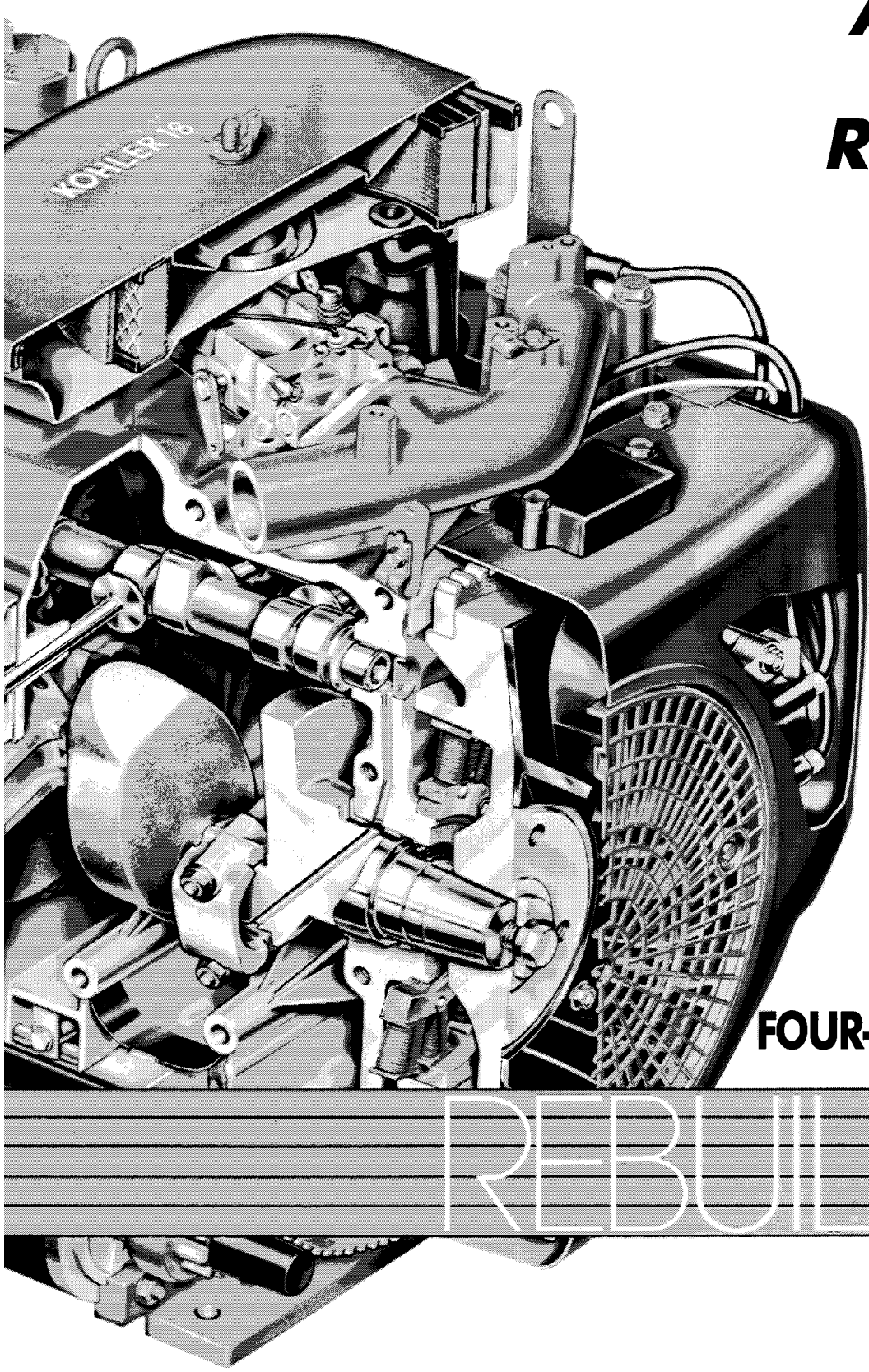
KOHLER engines

A GUIDE TO ENGINE REBUILDING



SINGLE-CYLINDER
TWIN-CYLINDER
FOUR-CYCLE/AIR-COOLED

REBUILDING

Long-life strength and on-the-job durability are designed and built into Kohler engines. Parts subject to most wear and tear – like cylinders, crankshafts, and camshafts – are made from precision formulated cast iron...and because the iron cylinders can be rebored, engines last even longer.

This guide provides information and instructions for rebuilding Kohler single cylinder and twin cylinder engines.

Before attempting to rebuild a Kohler engine, it is important to fully diagnose the engine problem and its cause. Insure that all simple and easy remedies are tried before adjusting or repairing the engine. A simple engine problem may be made a complex problem, if this procedure is not followed. As always, follow the specification recommended by Kohler when reassembling and adjusting.

CONTENTS

General Information

Preliminary Checks 3
Cleaning 3
Measuring Tools 4
Gaskets and Sealants 4
Oil Seals 5
Bearing Care 5
Lubrication 5
Torquing and Tightening Sequence 5
Engine Break-In
  Oil Type 6

Inspection, Overhaul

Cylinder Heads
  Inspection 6
  Service 6
Cylinder Block Barrels
  Inspection 6
  Honing 6
Valves, Inspection and Service 8
  Valve Guides 8
  Valve Seat Inserts 9
  Valve Stem Seals 10
Pistons and Rings
  Inspection 10
  Service 10
Connecting Rods
  Inspection 12
  Service 12
Camshaft and Crankshaft
  Inspection 12
  Service 12
Oil Pump
  Inspection 12
  Service 12
Governor - Inspection 13
Dynamic Balance 13
  Stub Shaft 13
  Balance Gear 13
  Timing 13
Fuel Pump 14
Carburetor 14
Engine Inspection Data Record 15

SAFETY

Observe all rules of safety when servicing engines. Follow the manufacturer's instructions carefully when using cleaning solvents and other flammable liquids—and make sure they are properly identified and stored in covered containers safely away from the danger of combustion from open flames, sparks, etc.

PRELIMINARY CHECKS

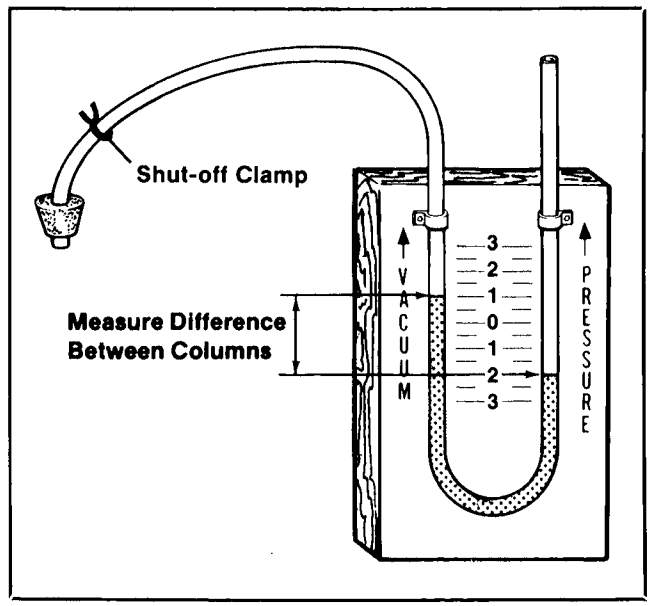
During disassembly, carefully inspect and note the physical appearance of each of the components. Often the appearance of parts will indicate engine operation under other than ideal conditions. Some of the things to look for are:

Excessive Sludge: This is a natural by-product of combustion and a small accumulation is normal. Excessive sludge formation could indicate several things: perhaps too infrequent oil changes; operation with improper ignition timing; or overrich carburetor adjustment, to name a few.

Scoring of the Cylinder Walls: Unburned fuel not only adds to sludge formation but can, in severe cases, cause scuffing and scoring of the cylinder walls. As raw fuel seeps down the cylinder walls, it washes the necessary lubricating oils off the piston and cylinder walls so that the piston rings make metal to metal contact with the walls. Scoring of the cylinder walls can also be caused by localized hot spots resulting from blocked cooling fins or from inadequate or contaminated lubrication.

Severe Piston Damage: Major damage to pistons and rings can take various forms. The top of the piston ring may be burned through or the top groove may be excessively worn and the ring broken or stuck in the groove. This can be attributed to abnormal combustion. If ignition timing is overadvanced, ignition will occur while the piston still has a long distance to travel on its compression stroke. As a result, the combined heat of compression, plus the heat of pre-ignited fuel, raises temperatures to values comparable to that of an acetylene torch. This, of course, acts mainly on the top land and top ring of the piston and results in early failure. A lean fuel mixture, excessive back pressure, or intake leaks, can also cause high temperatures.

Evidence of External Oil Leakage: If excessive oil leakage is evident, this may indicate improperly serviced breather systems. Normally, an engine operates internally at pressures less than atmospheric or, in other words, with a crankcase vacuum. If positive pressures build up within the crankcase from a clogged breather or from piston blowby, oil will be forced out of an engine at oil seals, gaskets, or any other available spot. Positive pressures can also be caused by worn seals, loose dipstick, or clogged crankcase breather holes.



