Tool Kit for Home and Car, Durable Hand Tool Set with SAE/Metric Sockets (CMMT99449) NOCO Boost Plus GB40 1000A UltraSafe Car Battery Jump Starter, 12V Jump Starter Battery Pack, Battery Booster, Jump Box, Portable Charger and Jumper Cables for 6.0L Gasoline and 3.0L Diesel Engines BIG RED T43002A Torin Steel Jack Stands: Double Locking, 3 Ton (6,000 lb) Capacity, Red, 1 Pair AstroAI Digital Tire Pressure Gauge with Inflator, 250 PSI Air Chuck & Compressor Accessories Heavy Duty with Quick Connect Coupler, 0.1 Display Resolution, Car Accessories, 1pack Specification Value Displacement 5.7 liters (350 cubic inches) Horsepower Ranges from 145 to 370+ depending on the configuration Torque Ranges from 250 to 400+ lb-ft depending on the configuration Bore x Stroke 4.00 in x 3.48 in Compression Ratio Typically between 8.5:1 and 10.5:1 When considering a rebuild, knowing your engine’s history, including previous performance upgrades or maintenance issues, is essential. A well-documented service history can streamline the rebuilding process and guide your decisions on parts and modifications. Visualizing the engine’s architecture aids understanding its function. The 350 consists of key components, such as: Block: The engine’s foundation houses the cylinders and crankshaft. Cylinder Heads: These cover the top of the cylinders, containing intake and exhaust valves. Camshaft: Controls the timing of the opening and closing of the valves. Crankshaft: Converts linear motion from the pistons into rotational motion. Each component plays a critical role in the engine’s performance. Take note of how they interact, as this helps in planning your rebuild strategy. You’ll encounter numerous resources, including manuals and online forums, where enthusiasts share their rebuild stories. Engaging with the community can provide insights and troubleshooting tips specific to your 350 Chevy engine. Gathering the right tools and materials simplifies the process of rebuilding your 350 Chevrolet engine. This section outlines essential tools and recommended parts to ensure a successful rebuild. Sun Joe Electric Pressure Power Washer, 2030 PSI (PWMA Certified), 1.76 GPM, Dual Soap Tanks, SPX3000 (35-FT GFCI Water-Safe, Power Cord) AstroAI Digital Multimeter Tester 2000 Counts with DC AC Voltmeter and Ohm Volt Amp Meter; Measures Voltage, Current, Resistance, Continuity and Diode, Blue KONNWEI KW208 12V Car Battery Tester, 100-2000 CCA Load Tester Automotive Alternator Tester Digital Auto Battery Analyzer Charging Cranking System Tester for Truck Marine Motorcycle SUV Boat GLOVEWORKS HD Orange Nitrile Gloves, 8 Mil, Disposable, Raised Diamond Texture, Mechanic Gloves AstroAI Tire Inflator Portable Air Compressor Tire Air Pump for Car Tires - Car Accessories, 12V DC Auto Pump with Digital Pressure Gauge, Emergency LED Light for Bicycle, Balloons, Yellow Socket Set – A comprehensive metric and standard socket set will allow for various bolt sizes. Wrench Set – A full set of combination wrenches is crucial for tightening and loosening fasteners. Torque Wrench – Ensures bolts are tightened to manufacturer specifications for optimal performance. Engine Stand – Provides support and stability while you work on the engine. Crankshaft Pulley Tool – Assists in removing and installing crankshaft pulleys easily. Piston Ring Compressor – Helps install piston rings on pistons efficiently without damage. Feeler Gauge – Essential for measuring the gap between spark plug electrodes or other components. Magnetic Pickup Tool – Aids in retrieving dropped bolts or parts in tight spaces. Shop Manual – Contains specific information for your engine, providing valuable guidance throughout your rebuild. Rebuild Kit – A complete rebuild kit typically includes gaskets, rings, bearings, and seals, making it a convenient choice. Pistons – Upgrading to high-performance pistons can enhance power and efficiency. Camshaft – Selecting an appropriate camshaft profile affects torque and horsepower. Choose one based on your performance goals. Cylinder Heads – Consider aftermarket heads for improved airflow, contributing to better engine performance. Timing Chain and Gears – Replacing these with high-quality components ensures proper engine timing. Oil Pump – A new or upgraded oil pump maintains optimal oil pressure, which is vital for engine longevity. Fuel Injectors – Replacing old injectors with new ones improves fuel delivery and engine responsiveness. Water Pump – A reliable water pump keeps your engine cool during operation. Headers – Headers can provide better exhaust flow, positively impacting performance. This collection of tools and parts lays a solid foundation for your engine rebuild. Preparing adequately helps ensure a smoother process and enhances the performance of your rebuilt engine. Rebuilding a 350 Chevrolet engine involves several crucial steps. Follow these