KOHLER TWO-CYCLE

TWO AND THREE CYLINDER MODELS
CONDENSED SERVICE DATA

ENGINE MODEL	K295-2T	K295-2AX	K340-2T	K340-2AX	SK340-2AS	K-340-2FA	K399-2T	K399-2AX
Bore–(mm)	57.5	57.5	62	62	60	62	65	65
Inches	2.26	2.26	2.44	2.44	2.362	2.44	2.56	2.56
Stroke–(mm)	56	56	56	56	60	56	60	60
Inches	2.2	2.2	2.2	2.2	2.362	2.2	2.36	2.36
No. of Cylinders	2	2	2	2	2	2	2	2
Displacement–(cc)	292	292	338	338	339	338	398	398
Cubic Inches	17.8	17.8	20.6	20.6	20.7	20.6	24.3	24.3
Horsepower @RPM	....	24@6500	24@5500	28@6500	....	....	28@6000	32@6500
Cooling Type	Cent. Fan	Axial Fan	Cent. Fan	Axial Fan	Axial Fan	Free Air	Cent. Fan	Axial Fan
Carburetor Model	HR-WR	HR-WR	HR-WR	HR-WR	HR-WR	VM or B	HR-WR	HR-WR
Number Used	1	1	1	1	1	1	1	1
Ignition:								
Type	ET	ET	ET	ET	CD	CD	ET	ET
Point Gap–(mm)	0.4	0.4	0.4	0.4	....	....	0.4	0.4
Inch	0.016	0.016	0.016	0.016	....	....	0.016	0.016
Timing Advance?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Timing BTDC (mm)	2.3	2.3	2.3	2.3	....	2.12	2.3	2.3
Inch	0.090	0.090	0.090	0.090	....	0.085	0.090	0.090
Degrees	....	....	....	....	....	....	....	....
Measured at	Adv.	Adv.	Adv.	Adv.	....	6000	Adv.	Adv.
Spark Plug:								
Bosch	W260T2	W260T2	W260T1	W260T2	....	....	M240T1	W260T2
Champion	N2	N2	L78	N2	N19V	QN-3	K8	N2
Electrode Gap–(mm)	0.5	0.5	0.5	0.5	....	0.635	0.5	0.5
Inch	0.020	0.020	0.020	0.020	....	0.025	0.020	0.020
Fuel/Oil Ratio	20:1	20:1	20:1	20:1	20:1	50:1	20:1	20:1

ENGINE MODEL	K440-2T	K440-2AX	K440-2SS	K440-2AS	K618-2	K645-3SS
Bore–(mm)	68	68	67.5	68	75	67.5
Inches	2.68	2.68	2.66	2.677	2.95	2.66
Stroke–(mm)	60	60	60	60	70	60
Inches	2.36	2.36	2.36	2.362	2.75	2.36
No. of Cylinders	2	2	2	2	2	3
Displacement–(cc)	436	436	430	436	618	644
Cubic Inches	26.7	26.7	26.0	26.7	37.7	39.2
Horsepower @ RPM	30@6000	37@6500	....	....	33@5000	....
Cooling Type	Cent. Fan	Axial Fan	Free Air	Axial Fan	Cent. Fan	Free Air
Carburetor Model	HR-WR	HR-WR	HD-WD	HD-WD	HR	HD-WD
Number Used	1	1	2	2	1	3
Ignition:						
Type	ET	ET	ET	CD	ET	ET
Point Gap–(mm)	0.4	0.4	0.4	...	0.4	0.4
Inch	0.016	0.016	0.016	....	0.016	0.016
Timing Advance?	Yes	Yes	Yes	Yes	Yes	Yes
Timing BTDC (mm)	2.3	2.3	2.3	....	3.0	2.3
Inch	0.090	0.090	0.090	....	0.118	0.090
Degrees	....	....	....	....	....	....
Measured	Adv.	Adv.	Adv.	....	Adv.	Adv.
Spark Plug:						
Bosch	M240T1	W260T2	....	....	M225T1	....
Champion	K8	N2	....	N19V	K7	....
Electrode Gap–(mm)	0.5	0.5	0.5	....	0.5	0.5
Inch	0.020	0.020	0.020	....	0.020	0.020
Fuel/Oil Ratio	20:1	20:1	20:1	....	20:1	20:1

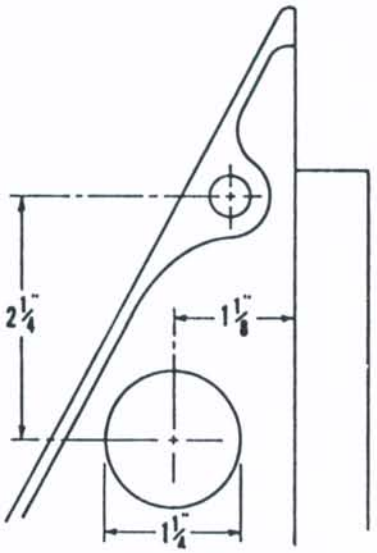

Fig. 1 — To cure vapor lock on models K399-2 and K440-2, cut hole in end plate to dimensions shown above as outlined in text.