CLEANING

All parts should be thoroughly cleaned—dirty parts cannot be accurately gauged or inspected properly for wear or damage. There are many commercially available cleaners that quickly remove grease, oil, and grime accumulation from engine parts. If such a cleaner is used, *follow the manufacturer's instructions carefully*, and make sure that all traces of the cleaner are removed before the engine is reassembled and placed in operation. Even small amounts of these cleaners quickly break down the lubricating properties of engine oils.

Soap and warm water works nicely to thoroughly remove the cleaner. Remember to dry and lubricate the engine parts immediately after cleaning.

Gasoline should never be used as a cleaning solution because of its many safety hazards. Gasoline fumes are explosive, and the fuel is easily ignited. The ignition spark may be sufficient to explode the entire area. *Play safe! Do not use gasoline for cleaning!*

Use ventilating fans, or provide ventilation by some other means, when cleaning. Some solutions give off toxic or noxious fumes; other fumes are highly combustible.

MEASURING TOOLS

There are a number of measuring tools which are required to correctly rebuild a Kohler engine. These include:

- Outside and inside micrometers
- Dial indicators
- Telescoping gauges
- Bore gauges
- Feeler gauges
- Torque wrenches
- Plastigage

Outside Micrometers: Outside micrometers are used to check the diameters of engine parts such as the pistons and crankshaft.

Inside Micrometers: Inside micrometers are used to measure the distance between two parallel surfaces. The inside micrometer will measure the dimensions of the cylinder bore, connecting rod pin diameters, sleeve bearings, etc.

Dial Indicators: A dial indicator is a gauge which uses a dial face and a needle to register measurements. There is a movable contact arm on the dial indicator. Dial indicators are calibrated in thousandths of an inch and typically, are used to measure end play and runout on crankshafts, gears, etc.

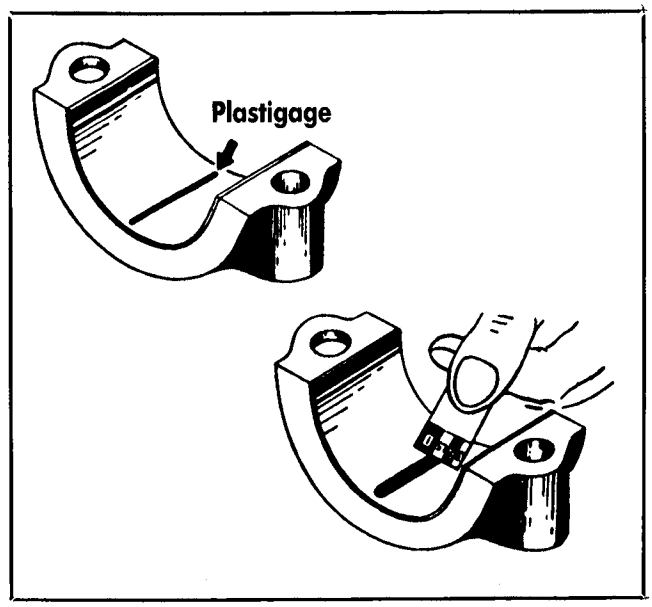
Telescoping Gauges: Telescoping gauges can take the place of an inside micrometer to measure the inside of bores, connecting rod pin diameters, etc.

Bore Gauges: Bore gauges are used to measure the diameter of cylinder bores. They may be used in place of an inside micrometer or telescoping gauge.

Feeler Gauges: Feeler gauges are used for measuring crankshaft and camshaft end play, valve clearance, piston ring end gaps, etc.

Torque Wrenches: Torque wrenches are used to deliver and monitor the specific limit (torque) to which a fastener can be safely stretched. Four types of torque wrenches are used; direct reading, dial, clutch, and click.

Plastigage: Plastigage provides a fast and accurate way to check running clearances. Plastigage is a soft plastic that will flatten out to predetermined widths when subjected to pressure. These widths will equal a specific clearance. Plastigage is normally used to check the connecting rod to crankpin running clearance. The most common type is green Plastigage which is used to measure clearances from .001 to .003 inches.



GASKETS AND SEALANTS

Engine gaskets are made of different materials, depending upon the requirements of heat, the solution present, and the wear encountered. Some surfaces (particularly of two piece crankcases) are sealed with liquid gasket compound. Since most gaskets partially adhere to the surfaces after use, it is impractical to reuse a gasket. The cost of replacing a gasket that has been removed is only the cost of the gasket, but if a gasket is reused and leaks, further engine troubles may develop and the rebuild time is then added to the gasket cost. Always clean the surfaces carefully to remove all gasket particles. Be sure that all surfaces are clean and flat, not warped, gouged, or scratched. A gasket cannot compensate for wear, gouges, warping, misalignment, or dirt on the surface.

OIL SEALS

Seals are used to prevent the lubricant from leaking out of the crankcase, and to prevent dirt from entering. Whenever a rotating part moves through a stationary part, it is necessary to provide a seal. Seals are of several types. Basically, however, all seals consist of a sleeve, which is pressed or fit carefully into the stationary part, and a pliable wiper, which is sealed to the sleeve, and held against the rotating part by spring pressure. Some seals have one pliable part or lip at one face. Other seals have two lips, one facing in each direction. If a seal with a single lip is being installed, it is important that it is installed in the same direction as the original seal.

When a lubricated seal is inserted into a bore, the lip must not be deformed or torn, and the seal must be inserted squarely. The seal is usually damaged by removal, and should be replaced with each engine rebuild.

BEARING CARE

Ball bearings and sleeve bearings are used in Kohler engines. Generally, sleeve bearings are used on KT engines. Ball bearings must be replaced if they show signs of damage. If the bearings turn easily and quietly, and there is no evidence of scoring or grooving on the races, the bearings can be reused.

A sleeve bearing must be inspected for out-of-round. If the wear is uneven, the bore or outer diameter may be eliptical or the bore and outer axis may not be true. These defects are sufficient reason for replacing the bearing.

LUBRICATION

Keep parts oiled and insure that they are lightly coated with lubricant as they are cleaned and reassembled. Not only does this practice make reassembly easier, but it insures lubrication of the parts during initial operation of the engine after reassembly. Use the same oil to lubricate the parts that are used in the engine crankcase.

TORQUING AND TIGHTENING SEQUENCE

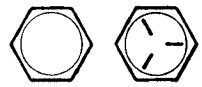
There are industry standards for the torque to which bolts should be tightened, depending on their size. However, most parts are secured by tightening the bolts or screws as tightly as reasonable. Some parts must be held with a specific torque. These should be tightened with a torque wrench. When torques are not specified, the standard torque specified by size should be used. Whenever Kohler Co. has listed a torque value to which a bolt or other part is tightened, it is important that the torque be observed. Parts that are torqued include: flywheel retaining screw or nut, closure plate screw, cylinder head screws, cylinder barrel stud nuts, connecting rod screws or nuts, crankcase stud nuts, crankcase cap screws, and spark plug.

In addition to the torque values, another important consideration is the sequence to be observed when tightening bolts or screws. Always tighten the bolts or screws in stages, tightening each approximately the same amount each time.

Tightening Torque Into Cast Iron or Steel

Size	Grade 2	Grade 5	Grade 8
8-32	20 in. lb.	25 in. lb.	
10-24	32 in. lb.	40 in. lb.	
10-32	32 in. lb.	32 in. lb.	
1/4-20	70 in. lb.	115 in. lb.	165 in. lb.
1/4-28	85 in. lb.	140 in. lb.	200 in. lb.
5/16-18	150 in. lb.	250 in. lb.	350 in. lb.
5/16-24	165 in. lb.	270 in. lb.	30 ft. lb.
3/8-16	260 in. lb.	35 ft. lb.	50 ft. lb.
3/8-24	300 in. lb.	40 ft. lb.	60 ft. lb.
7/16-14	35 ft. lb.	55 ft. lb.	80 ft. lb.
7/16-20	45 ft. lb.	75 ft. lb.	105 ft. lb.
1/2-13	50 ft. lb.	80 ft. lb.	115 ft. lb.
1/2-20	70 ft. lb.	105 ft. lb.	165 ft. lb.
9/16-12	75 ft. lb.	125 ft. lb.	175 ft. lb.
9/16-18	100 ft. lb.	165 ft. lb.	230 ft. lb.
5/8-11	110 ft. lb.	180 ft. lb.	260 ft. lb.
5/8-18	140 ft. lb.	230 ft. lb.	330 ft. lb.
3/4-10	150 ft. lb.	245 ft. lb.	350 ft. lb.
3/4-16	200 ft. lb.	325 ft. lb.	470 ft. lb.

Tightening Torque Into Aluminum



Size	Grade 2	Grade 5
8-32	20 in. lb.	20 in. lb.
10-24	32 in. lb.	32 in. lb.
1/4-20	70 in. lb.	70 in. lb.
5/16-18	150 in. lb.	150 in. lb.