detailed instructions to ensure a successful rebuild. Gather Tools: Collect essential tools including a socket set, wrenches, and pliers. An engine hoist simplifies the removal process. Remove Engine Components: Detach accessories like the alternator, carburetor, and intake manifold. Document your steps for easy reassembly. Take Apart the Engine Block: Remove the cylinder heads, connecting rods, and crankshaft. Pay attention to the order of removal. Store Parts Safely: Keep bolts and small parts in labeled bags. This method prevents mix-ups during reassembly. Use a Parts Washer: Clean metal components in a dedicated parts washer. Ensure thorough removal of carbon deposits and grime. Inspect for Damage: Look for cracks or excessive wear on cleaned parts. Use a magnifying glass for a detailed check. Chemical Cleaners: Apply chemical cleaners for stubborn residues. Follow the manufacturer’s instructions for safe usage. Dry Completely: Use compressed air or cloth to remove moisture before reassembly. Moisture can cause rust and damage. Examine Cylinder Walls: Check for scratches or scoring. A smooth surface is essential for proper piston function. Check Tolerances: Use calipers to measure important dimensions like bore and main bearing clearance. Reference specifications from a repair manual. Replace Worn Parts: Swap out any damaged components. This could include bearings, piston rings, and gaskets. Micrometer Utilization: Utilize a micrometer for precision measurements. Accurate findings ensure optimal performance. Follow a Manual: Use a service manual for specific torque specifications and assembly sequences. This ensures you follow the correct procedures. Apply Assembly Lube: Coat moving parts with assembly lube to reduce initial wear. This method prolongs engine life. Install Components in Reverse Order: Assemble parts in the opposite order of disassembly. Refer to your notes and labeled bags. Double-Check All Connections: Ensure all bolts and connections are tightened per specifications. A thorough check reduces the chances of future leaks or failures. By adhering to these steps, you can successfully rebuild your 350 Chevrolet engine, leading to improved performance and longevity. Rebuilding a 350 Chevrolet engine presents common challenges that require practical solutions. Here’s a closer look at these challenges and how to overcome them. Identifying worn components can be tricky. Inspect each part carefully for signs of wear or damage. Common indicators include scoring on cylinder walls, pitting on crankshafts, and worn valve seats. If you notice significant wear, replace the part with high-quality components. This ensures longevity and performance. Improving the engine’s performance relies on correct torque specifications. Missing or improperly tightening bolts impacts engine integrity. Always refer to a service manual for the exact torque values. Use a calibrated torque wrench for accuracy. This prevents issues like gasket leaks or component failure. Cleaning engine components can become cumbersome. Debris and oil buildup often resist initial efforts. A parts washer effectively removes stubborn grease. For areas that require extra attention, use brushes and solvents designed for engine cleaning. Ensure all components are thoroughly cleaned to avoid contamination during assembly. Maintaining tolerances during assembly is crucial. If gaps between parts are off, engine performance suffers. Use feeler gauges and micrometers to measure clearances accurately. Adjust components as needed. For example, replace bearings if they show excessive wear, ensuring they match specified tolerances. Sealing components properly can be challenging. Leaks may occur if gaskets or seals aren’t fitted correctly. Always clean surfaces thoroughly before installing seals. Consider using a light layer of gasket sealer for added protection. This helps ensure components stay secure and leak-free. Assembly can feel overwhelming due to numerous parts and sequences. To simplify this, create a checklist as you reassemble each component. Keeping a detailed sequence of the assembly process helps prevent mistakes. Mark components clearly as you complete them to track progress. Re-torquing components after initial assembly can be often overlooked. It’s essential to check the torque of critical bolts after the engine runs for the first time. This helps ensure everything settles properly. Follow up and re-check torque values after a short break-in period. Lack of access to resources may hinder your rebuilding efforts. Engage with local car clubs or online forums for guidance and support. Many experienced rebuilders share tips and troubleshooting advice that can be invaluable. Consider investing in service manuals for specific details on your 350 engine. By tackling these common challenges with the suggested solutions, you set the stage