MAINTENANCE

CARBURETOR. Tillotson, Walbro or Mikuni carburetors are used. Refer to appropriate Carburetor Section for specific overhaul information. An external impulse line is used to operate the fuel pump. Be sure all passages are open and that vacuum and pressure leaks are eliminated.

NOTE: On models K399-2 and K440-2 encountering vapor lock, a 1¼ in. hole cut in end plate adjacent to carburetors will allow air to be blown across carburetors. Cut hole using dimensions in Fig. 1. Access to end plate is possible by removing starter and blower housing, or by removing intake manifold assembly. Stuff rags in intake ports if hole is cut from carburetor side.

IGNITION AND TIMING. On models equipped with breaker points, point gap should be 0.016 in. Both sets of points must be adjusted to open exactly 180° apart. Engines are equipped with a centrifugal timing advance which provides retarded timing for starting only. Advance timing position is marked by a chipped fan blade and an alignment mark on fan housing. Hold flyweight in advanced position as shown in Fig. 2, when checking ignition timing.

The Capacitor Discharge Ignition (CDI) system uses a permanent magnet flywheel to induce voltage into exciter coil. The exciter coil then sends current to CDI unit where a diode allows only DC current to flow into a capacitor. When gate control switch in CDI unit receives the small current signal from the pulser coil, it closes and allows the capacitor to discharge its stored voltage into the ignition coil. The coil then "steps up" voltage enough to fire both spark plugs simultaneously.

If an engine problem is experienced check fuel system, electrical connections, wiring and spark plugs. To test CDI ignition system a special tester or ohmmeter must be used. **DO NOT** use a 12 volt test light as it may damage the CDI system.

Timing is electronic and should not change once properly adjusted. Check timing with an electronic timing light. If timing has changed, check for a loose flywheel nut, sheared flywheel key, or loose mounting screws on stator base plate. To check ignition timing, first remove drive belt. Connect a timing light to No. 1 spark plug wire and a tachometer to No. 2 plug wire. Start engine and run at 6000 rpm. Aim timing light at hole in flywheel housing and check to see if mark on flywheel lines up with mark on flywheel housing. If timing is incorrect, adjust timing stator plate and recheck timing marks for correct alignment. Reinstall drive belt.

LUBRICATION. Engine is lubricated by mixing oil with the fuel. The recommended ratio is 20:1 for all models except K-340-2FA. Use Regular or Premium gasoline and SAE 40 (Diluted) two-cycle (air-cooled) engine oil.

For Model K-340-2FA manufacturer recommends a gasoline with an octane rating of 88 or higher, mixed with a two-cycle BIA certified oil or suitable equivalent at a ratio of 50:1.

Mix fuel and oil thoroughly using a separate container before pouring mixture into fuel tank. For cold weather blending, pre-mix the oil with a small amount of gasoline and shake thoroughly until mixture is liquid, then blend with remainder of fuel. Do not use kerosene or fuel oil for premixing.

COOLING FAN AND BELT. The cooling fan drive belt should have approximately ⅜-inch deflection measured midway between pulleys as shown by arrows, Fig. 3. To adjust the belt, use a suitable pin-type spanner (W) to hold the upper pulley and remove fan shaft nut. Transfer shims from between pulley halves to front of pulley to tighten belt or add shims to loosen belt. Tighten fan shaft nut to a torque of 35 ft.-lbs. When a new belt is installed, tension should be checked after the first 2 or 3 hours of operation.

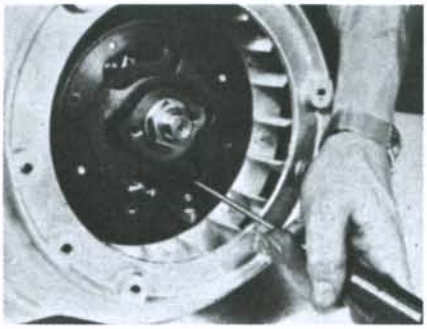

Fig. 2 — Breaker cam must be held in advanced position when checking timing.

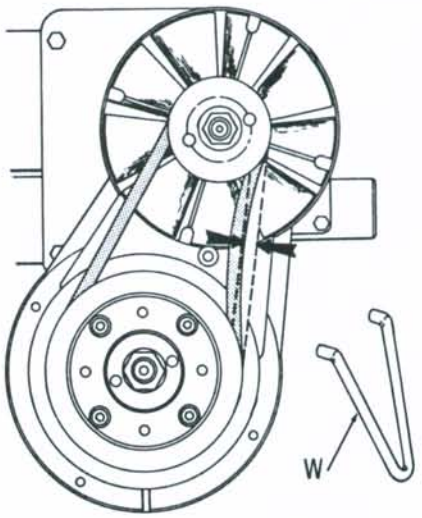

Fig. 3 — On axial fan models, cooling fan drive belt should have approximately ⅜-inch deflection when finger pressure is applied at point shown by arrows. A pin-type spanner wrench (W) is used to hold fan pulley to remove shaft nut.