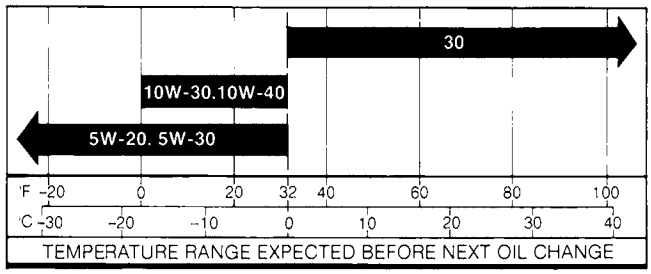
ENGINE BREAK-IN

Use straight SAE 30, SF-quality oil for the first 5 hours of operation. Change the oil after this initial run-in period. Refill with SF-quality oil as specified under "Oil Type."

Oil Type

Use high quality detergent oil of API (American Petroleum Institute) service class SF. Select viscosity based on the air temperature at the time of operation as shown below:

RECOMMENDED SAE VISCOSITY GRADES



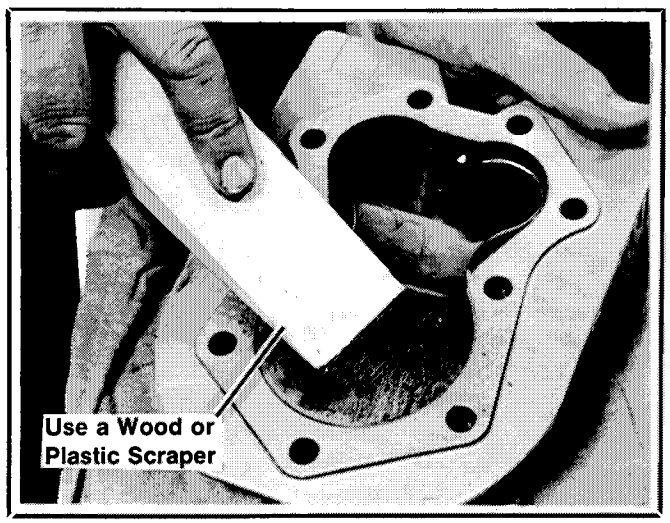
CYLINDER HEADS

Inspection

Blocked cooling fins often cause localized "hot spots" which can result in "blown" cylinder head gaskets. If the gasket fails in area surrounding one of the retaining capscrews, high temperature gases can burn away portions of the aluminum alloy head. A cylinder head in this condition must be replaced.

Service

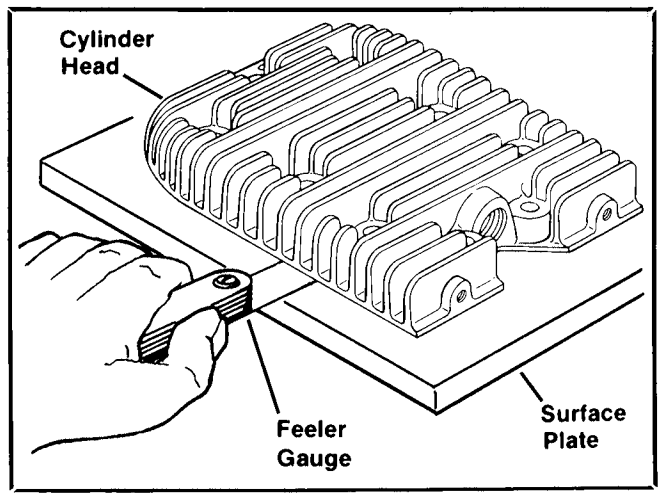
If the cylinder head appears to be in good condition, use a block of wood to scrape away carbon deposits. Be careful not to nick or scratch the aluminum, especially in gasket seating areas.



Cleaning Cylinder Heads

Cylinder head should also be checked for flatness. Use a feeler gauge and a surface plate or piece of plate glass to make this check. Clearance between the head and plate should not exceed .003" at any point. If it does, replace the cylinder head.

In cases where the head is warped or burned away, it will also be necessary to replace the head screws. The high temperatures that warped or burned the head could have caused them to stretch and lose their ability to retain proper torque.



Checking Cylinder Head Flatness

CYLINDER BLOCK/BARRELS

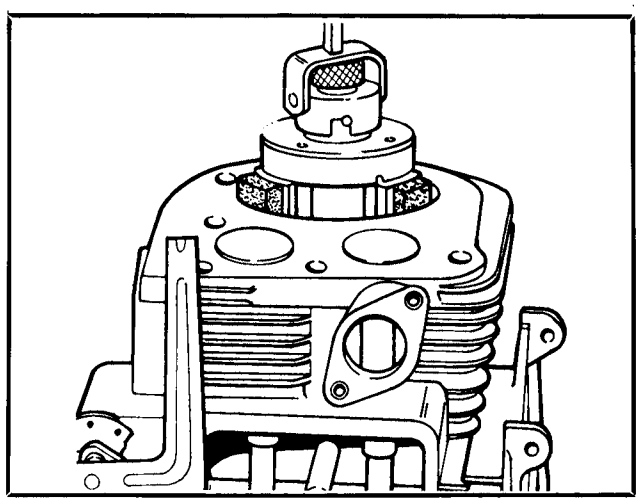
Inspection

Check all gasket surfaces to make sure they are free of gasket fragments. Gasket surfaces must also be free of deep scratches or nicks.

If the cylinder bore is badly scored, excessively worn, tapered, or out-of-round, resizing is necessary. Use an inside micrometer, telescoping gauge, or bore gauge to determine the amount of wear, refer to "Specifications and Tolerances", in the appropriate service manual, then select the nearest suitable oversize of either .010", .020", or .030". Resizing to one of these oversizes will allow usage of the available oversize piston and ring assemblies. Initially resize using a boring bar, then use the following procedures for honing the cylinder.

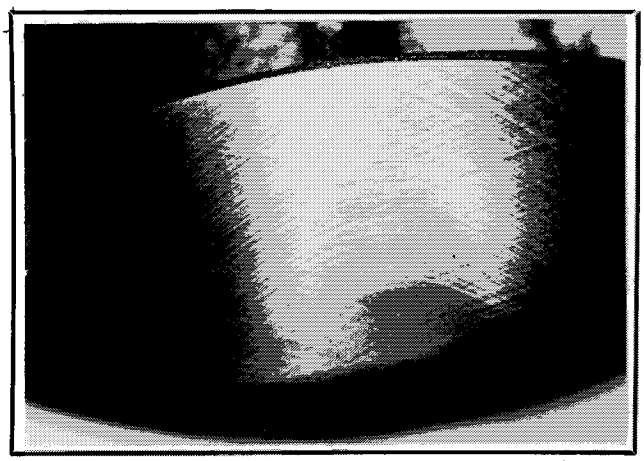
Honing

While most commercially available cylinder hones can be used with either portable drills or drill presses, the use of a low speed drill press is preferred as it facilitates more accurate alignment of the bore in relation to the crankshaft crossbore. Honing is best accomplished at a drill speed of about 250 RPM and 60 strokes per minute. After installing coarse stones in hone, proceed as follows:



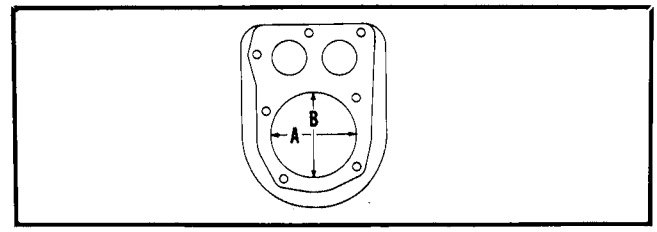
1. Lower hone into bore and after centering, adjust so that stones are in contact with walls. Use of a commercial cutting/cooling agent is recommended.
2. With the lower edge of each stone positioned even with the lowest edge of the bore, start drill and honing process. Move hone up and down while resizing to prevent formation of cutting ridges. Check size frequently.

   NOTE: Measure the piston diameter and resize the bore to the piston to obtain the specified running clearances. See "Measuring Piston to Bore Clearance". Keep in mind that the temperatures caused by honing may yield inaccurate measurements. Insure that the block is cool while measuring.
3. When bore is within .0025" of desired size, remove coarse stones and use finish stones (220-280) and polish to final size. A crosshatch pattern should result when honing is done correctly. The crosshatch should intersect at approximately 23-33° off the horizontal. Too flat an angle could cause the rings to skip and wear excessively, too high an angle will result in high oil consumption.



Cylinder Bore Cross-Hatch After Honing

4. After resizing, check the bore for roundness, taper, and size. Measurements can be made with an inside micrometer, telescoping gauge, or bore gauge. The measurements should be taken at three places in the cylinder; at the top, middle, and bottom. Two measurements should be taken, perpendicular to each other, at each of the three locations.



5. Carefully clean the cylinder wall with soap and hot water, then after drying thoroughly, apply a light coat of SAE 10 oil to prevent rust. Insure that the oil drain hole in the valve chamber is clean.