for a successful rebuild of your 350 Chevrolet engine, enhancing its performance and reliability. Change the oil every 3,000 to 5,000 miles. Fresh oil lubricates moving parts and prevents sludge buildup. Use high-quality oil specific to your engine’s requirements. Check coolant, transmission fluid, and brake fluid regularly. Low levels may indicate leaks or other issues. Topping off fluids keeps your engine running smoothly. Examine belts and hoses for wear or cracks every few months. Replace damaged components promptly to avoid breakdowns. Consider replacing them every 50,000 miles as a precaution. Remove dirt and debris from the engine bay to prevent overheating. Use a gentle cleaner and a soft brush, and rinse off residues. A clean engine is easier to inspect for potential issues. Inspect for oil or coolant leaks after every drive. Address any leaks immediately to avoid engine damage. Use cardboard under the engine to help detect leaks. Keep an eye on the temperature gauge during drives. If the engine runs hotter than usual, investigate coolant levels and the condition of the radiator. Overheating can cause severe damage. Perform a tune-up every 30,000 miles. Replace spark plugs, ignition wires, and filters. Regular maintenance helps maintain performance and fuel efficiency. Avoid rapid acceleration and hard braking. Smooth driving reduces stress on engine components. Aim for steady speeds to improve fuel economy. Utilize high-quality fuel from reputable stations. Quality fuel can optimize engine performance and longevity. Avoid low-grade fuels that can cause deposits over time. Join local car clubs or online forums for support and resources. Sharing experiences with other enthusiasts provides valuable insights and tips to maintain your rebuilt engine. Rebuilding your 350 Chevrolet engine can be a rewarding journey filled with learning and accomplishment. You’ll not only save money but also gain a deeper appreciation for your classic Chevy. Remember that patience and attention to detail are key throughout the process. By following the steps outlined and staying engaged with the community, you’ll set yourself up for success. With proper maintenance, your rebuilt engine will deliver impressive performance for years to come. Enjoy the ride and the satisfaction that comes from knowing you’ve breathed new life into your beloved vehicle. The 350 Chevrolet engine is a 5.7-liter V8 engine known for its balance of power and efficiency. It belongs to the small-block family and has been a popular choice for various applications since its introduction in the mid-1960s. Depending on the configuration, it offers horsepower from 145 to over 370 and torque from 250 to over 400 lb-ft. Rebuilding a 350 Chevrolet engine can rejuvenate a classic Chevy and significantly improve performance while saving costs. The process, although challenging, offers rewards like enhanced power and efficiency, making it an appealing project for both experienced mechanics and DIY enthusiasts. Essential tools for a 350 engine rebuild include a comprehensive socket set, wrench set, torque wrench, engine stand, and piston ring compressor. Additionally, a rebuild kit with gaskets, rings, bearings, and seals is recommended for a smoother restoration process. Rebuilding a 350 Chevrolet engine involves several key steps: disassembling the engine, cleaning and inspecting components, checking tolerances, replacing worn parts, and finally, assembling the engine. Following a service manual for torque specifications can ensure proper assembly. During the rebuild, common challenges include identifying worn components, ensuring correct torque specifications, and effectively cleaning engine parts. Maintaining tolerances during assembly and sealing components properly to prevent leaks are also critical for successful rebuilding. To maintain your rebuilt engine, regularly change the oil, monitor fluid levels, inspect belts and hoses, and keep the engine clean. Check for leaks and engine temperature, schedule tune-ups, drive smoothly, and use quality fuel for optimal longevity and performance. Engaging with local car clubs, online forums, and automotive communities can provide valuable support and resources. These platforms offer insights, troubleshooting tips, and a space to share experiences with fellow enthusiasts, enhancing your rebuilding journey. These days, recycling is all the rage. Airplanes get ground up and turned into beer cans, which eventually get melted down and formed into some other widget we just can't live without. In a way, hot rodding is one of the “greenest” hobbies out there. We take old worn-out junk and rebuild it into functioning items. This is especially true of engines. Sometimes, it's an old crank that's cleaned up and put to use again, or maybe it's a discarded engine block left to gather dust in the back of a shop. Whatever it