REPAIRS

TIGHTENING TORQUES. Recommended tightening torques are as follows: (All values are given in ft.-lbs.).

CENTRIFUGAL FAN MODELS	
Bearing Plates	
K618-2	16
All Other Models	13
Crankcase and Cylinder Nuts	
K618-2	32
All Other Models	18
Crankcase Flange Bolts (K618-2)	17
Cylinder Head Bolts	
K295-2T	18
K618-2	32
Other Models	22
Flywheel	100
Intake Manifold	13
Spark Plug	
K295-2T-K340-2T	14
Other Models	18

NOTE: To determine type of threads used on engine, refer to engine specification number. If number has six digits, threads are U.S. standard. If specification number has seven digits, refer to suffix of two numbers. Numbers from 01 to 05 indicate metric threads while numbers from 06 to 20 indicate U.S. standard threads.

AXIAL FAN MODELS

Crankcase and Cylinder Nuts	16
Crankcase Flange Bolts	13
Cylinder Head	18
Drain Plug	8
Fan Shaft Nut	40
Flywheel	95
Manifold Halves	8
Spark Plug	14

MODEL K-340-2FA

Crankcase Halves	9
Crankcase to Cylinder	18
Cylinder Head	18
Intake Manifold	18
Exhaust Manifold	18
Flywheel	90
Spark Plug	20

DISASSEMBLY AND REASSEMBLY. Repair sections are divided into three types; axial fan twin, centrifugal fan twin and late K-340-2FA model. K-440-2SS and K-645-3SS models are listed in CONDENSED SERVICE DATA Tables but specific overhaul data is not given. Repair procedures differ on engine models, refer to the appropriate following paragraphs for suggested procedures.

CENTRIFUGAL FAN MODELS. Refer to Figs. 4 and 5 for exploded views of engine. If the Engine Specification number has seven digits and the last two are 05 or lower, the engine has metric threads. All other engines have U.S. Standard threads. As an example, metric threads will be found on K399-2 and K618-2 engines.

To disassemble the removed engine, first remove carburetor, manifolds, drive clutch, starter, air shroud and flywheel. Cooling fins on early models were cast square with heads as shown in upper view, Fig. 6. Late models have oblique fins as shown in lower view. Cylinder heads or shrouds are not interchangeable between the two types. On all models, carefully note or mark positioning of heads so they can be installed in correct position.

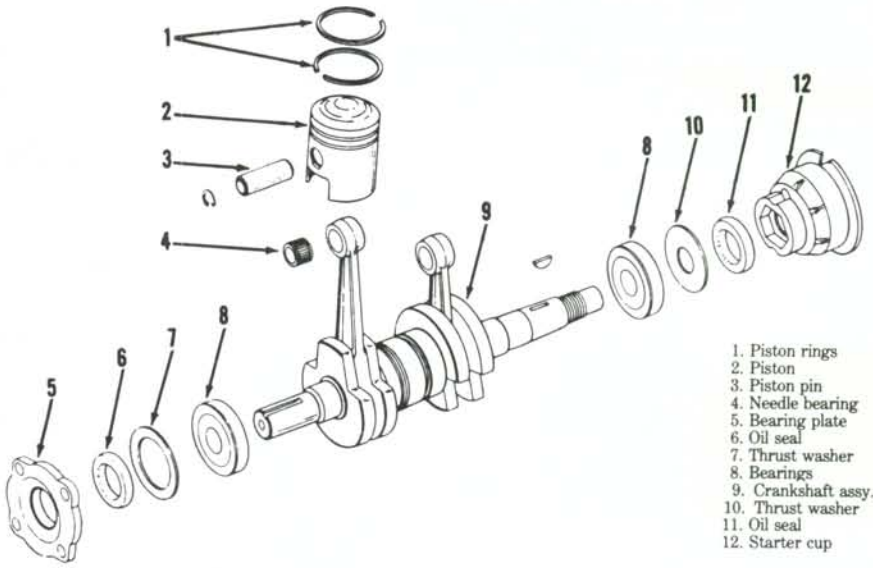

Fig. 5—Exploded view of crankshaft, pistons and associated parts used on centrifugal fan engines.

When removing drive-end bearing plate (5—Fig. 5) note number of shims (7) on shaft. Keep shims with bearing plate for reassembly. Scratch-mark magneto plate to assist in timing during reassembly, then remove magneto plate, flywheel end plate and shims (10). Note number of shims (10) and keep with end plate for reassembly.

Scratch-mark cylinders and crankcase for identification and remove cylinders and pistons, keeping No. 1 and No. 2 assemblies separate and identified. Remove the retaining stud nuts and, supporting upper crankcase half, bump crankshaft gently with a soft hammer to break the sealant and separate the halves; then lift off upper crankshaft half and lift out crankshaft.