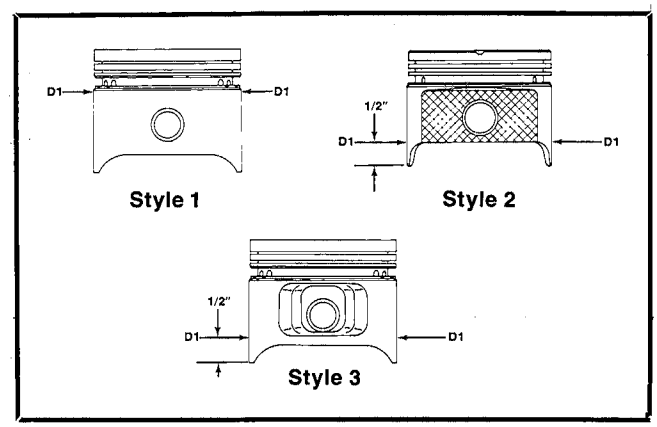
Measuring Piston to Bore Clearance

Before installing the piston into the cylinder bore, it is necessary that the clearance be accurately checked. This step is often overlooked, and if the clearances are not within specifications, generally engine failure will result.

NOTE: Do not use a feeler gauge to measure piston to bore clearance—it will yield inaccurate measurements—Use a Micrometer.

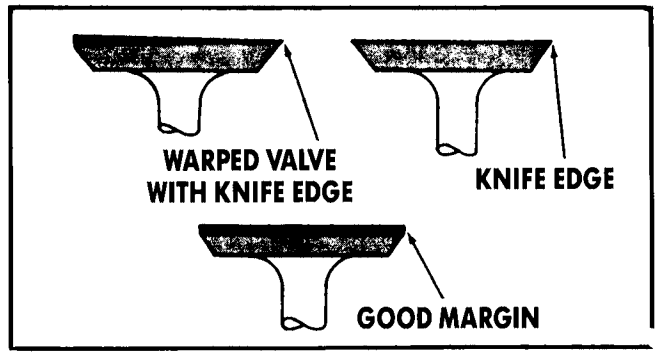
The following procedures should be used to accurately measure the piston to bore clearance.

1. Use a micrometer and measure the diameter of the piston (D1) at the appropriate position.



2. Use an inside micrometer, telescoping gauge, or bore gauge and measure the cylinder bore. Take the measurement approximately 2½" below the top of the bore and perpendicular to the piston pin.

The difference between the two measurements is the piston to bore clearance. If the clearance is within specifications, the piston may be used as is. If the clearance is not within specifications, resize and install the appropriate size piston and rings.



VALVES

Inspection and Service

Hard starting or loss of power accompanied by high fuel consumption may be symptoms of faulty valves. Carefully inspect all valve mechanism parts. Also, check the valve seat area or inserts for evidence of deep pitting, cracks, or distortion.

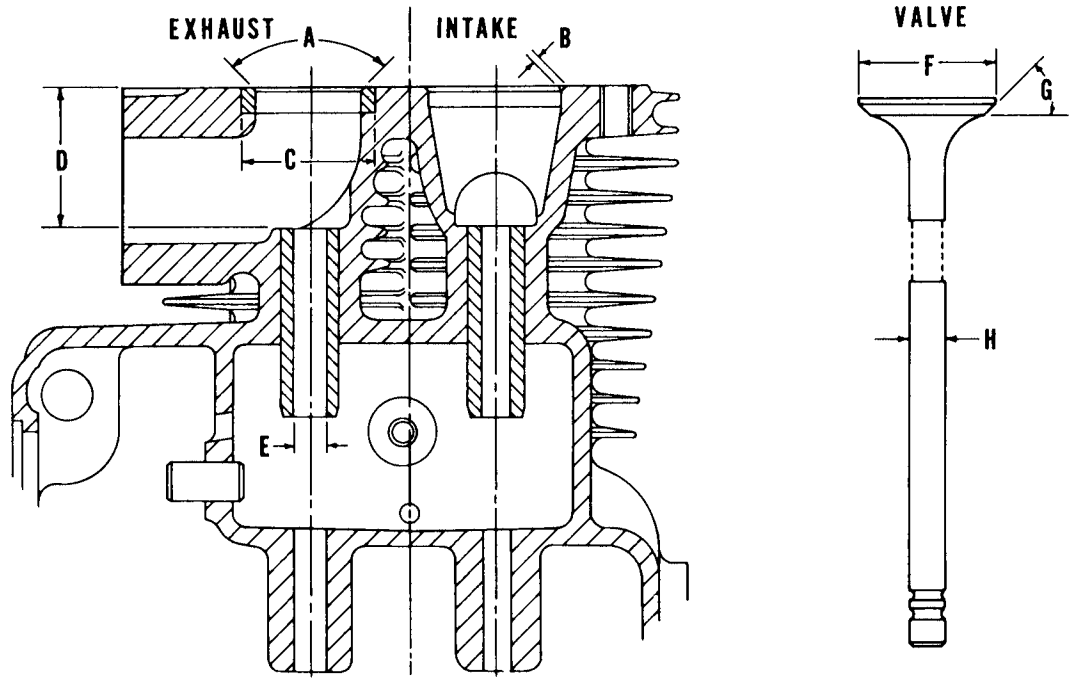
After removing the valve, clean the valve head, face and stem with a power wire brush, then carefully inspect for defects, such as warped valve head, excessive corrosion and worn or bent valve stems. Replace valves found to be in bad condition.

A valve can be reconditioned and reused, if the face and margin are in good shape. If a valve is worn to where the margin is less than 1/32", do not reuse it.

Valve Guides

If a valve guide is worn beyond specifications, it will not guide the valve in a straight line. This may result in burnt valve faces or seats, loss of compression, and excessive oil consumption.

To check valve guide to valve stem clearance, thoroughly clean the valve guide and, using a split-ball gauge, measure the diameter. Then, using an outside micrometer, measure the diameter of the valve stem at several points on the stem where it moves in the valve guide. Use the largest stem diameter to calculate the clearance. If the clearance exceeds the specified limits,

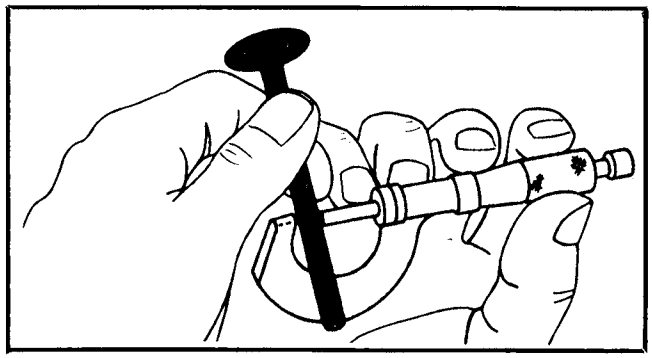


Valve	Ⓐ Seat Angle	Ⓑ Seat Width	Ⓒ Insert O.D.	Ⓓ Guide Depth	Ⓔ Guide I.D.	Ⓕ Valve Head Dia.	Ⓖ Valve Face Angle	Ⓗ Valve Stem Dia.
Intake	89°	.037" .045"	—	1.586"	.312" .313"	1.380" 1.370"	45°	.3110" .3103"
Exhaust	89"	.037" .045"	1.5045" 1.5035"	1.497"	312" .313"	1.380" 1.370"	45°	.3091" .3085"

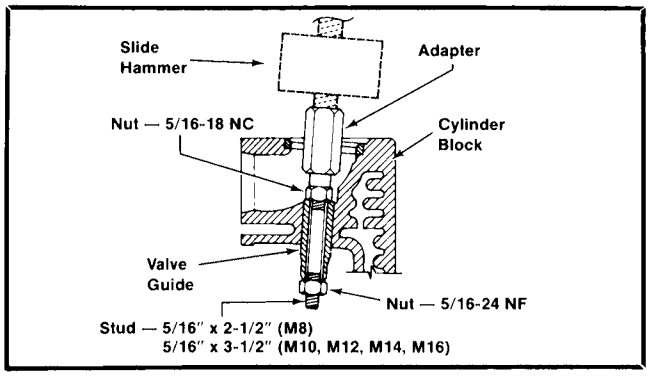
Valve Port Specifications

determine whether the valve stem or the guide is responsible for the excessive clearance.

If the valve stem diameter is within specifications, then replace the valve guide.