is, the whole concept of turning trash into treasure is what drives our hobby.The nexus for this story was an old short-block we found in the back of the shop. After doing a little sleuthing, we determined it was the remnants of a GM ZZ4 crate engine. Now, we're pretty sure that many hot rodders have half-built engines lying about, so why not see what the addition of a few aftermarket parts could recycle these mills into? In our case, the ZZ4 first hit the streets well over 10 years ago. Back then, 355 horsepower was a much more impressive number, and the price of gas was much lower. So our plan became to up the power a bit and do it so it'll run on a lower grade (less expensive!) of gasoline. We also wanted to try out a few parts that have recently caught our attention. The first was a Thumpr cam from COMP. These hydraulic roller cams are ground and profiled to maximize the rough-idling characteristics without negatively impacting the power output or streetability of the engine. In other words, the hot rod sound we love without the hassle.We also wanted to try out Summit Racing's new line of wallet-friendly aluminum heads. The cost of cylinder heads can quickly consume the lion's share of any engine build budget, so finding some affordable choices that still make good power really helps to keep the costs down. To make sure we did it right we hauled all the parts over to EVOD Garage in Escondido, California. Oh, and if this mill looks a bit familiar it's because it powers Dick Kvamme's road trippin' '61 that graced last month's cover.01.Our starting point is this clean ZZ4 GM Performance Parts 350-inch short-block. At some point someone swiped all the parts off of it and left it languishing in a corner. When it had all of its original parts, this GM crate engine was rated at 355 horsepower and 405 lb-ft of torque. Not bad, but we’re pretty sure we can improve upon those numbers without sacrificing street manners or breaking the bank.02. Since it had been sitting around for who knows how many years, we decided to do a quick teardown and inspection of the short-block. We found all the GM parts, including the powdered metal rods, aluminum pistons, and forged crank, to be in great condition. Better safe than sorry and besides, it’s no fun building things twice.03.For a camshaft, we ditched the factory 208/221-degree, 112 LSA bumpstick for a COMP Thumpr stick (PN 08-600-8, $297). The Thumpr wasn’t crazy big (227/241-degree duration, 107 LSA), but it will give the engine that lumpy hot rod sound we dig.04.The GM timing chain was MIA so we picked up a nice COMP roller timing chain and gearset from Summit Racing (PN 3136, $72).05. With the parts in place, we were able to properly degree the cam. This often overlooked step is crucial if the engine is going to run to its full potential.06.The roller system used this set of GM hydraulic lifters and a spider lifter retainer.07. We then installed a Rattler Torsional Vibration Absorber from TCI. The Rattler is designed to absorb, rather than just damp, vibrations and is SFI 18.1 certified.08.When it came to heads, we had a choice to make. The GM heads that came with the ZZ4 engine had 58cc chambers that worked the compression to right around 10:1, which meant we needed to use 92-octane gas. Given today’s gas prices we opted to go with Summit Racing’s 200cc street/strip aluminum heads (PN 162111, $1,050 pair). These feature 64cc chambers that drop our compression to around 9.6:1, allowing us to run much less expensive 87-octane gas if we choose.09.For $1,000, it’s really hard to beat these Summit-branded heads. They feature phosphorous, bronze valveguides; ductile iron valve seats; and came fully assembled with 2.02/1.60 stainless steel valves. The heads also had screw-in rocker studs, guideplates, and 7-degree valve locks. To secure them to the block we used a set of Fel-Pro head gaskets (PN 1003, $38 each) and a set of ARP stainless head bolts (PN 434-3601, $169). If you want to sacrifice a little bling and save a few bucks you can get the bolts in black oxide for $79.10. For rockers, we decided to roll with a set of COMP Ultra Golds we had left over from a previous build (PN 19004-16, $282). On this engine we could have gotten away with a lesser rocker, but the Ultra Golds are rock solid and being full-roller, they will free up a bit of power. This did mean we needed to swap out the 3/8-inch rocker studs that came with the Summit heads for some 7/16-inch versions.11.It’s a street engine, so we opted to go the dual-plane route when choosing an intake. This Weiand Speed Warrior aluminum intake (PN 8501, $225) featured long, separated runners for improved bottom and mid-range power. Plus, the runner design won’t choke off the power in the higher rpm range (up to 6,000 rpm).12.Now, when it comes to valve cover gaskets you can cheap out and go with standard cork, but