When reassembling the engine, make sure all parts are clean. Insert crankcase through-bolts in lower crankcase half and attach to a suitable engine stand, then lower crankshaft into position in crankcase half. Install both crankcase end plates and removed shim packs on

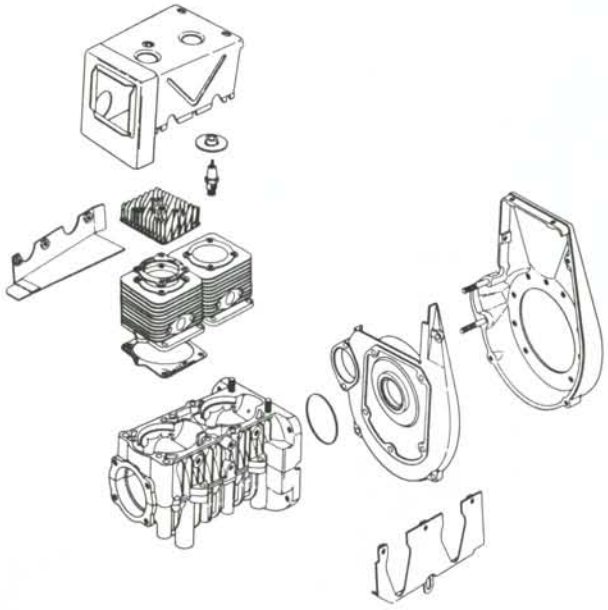

Fig. 4—Exploded view of major housing components used on centrifugal fan models.

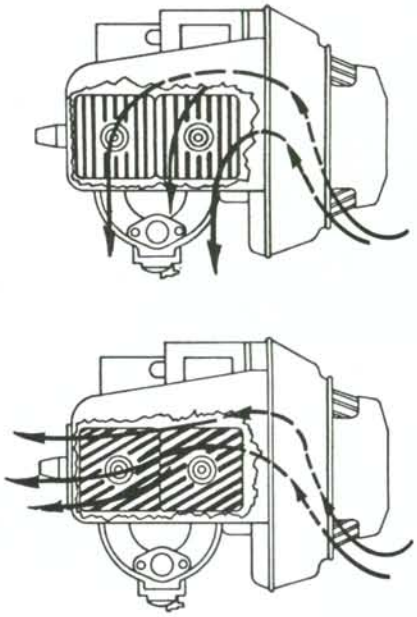

Fig. 6—On early models, cooling air outlet was located on carburetor side of engine and cylinder head cooling fins run crosswise as shown in upper view. On later engines, cooling air outlet is located at drive end of engine and oblique cooling fins are used (lower view).

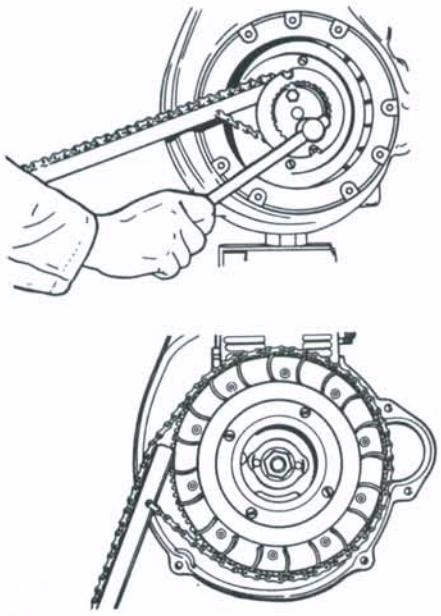

Fig. 7—A Chain Clamp Tool is available from the engine manufacturer which can be used for a number of holding operations.

lower crankcase half and snug up retaining cap screws. Slide crankshaft solidly toward flywheel end of housing as shown in Fig. 8 and measure end clearance between crankshaft bearing and drive end housing using a feeler gage as shown. Clearance should be 0.006-0.012; if it is not, vary the thickness of either shim pack (7 or 10–Fig. 5) as required. Shims are available in thicknesses of 0.006 and 0.012. Remove both bearing plates leaving shim pack in position on crankshafts. Coat flange areas of both crankcase halves evenly and lightly with KOHLER Crankcase Sealer (or equivalent). Lubricate all bearings with clean, light oil and reassemble crankcase halves and end plates.

Heat the piston and install piston pin, with piston ring locating pins positioned on carburetor side of crankcase. The lighter colored piston ring should be installed in lower ring groove and the darker (moly coated) ring in top groove. Make sure both rings are properly positioned over locating pins, then install

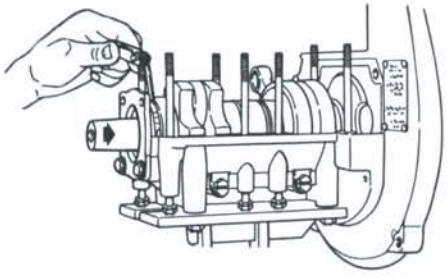

Fig. 8—Push crankshaft of partially assembled engine to flywheel side and measure end play with a feeler gage as shown.