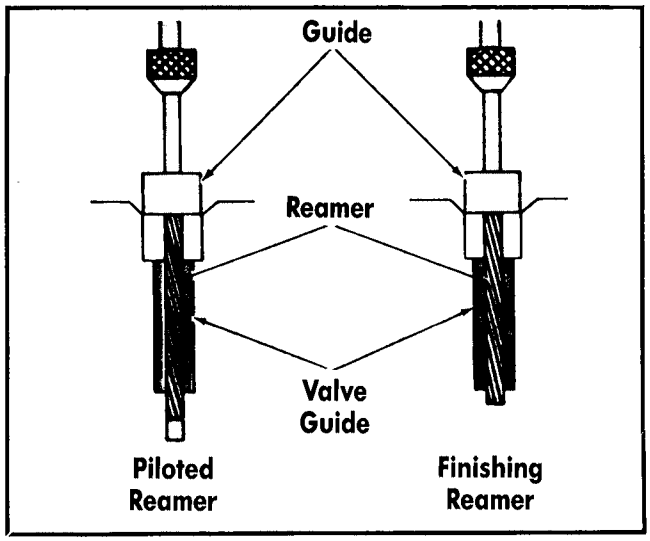


Remove guides with a special puller, a piloted pressing mandrel on a press, or a valve guide driver.



Pulling Valve Guide (Typical)

Clean the guide bores thoroughly before installing new guides and seats. Press the new guides in making sure they are properly seated. Valve guides are often slightly compressed during insertion. Use a piloted reamer and then a finishing reamer to resize the guide bore to the correct dimension.

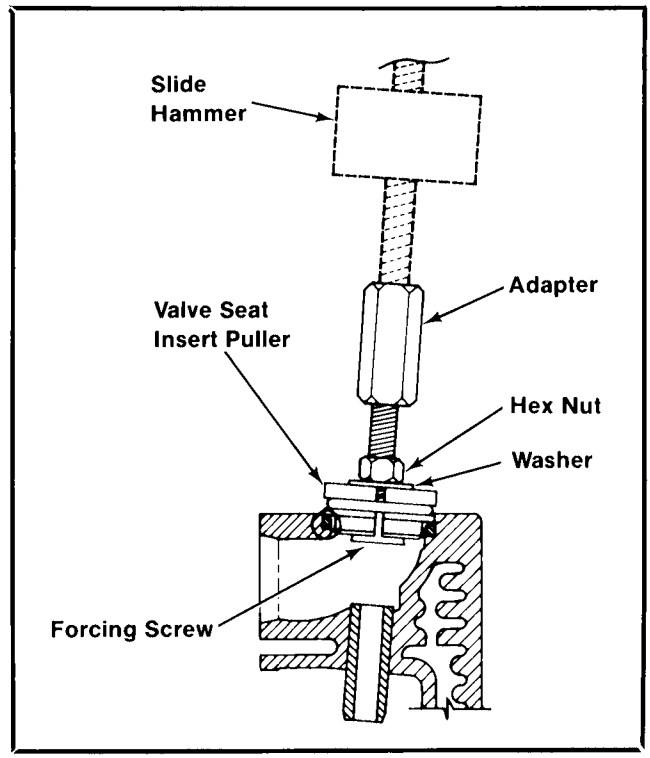


Valve Seat Inserts

Intake valve seats are usually machined into the cylinder block/barrel, however, certain applications may specify hard alloy inserts. The exhaust valve seats are replaceable alloy inserts. If the seats become badly pitted, cracked, or distorted, the inserts must be replaced.

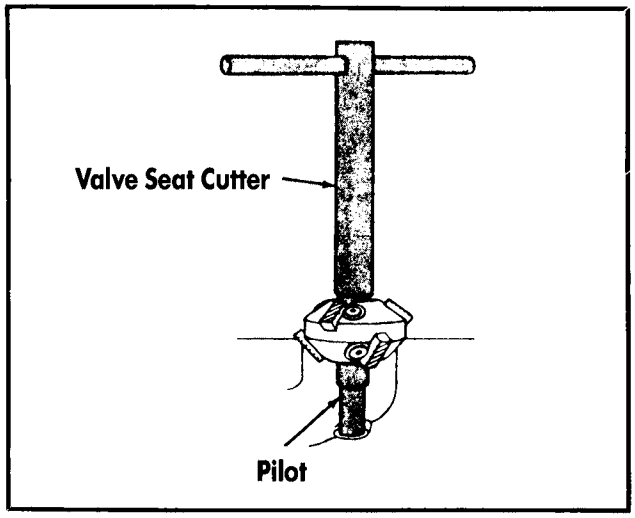
When replacing valve seat inserts, measure the width of the insert before removal to be sure you order the correct size insert.

The inserts are a tight press fit in the cylinder barrel. A commercial valve seat removal tool is recommended for this job. Since insert removal causes loss of metal in the insert bore area, use only Kohler service replacement inserts, which are slightly larger to provide proper retention in the cylinder block/barrel. Make sure new inserts are properly started and pressed into bore to prevent cocking of the insert.

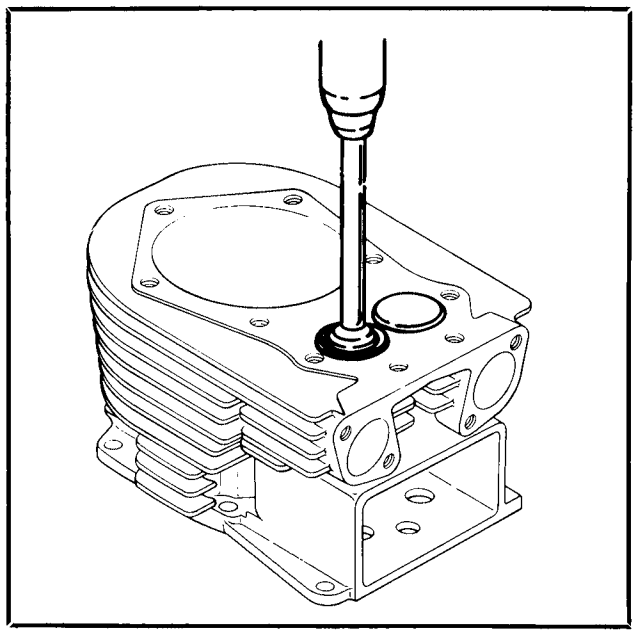


Pulling Valve Seat Insert (Typical)

Seating surfaces should be held between .037" and .045" width. Seats with more than .045° must be reconditioned with a 45° cutter and overcutting or undercutting with 30° and 60° cutters, to obtain the proper seat width, is recommended.



Reground or new valves must be lapped in, to provide proper fit. Use a hand valve grinder with suction cup for final lapping. Lightly coat valve face with "fine" grade of grinding compound, then rotate valve on seat with grinder. Continue grinding until smooth surface is obtained on seat and on valve face. Remove all traces of grinding compound.



Lapping Valves

Valve Stem Seals

Valve stem seals can be reused, but should be replaced when new valves are installed. Seals should also be replaced, if damaged, or deteriorated in any way.

Valve Springs

The valve springs are progressively wound; that is, coils are closer together on one end than the other. Valve springs are installed with the coils which are closer together, toward the cylinder head.

A valve spring will seldom wear out, but if it does, it will usually break. Broken springs must be replaced.

PISTONS AND RINGS

Inspection

Scuffing and scoring of pistons and cylinder walls occurs when internal temperatures approach the welding point of the piston. Temperatures high enough to do this are created by friction which is usually attributed to improper lubrication, improper clearance, and/or overheating of the engine.

Normally, very little wear takes place in the piston boss-piston pin area. If the original piston and connecting rod can be reused after new rings are installed, the original pins can also be reused, but new piston pin retainers are required. Piston pins are included as part of the piston assemblies—if the pin boss in piston or the pin are worn, or damaged, a new piston assembly is required.

Ring failure or wear is usually indicated by excessive oil consumption, blue exhaust smoke, or low crankcase vacuum. When rings fail, oil is allowed to enter the combustion chamber, where it is burned, along with the fuel. High oil consumption can also occur when gap is incorrect; rings cannot properly conform to the cylinder walls under this condition. Oil control is also lost when ring gaps are not staggered during installation.

When cylinder temperatures get too high, lacquer and varnish collect on pistons causing rings to stick, which results in rapid wear. A worn ring takes on a shiny or bright appearance. Scratches on rings and pistons are caused by abrasive material, such as carbon, dirt or pieces of hard metal.

Detonation damage occurs when a portion of the fuel charge ignites spontaneously from heat and pressure shortly AFTER ignition. This creates two flame fronts which meet and explode to create extreme hammering pressures on a specific area of the piston. Detonation generally occurs from using fuels with too low an octane rating.

Pre-ignition or ignition of the fuel charge BEFORE the timed spark can cause damage rather similar to detonation. Pre-ignition is often more severe than detonation damage—often a hole is quickly burned right through the piston dome by pre-ignition. Pre-ignition is caused by a hot spot in the combustion chamber from sources such as: glowing carbon deposits, blocked fins, improperly seated valves or wrong spark plugs.