we much prefer these Fel-Pro steel-core silicone pieces (PN 1628). They seal great, which equates to no leaks—oil or vacuum. They will also last nearly forever. Trust us; they are well worth the $50.13.To spark the fuel we chose a ready-to-run MSD billet distributor (PN 8360, $290). With a vacuum advance we will get better economy, which is even more important these days. The housing features an all-billet 6061-T6 aluminum design for super accuracy and an oversized steel shaft that is QPQ-coated for low friction. Sealed bearings at the top and bottom of the distributor make sure it all stays steady, which equates to accurate spark delivery at any rpm.14.This engine belongs to Dick Kvamme over at Best of Show Coach Works and since they’re always willing to lend us a lift or spray a little paint, we asked the guys over at Eddie Motorsports (EMS) to whip up some special valve covers for the small-block. EMS can laser etch any design you send them onto their valve covers, air cleaners, breathers, or other widgets for a fee based on the complexity of the design. Pricing starts at $40, and the logo we sent them ran about $50 for the pair, plus the cost of the valve covers.15.To top off our engine, we went with Holley’s new Ultra Street Avenger carburetor (PN 86770HB, $599). At 770 cfm, it’s sized just right for our mill and the electronic choke will make it easy to live with on the street. The carb features ultra-lightweight aluminum construction along with billet metering blocks and base for more strength than cast pieces. It’s also easy to adjust and change the spring for the vacuum actuated secondaries.16. At Westech Performance, we strapped the newly revitalized ZZ4 engine to the Superflow dyno, filled the tank with 87-octane pump gas, and fired it up. Once properly broken in, Westech’s carb-guru Steve Brule started making pulls and performing adjustments. Over the course of a dozen pulls, he slowly added timing, installed a lighter spring for the vacuum secondaries, and swapped the jets around. On pull 13, we were rewarded with our best corrected numbers of 413 hp and 415 lb-ft of torque. That’s more power than the ZZ4 made stock and we did it with less compression and on lower octane gas that GM recommends. As for torque, the peak isn’t much higher than the ZZ4’s advertised number, but we really like the flat curve and that it made over 370 lb-ft way down at 3,000 rpm. If we didn’t mind upping the compression and running the more expensive swill there was even more power to be had, but we still remember when a 400hp engine was enough to make us smile. Besides, this is more than enough to motivate Dick Kva orange and black image by John Sfondilias from Fotolia.com When an engine reaches its durability limit, it performs poorly or it does not perform at all. Chevrolet is a good example of one engine builder with loyal owners. Because its 350 motors were easily rebuilt and produced big power, they became popular in the racing industry. The Chevy 350 engine remains one of the most rebuilt, upgraded, tuned and reworked engine in history. One reason is because you can rebuild it back to new. Loosen and remove all the retaining bolts of the upper block including the valve covers, intake manifold and fuel pump. Pull each component free from the long block and set aside. Remove the lifters and valve shafts from the each head and store to the side. Flip the block over to access the oil pan and crankshaft to remove them from the block prior to any work to rebuild a 350 Chevy engine. Removing all the internal parts will give you access to the cylinders and bearing, which when replaced or machined, will be what makes your rebuild good or great. Remove the oil pan to expose the crankshaft and its journals. Remove each piston from the crankshaft at the base of each rod that the piston sits on and then remove the bearing that holds the crank in place. Pull the crank out and set aside. Flip the block back over and remove the head bolts and separate the heads from the block. Scrape away any and all gasket remnants and clean the block inside and out with quality solvents. Clean the engine block to free it of all debris and dirt before moving on through the steps to rebuild a Chevy 350 engine. Hone the walls of each cylinder until the inside diameters of each cylinder match. Repeat the process for each lifter port. Honing the cylinder walls smooth will keep the pistons aligned perfectly to improve the performance once the Chevy 350 engine is rebuilt. Grease the cylinder walls, the pistons, the lifter ports and around the camshaft before beginning to assemble the parts when you want to rebuild. Start at the bottom and work your way to the top of the engine, turning the block in the engine stand each time you need access to the upper or lower engine block. Oil each component liberally and remember to torque each bolt securely.