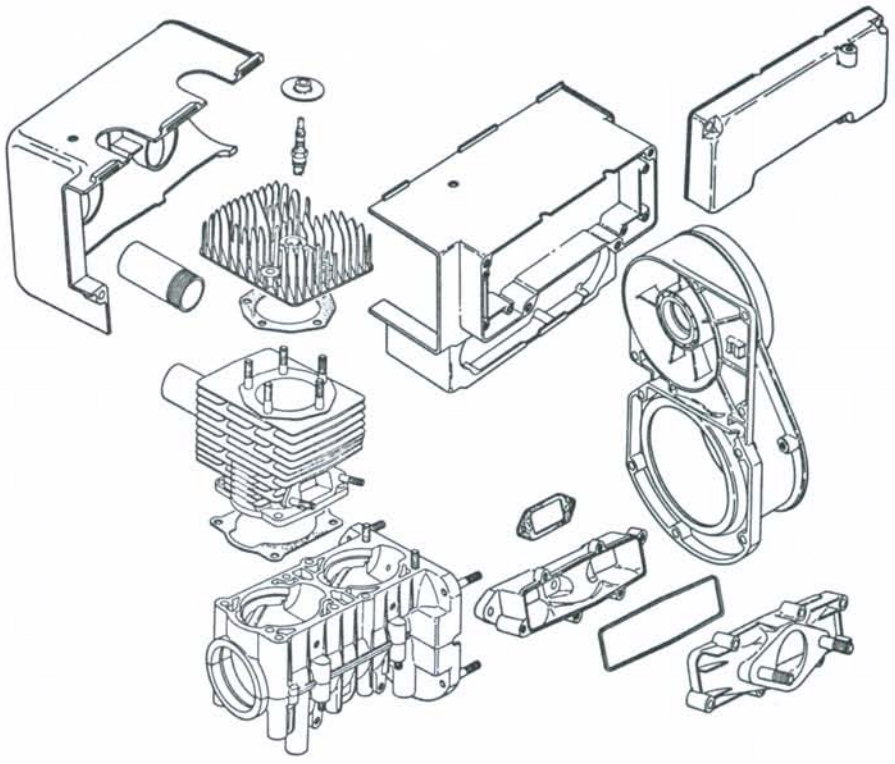

Fig. 9—Exploded view of major housing components used on axial fan models. Note split cylinder shroud and two-piece intake manifold. Minor differences exist between large and small engines; refer also to Fig. 11.

cylinders using new base gaskets and a suitable ring compresser. Install and tighten intake manifold to align the cylinders, then tighten all crankcase through-bolts. Complete the assembly by reversing the disassembly procedure.

AXIAL FAN MODELS. Refer to Figs. 9, 10 and 11 for exploded views. All engines are equipped with U. S. Standard threads.

To disassemble the removed engine, first remove drive clutch, starter, air

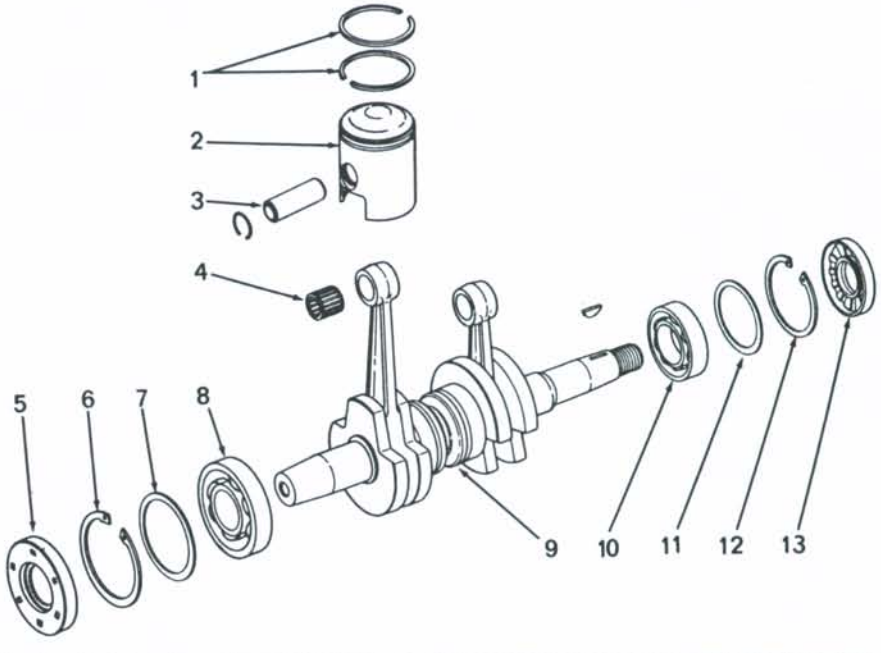

Fig. 10—Exploded view of crankshaft, pistons and associated parts used on big block axial fan models. Small block engines are similar except end plates (Fig. 11) control crankshaft end play instead of snap rings (6 & 12).