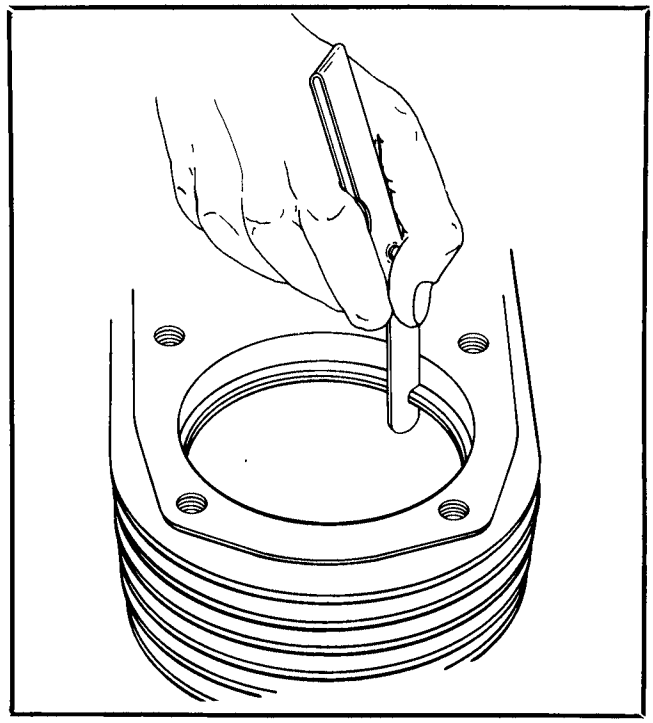
Service

Service ring replacement sets and piston assemblies are available in the standard size, and in .010", .020" and .030" oversize sets. The service oversize piston assemblies are used only when the cylinder has been rebored to the corresponding oversize. NOTE: If engine is .003 oversize and piston is to be replaced, use .003 piston and STD service rings.

Service type rings and piston assemblies are used when the cylinder is worn, but still within wear and out-of-round limits, refer to "Specifications and Tolerances", in the appropriate service manual. Service ring sets usually include expanders or other arrangements to provide uniform pressure on ring and better conformity to cylinder wall, regardless of wear. Cylinder bore must be deglazed before service ring sets are used.

Some important points to remember when servicing pistons and/or rings:

1. If the cylinder block does not need reboring, and if the old piston is within wear limits, and free of score or scuff marks, it may be reused.
2. Remove old rings and clean up grooves. Never reuse old rings.
3. Before installing new rings on piston, place top two rings each in turn in its running area in cylinder bore and check end gap. Refer to "Specifications and Tolerances" in the appropriate service manual for end gaps in used and new cylinder bores.

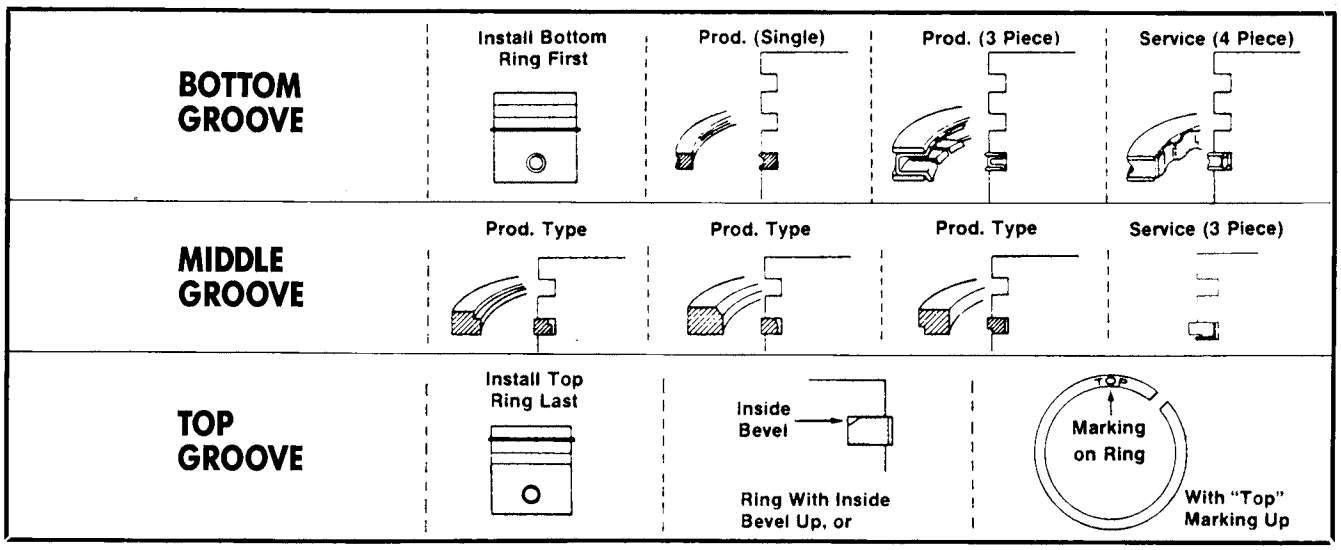


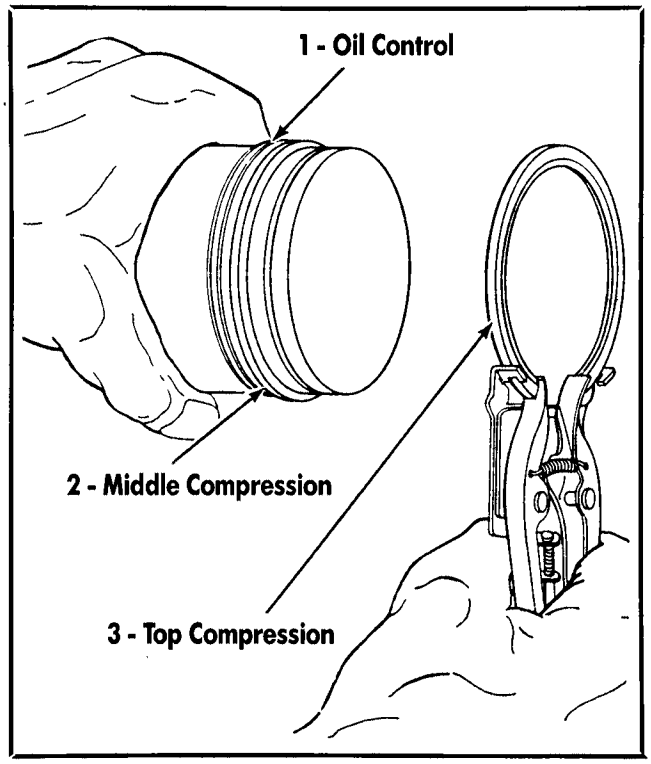
Measuring Piston Ring End Gap

NOTE: Deglaze and clean the cylinder bore prior to checking the end gaps of new rings.

In service ring sets, the oil ring may have end gaps as high as .060". Be sure to stagger ring and rails when installing.

4. Rings must be installed correctly. Ring installation instructions are usually included with new ring sets. Follow instructions carefully. Use ring expander to install rings and check side clearance of each ring after installation. For side clearances, refer to "Specifications and Tolerances" in the appropriate service manual.





Ring Installation Sequence

CONNECTING RODS

Inspection and Service

Check bearing area (big end) for excessive clearance (See Camshaft and Crankshaft, Inspection and Service), score marks and side clearances; refer to "Specifications and Tolerances" in the appropriate service manual. Replace rod if scored or excessively worn. Connecting rods with bearing diameter area .010" undersize are available for use with reground crankpin.

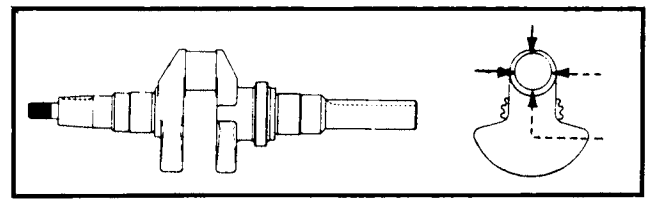
CAMSHAFT AND CRANKSHAFT

Inspection and Service

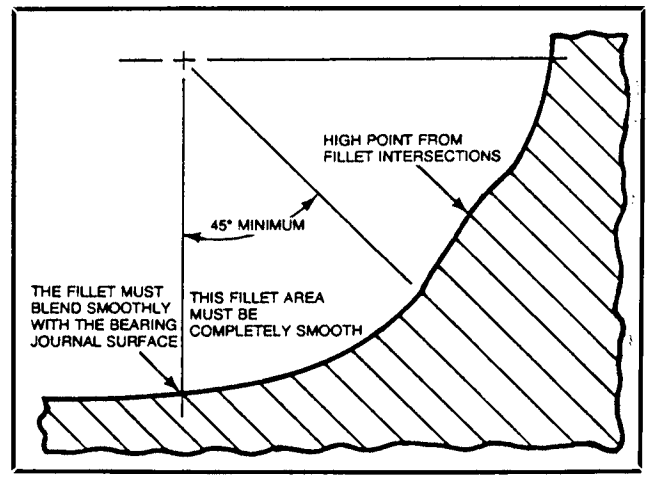
Inspect the gear teeth on both the crankshaft and camshaft. If the teeth are badly worn, chipped or some are missing, replacement of the damaged components will be necessary.

Also, inspect the crankshaft bearings for scoring, grooving, etc. Do not replace bearings unless they show signs of damage or are out of running clearance specifications. If crankshaft turns easily and noiselessly, and there is no evidence of scoring, grooving, etc., on the races or bearing surfaces, the bearings can be reused.