1. Piston rings
2. Piston
3. Piston pin
4. Needle bearing
5. Oil seal
6. Snap ring
7. Shim pack
8. Bearing
9. Crankshaft assy.
10. Bearing
11. Shim pack
12. Snap ring
13. Oil seal

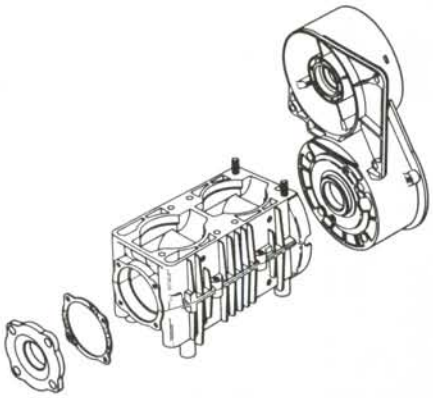

Fig. 11—On small block engines, end plates control crankshaft end play instead of snap rings shown in Fig. 10.

shrouds and flywheel. Intake manifold carburetor side may be removed along with carburetor; removal is necessary for access to the two center manifold stud nuts. Do not attempt to remove threaded exhaust tubes unless renewal is indicated. Tubes are installed with a special hardening sealer, and removal is difficult and unnecessary for normal service.

Scratch-mark cylinder heads, cylinders and crankcase for identification, then remove cylinder heads, cylinders and pistons. Keep No. 1 and No. 2 assemblies separate and identified. Scratch-mark armature plate to assist in timing at reassembly and remove armature plate and fan housing. On model K295-2AX and K340-2AX, remove drive-end bearing plate. Remove flange bolts or stud nuts. Support upper crankcase half and bump crankshaft gently with a soft-faced hammer to break the sealant grip, then separate crankcase halves and remove crankshaft unit.

When reassembling the engine, make sure all parts are clean. Install crankcase through-bolts in lower crankcase half and attach crankcase half to a suitable engine stand, then lower crankshaft in position. On large block engines, install the removed shim packs (7 & 11—Fig. 10) and fit snap rings (6 & 12) in crankcase bore grooves. On small block models, install removed shim packs and end plates (Fig. 11). On all models, slide crankshaft toward flywheel end and measure crankshaft end clearance using a feeler gage as shown in Fig. 8. Clearance should be 0.006-0.012; if it is not, vary the thickness of either shim pack (7 or 11—Fig. 10). Shims are available in thicknesses of 0.006 and 0.012. On engines so equipped, remove end plates leaving shim packs in place; on other models, position oil seals (5 & 13—Fig. 10) on shaft in lower crankcase half. Lubricate all bearings using light oil and coat both crankcase mating flanges with KOHLER Crankcase Sealer or equivalent. Reinstall crankcase upper half and on models so equipped, install bearing end plates.

Heat the piston and install piston pin, with piston ring locating pins positioned on carburetor side of crankcase. A square-section ring is used in lower ring groove, an L-ring in upper groove. Make sure rings are properly positioned over locating pins, then install cylinders using new base gaskets and a suitable ring compresser. Install and tighten intake manifold base half to align the cylinders, then tighten all crankcase through-bolts. Complete the assembly by reversing the disassembly procedure.

MODEL K-340-2FA. Refer to Fig. 11A and 11B for exploded views of engine assembly.

To disassemble the removed engine, first remove drive clutch, engine base, intake and exhaust manifolds, spark plugs and recoil starter. Remove flywheel retaining nut and locking plate, then using a suitable puller withdraw flywheel from crankshaft. Remove flywheel housing with CDI unit and coil attached to housing, then remove stator assembly. Remove cylinder heads and cylinders. Remove piston pin retaining rings, then push piston pins out and remove pistons. Remove crankcase retaining cap screws and split case in half. Lift crankshaft assembly out of housing.

Inspect crankcase halves for pitting, scoring or any other damage. Inspect cylinder heads and cylinders for excessive distortion. Cylinder head or cylin-

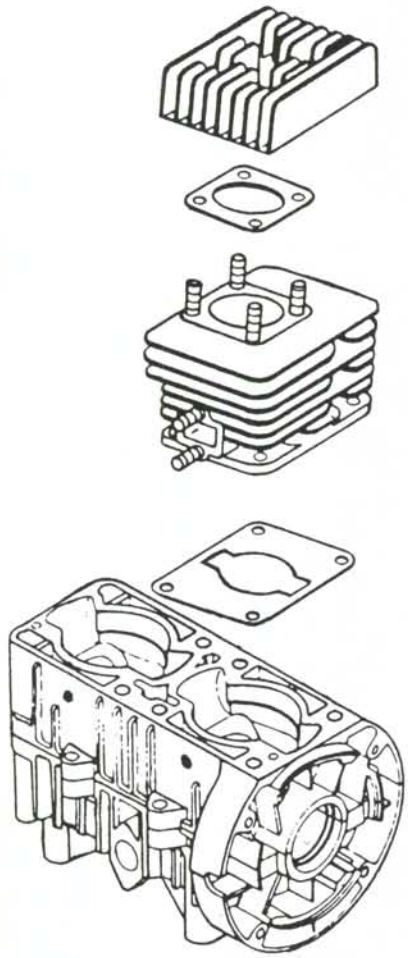

Fig. 11A—Exploded view of crankcase and cylinder assembly for Model K-340-2FA.

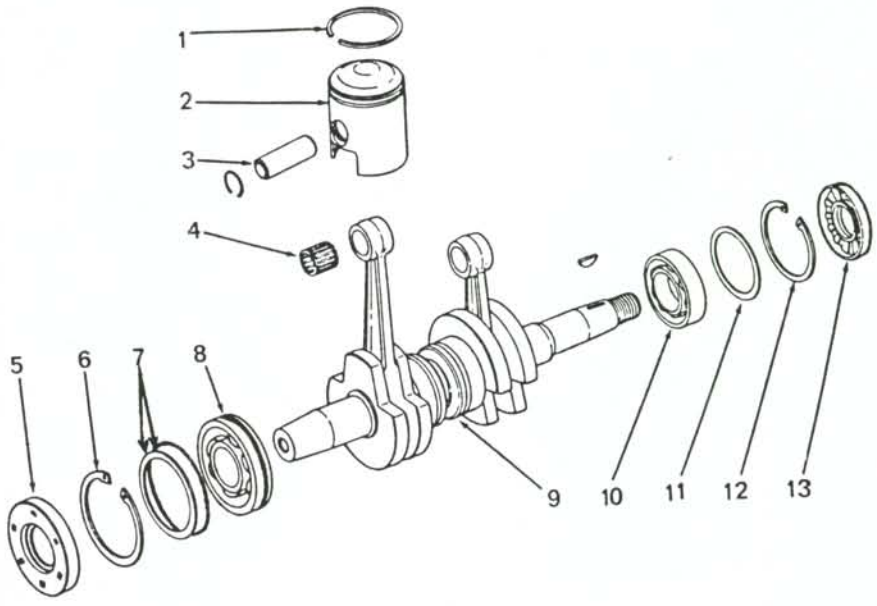

Fig. 11B—Exploded view of crankshaft assembly and associated parts for Model K-340-2FA.

1. Piston ring
2. Piston
3. Piston pin and circlip
4. Needle bearing
5. Oil seal
6. Snap ring
7. Shim pack and "O" ring
8. Roller bearing
9. Crankshaft assembly
10. Roller bearing
11. Shim pack
12. Snap ring
13. Oil seal

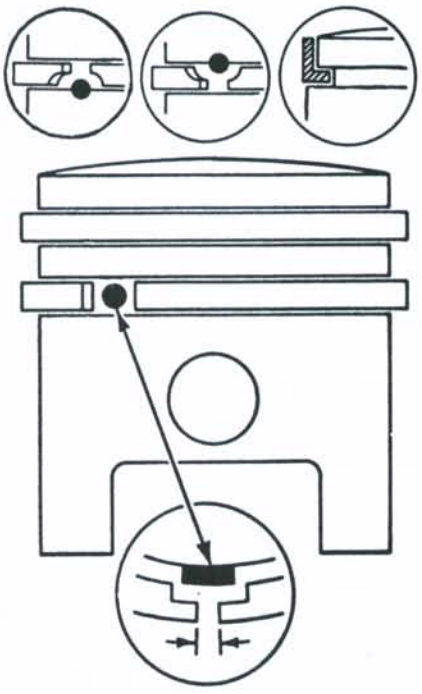

Fig. 12—Various locations of piston ring positioning pin have been used as shown. L-ring (upper right) is used in top groove on K295-2T and all axial fan models.

der should be renewed if distortion is more than 0.002-inch. Measure cylinder bore for out-of-roundness or excessive taper. Accepted allowable wear tolerance is 0.002-inch. Cylinder assembly must be renewed if beyond specification. Cylinder bore is chrome-plated and cannot be honed or rebored. Check pistons for pitting, scoring, corrosion or any other damage. Measure piston pin bore, pin diameter and piston skirt diameter. Specifications are as follows: piston skirt, 2.4364-2.4370 inches; piston pin diameter, 0.6297-0.6301 inch; piston pin bore, 0.6298-0.6302 inch. Inspect crankshaft for excessive wear, damaged roller bearings or any other damage. Connecting rod side clearance should be 0.006-0.016 inch. Crankshaft runout should not be more than 0.002-inch. Renew all parts as needed. Crankshaft outer bearings may be renewed using a suitable puller and installation tool.

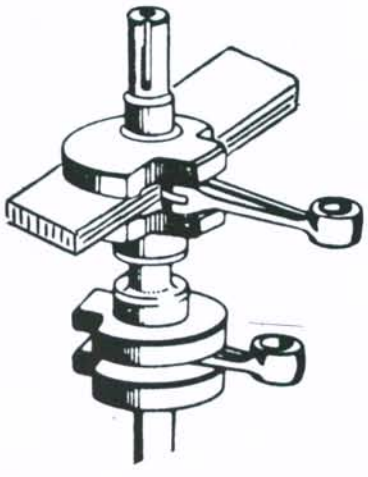

Fig. 13—Support crankshaft behind counterweights when pressing bearings.