Check crankshaft keyways. If worn or chipped, replacement of the crankshaft will be necessary. Also inspect the crankpin for score marks or metallic pickup. Slight score marks can be cleaned with crocus cloth soaked in oil. If wear limits, as stated in "Specifications and Tolerances" are exceeded by more than .002", it will be necessary to either replace the crankshaft or regrind the crankpin to .010" undersize. If reground, a .010" undersize connecting rod (big end) must then be used to achieve proper running clearance. Measure the crankpin for size, taper and out-of-round.



NOTE: If the crankpin is reground, visually check to insure that the fillet blends smoothly with the crankpin surface.



To check clearance, install the connecting rod on the crankshaft and torque the rod bolts to 20% over the nominal value. Loosen bolts and remove the rod cap. Use Plastigage, replace the rod cap and torque the rod bolts to specifications.

Loosen the rod bolts, remove the rod cap and check the clearance on the Plastigage. Maximum allowable clearance is .0035", minimum is .001".

OIL PUMP

Inspection and Service

Check oil pump gear for any cracked, chipped, or badly worn teeth. Replace gear, if any of these problems exist.

Oil pump rotors and shaft are virtually troublefree and will require very little service.

GOVERNOR

Inspection

Inspect the governor gear teeth. Look for any evidence of worn, chipped, or cracked teeth. If one or more of these problems is noted, replace the governor gear and rotate to check for freedom of movement.

DYNAMIC BALANCE

Dynamic balance if found on some 10 and 12 Hp models and is standard on most 14 and 16 Hp engines. This system consists of two balance gears which run on needle bearings. The gear bearing units are assembled to two stub shaft which are press fitted into special bosses in the crankcase. Snap ring retainers hold the gears and spacer washers are used to control end play. The gears are driven off the crankgear in the direction opposite to rotation of the crankshaft.

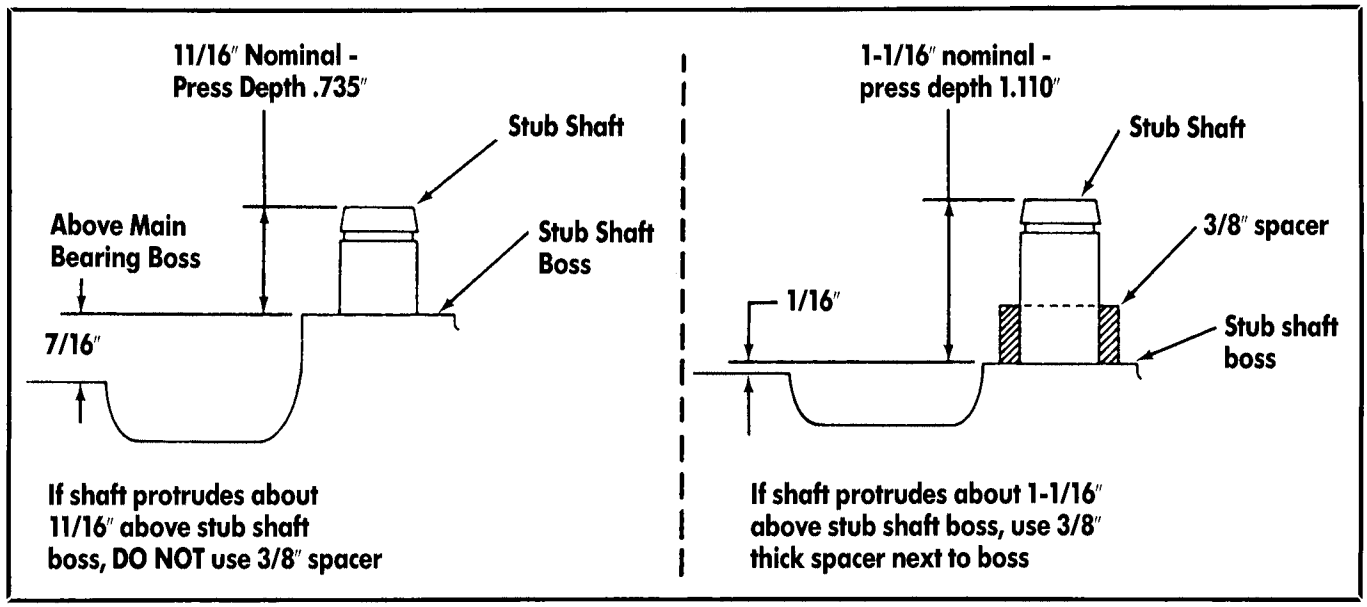
When working on Dynamic Balance models, care must be exercised to make sure that the proper end play is attained and that the gears are properly timed to the engine. Use the following procedure to install and time Dynamic Balance components.

Stub Shaft

If stub shaft is worn beyond specified diameters or damaged, press old shaft out and install a new shaft. Shaft must protrude a specific distance above the stub shaft boss. If the stub shaft boss is about 7/16″ above the main bearing boss, press the shaft in until it is .735″ above the stub shaft boss. On blocks where the stub shaft is only about 1/16″ above the main bearing boss, press shaft in until it is 1.110″ above the stub shaft boss—a 3/8″ spacer must be used with the shaft which protrudes 1.110″.

Balance Gear

Slip one .010″ spacer on the stub shaft, then install gear-bearing assembly on stub shaft (with timing marks out)—if assembly tool is not being used, do not install bottom gear until after the crankshaft is reinstalled. Proper gear end play (.002 - .010″) is attained with one .005″ spacer, one .010″ spacer, and one .020″ spacer which are installed on the snap ring retainer end of the shaft—install the thickest spacer (.020″) next to the retainer. After installing retainer, recheck end play and adjust (add or subtract .005″ spacers) if needed. NOTE: Install retainer with rounded edge facing spacers.



Stub Shaft Depth-Boss Height Variation

Timing

Many of the larger single cylinder models are equipped with dynamic balance. Refer to the appropriate service manual for service, reconditioning, and timing procedures.

FUEL PUMP

If it has been determined that the fuel pump is faulty, it should be replaced.

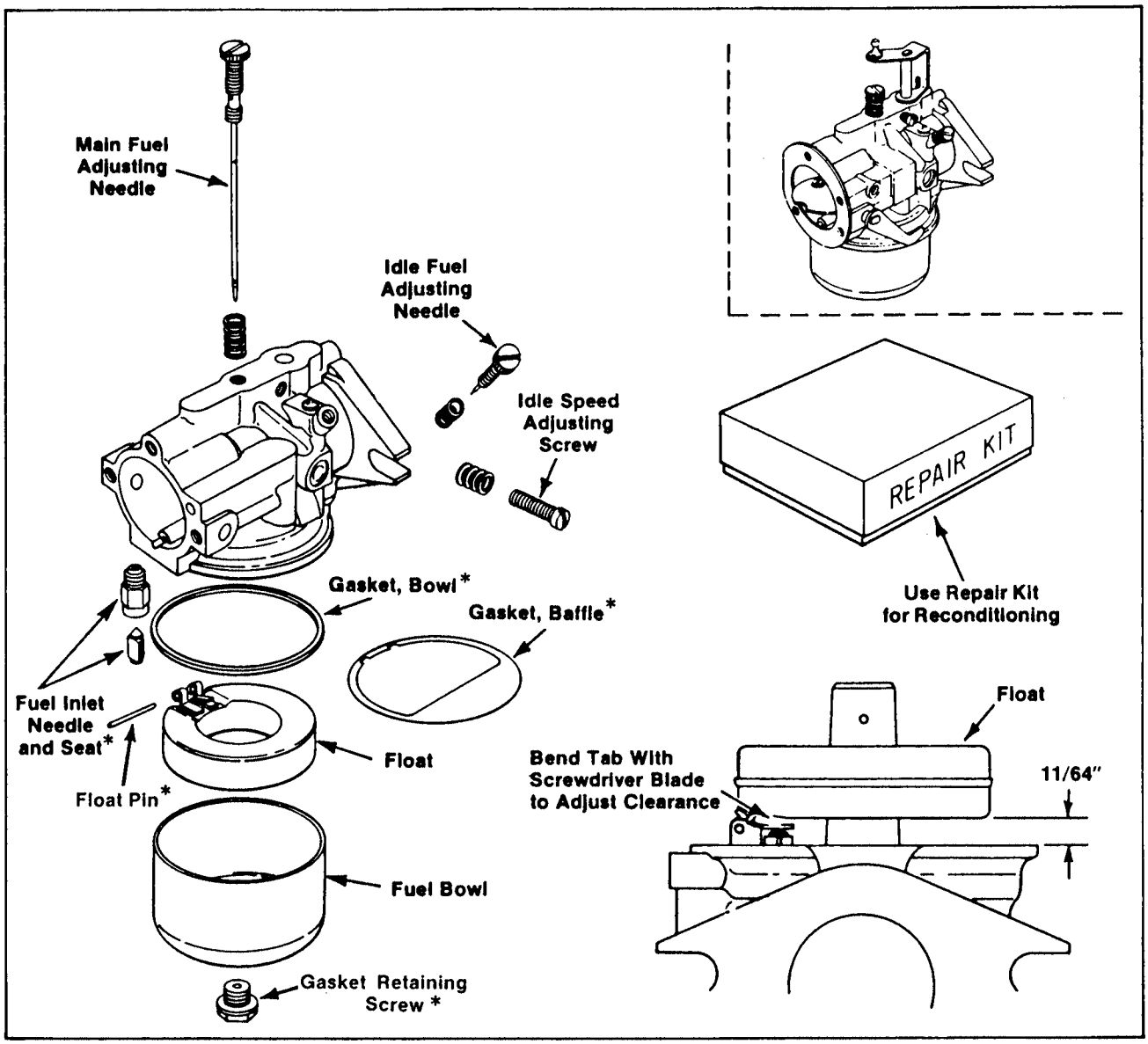
CARBURETOR

Difficulties with fuel systems usually originate from improper carburetor settings, or from dirt, gum or varnish in carburetor components. The necessity of cleaning will depend upon use and operating conditions. To clean thoroughly, it will be necessary to completely disassemble carburetor.

All parts should be cleaned in solvent. Carburetor should not be submersed in solvent, it may damage fiber and rubber seals. *Follow solvent manufacturer's warning and instructions on its proper and safe use.* Gum is easily removed with acetone solvent. Be sure all deposits are removed from bore, especially where throttle plate seats in casting. Blow out all passages with compressed air. Replace all worn and damaged parts. Always use new gaskets.

NOTE: Carburetors should be checked for loose throttle shafts. Loose shafts will allow dirt to enter the engine and may cause poor performance from leaks.

Carburetor repair kits are available from your Kohler parts supplier. Kits include a bowl retaining screw gasket, bowl ring gasket, float pin, bowl baffle, and fuel inlet needle and seat.



*Included in Repair Kit

KOHLER engines

Engine Inspection Data Record

To facilitate accurate evaluation:
- enter as much information as possible
- provide as many dimensions as possible
- mark location of break or crack on drawing
- record conditions found with check mark (✓) whenever possible

SECTION 1 OWNER AND EQUIPMENT INFORMATION

Owner's Name | Street Address | Phone No. ( ) -
City | State | Zip Code | Serial No.
Model No. | Spec No. | Manufacturer of Equipment
Type Equipment | Hours Used | Times Used
Date Purchased | Date Failed
Previous Repairs ☐ Yes ☐ No

Oil type: ☐ 30W ☐ 10W-30 ☐ 10W-40 ☐ 5W-2 5W-3
How often is the oil level checked? ☐ Everytime ☐ Never ☐ Oth
Was an oil additive used? ☐ Yes ☐ No What brand? –
Was it ever replaced or cleaned? Precleaner: ☐ Yes ☐ No E
Were any adjustments made to the carburetor or g ☐ Yes ☐ No If yes, specify —

Type: ☐ Dr

1. Wing Nut: ☐ Factory original
2. Outer cover: ☐ Good condition ☐ Cen
3. Precleaner: ☐ Clean ☐ Dirty ☐ Pl
4. Inner cover: ☐ Retaining seal/nut in place
5. Element: ☐ Clean ☐ Dusty ☐
6. Element seals: ☐ Pliable ☐ Hard ☐
7. Air cleaner base: ☐ Tight ☐ Loose

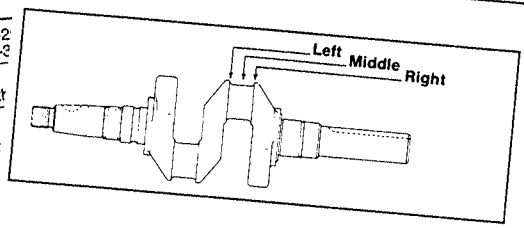
1. Amount on dipstick: ☐ Overfilled ☐ Full
2. Condition of oil: ☐ New ☐ Us
3. Quantity of oil:

Observations: ☐ Metal chips preser

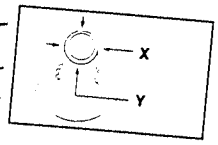
TP-2435

Tear Down Analysis *(continued)*

CRANKSHAFT ROD JOURNAL



	CYLINDER 1	CYLINDER
Scored	☐	☐
Worn	☐	☐
Unmeasureable	☐	☐
Broken	☐	☐
Not Damaged	☐	☐
Others	☐	☐

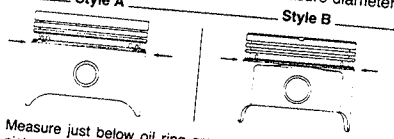


Maximum Wear Spec.

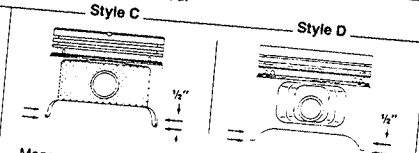
	CYLINDER 1		CYLINDER 2		
	X	Y	X	Y	MAX. OUT OF ROUND
Left					
Middle					
Right					
Max. Taper					

PISTON

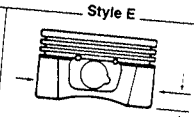
Select the following piston type and measure diameter using appropriate method.



Measure just below oil ring groove and at right angle to piston pin.



Measure ½ inch above the bottom of the skirt and at right angle to piston pin.



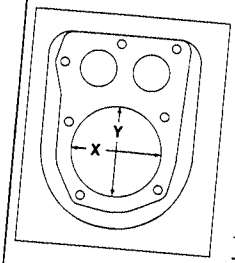
Measure 6 mm (0.24 in.) above the bottom of piston skirt at right angles to piston pin.

	CYLINDER 1	CYLINDER 2
Scored	☐	☐
Worn	☐	☐
Cracked	☐	☐
Broken	☐	☐
Ring Grooves Worn	☐	☐
Galled	☐	☐
Discolored	☐	☐

	CYLINDER 1	CYLINDER 2
Scratched		
Not Damaged	☐	☐
Others	☐	☐

Piston Diameter CYLINDER 1 _____ CYLINDER 2 _____

CYLINDER BORE

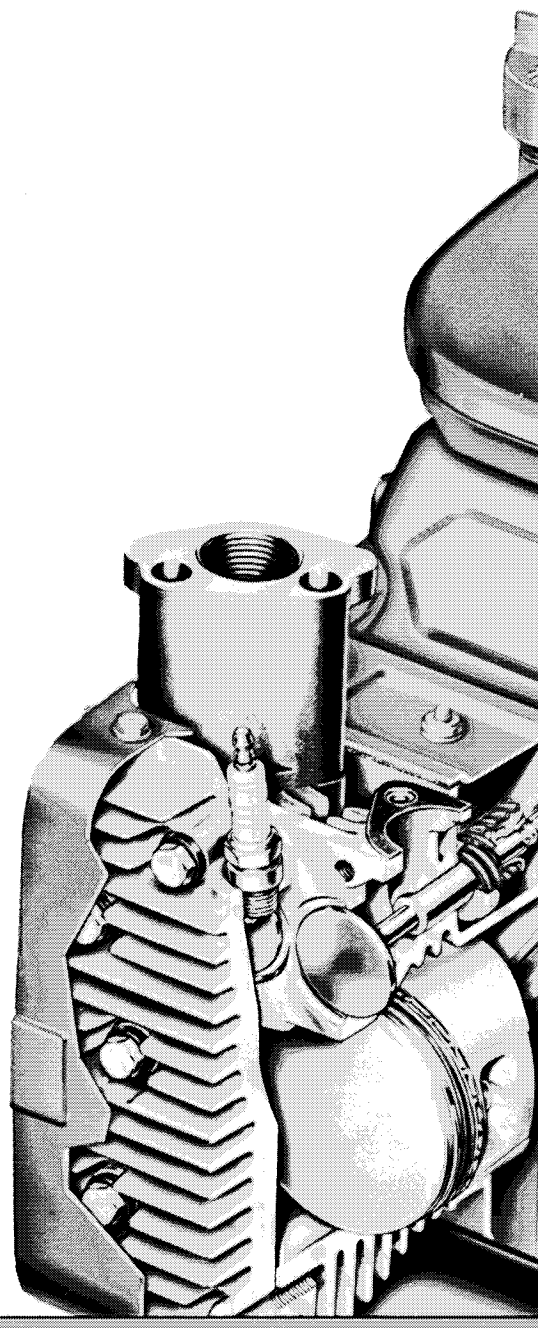


	CYLINDER 1	CYLINDER 2
Bore Scored	☐	☐
Worn	☐	☐
Not Damaged	☐	☐
Others	☐	☐

Maximum Wear Spec. _____

	CYLINDER 1		CYLINDER 2		
	X	Y	X	Y	MAX. OUT OF ROUND
Top					
Center					
Bottom					
Max. Taper					

3



KOHLER engines

ENGINE DIVISION, KOHLER CO., KOHLER, WISCONSIN 53044

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Power and Performance on Demand.
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