During reassembly all "O" rings, gaskets and seals should be renewed. Correct crankshaft end play is 0.006-0.012 inch. Add or remove shims from between end bearings and retaining rings until correct distance is obtained.

Reassemble engine in reverse order of disassembly. Listed below are some items to follow during reassembly:

1. Install piston on connecting rods with arrows pointing toward exhaust side.
2. Piston ring end gap measured one-inch down from top of cylinder should be 0.010-0.015 inch. If necessary, file ring end until correct measured gap is obtained.
3. Install new cylinder-to-crankcase gaskets with tabs toward exhaust port side.
4. During installation of cylinder assemblies, install intake manifold to cylinders before tightening cylinder retaining nuts as to insure alignment of cylinders.

Refer to TIGHTENING TORQUE section for torque specifications. Tighten cylinder head retaining nuts in a criss-cross sequence.

PISTONS, RINGS AND CYLINDERS. Engine Models K-440-2SS and K-645-3SS are listed in CONDENSED SERVICE DATA Tables but specific repair data is not given. For Model K-340-2FA refer to DISASSEMBLY AND REASSEMBLY section for repair procedures. For all other engine models refer to the following paragraphs for service data.

On some engines, cylinder head can be installed in more than one position and should be marked before removal. Renew any head with broken or missing fins, damaged spark plug threads or other damage.

Maximum cylinder taper or out-of-round is 0.006. Cylinders can be honed or rebored, and pistons and rings are available in oversizes of 0.010, 0.020 and 0.040.

Piston ring locating pins may be installed at top, bottom or center of ring groove as shown in Fig. 12, and the correct ring must be installed. On axial fan engines and K295-2T an L-ring is used in top ring groove. Other engines used a dark colored (moly coated) top ring. Recommended piston ring end is 0.012-0.018 for model K618-2, 0.008-0.014 for K295-2T and all axial fan models; and 0.010-0.016 for all other models. Piston ring side clearance using new rings should not exceed 0.005 for top ring or 0.004 for bottom ring on model K618-2, 0.003 for bottom ring on models K295-2T or axial fan engines; or 0.004 for any other ring on any model.

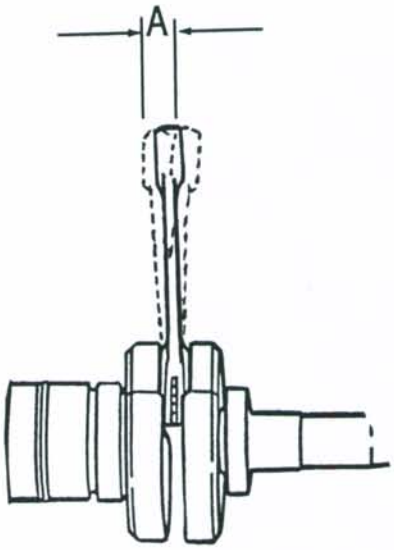

Fig. 14—Wear of connecting rod big-end bearing and crankpin can be checked by determining the axial "rock" or "Side Shake" of rod at small end as shown at (A). Wear may be considered excessive if side shake exceeds 0.080 in. (2.0 mm).

CRANKSHAFT ASSEMBLY. Engine Models K-440-2SS and K-645-3SS are listed in CONDENSED SERVICE DATA Tables but specific repair data is not given. For Model K-340-2FA refer to DISASSEMBLY AND REASSEMBLY section for repair procedures. For all other engine models refer to the following paragraphs for service data.

The crankshaft and connecting rods are available only as a complete unit and should not be disassembled.

Bearings are a press fit on crankshaft and will not normally need to be removed unless renewal is indicated. If bearings must be removed, support the crankshaft below the counterweights as shown in Fig. 13 when reinstalling bearings.

Check for wear of the connecting rod big end bearing by measuring the play at connecting rod small end as shown in Fig. 14. If side shake (A) exceeds 0.080 inch (2.0 mm), unit is excessively worn

and crankshaft assembly should be renewed. Also check for damage or roughness of crankshaft bearing by turning the rod around crankpin.

Check for runout before installation by mounting the shaft between lathe centers as shown in Fig. 15. Runout should not exceed 0.0015. If runout is excessive and remainder of unit is reusable, the unit may be straightened by a machine shop or engine rebuilder experienced with this type of construction. If bearings, shafts or connecting rods are unserviceable, renew the crankshaft unit.

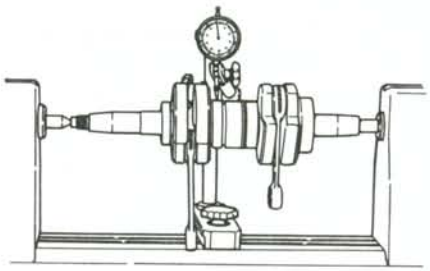

Fig. 15—Crankshaft runout should be checked before installation by mounting the unit in lathe centers as shown and measuring runout with a dial indicator.