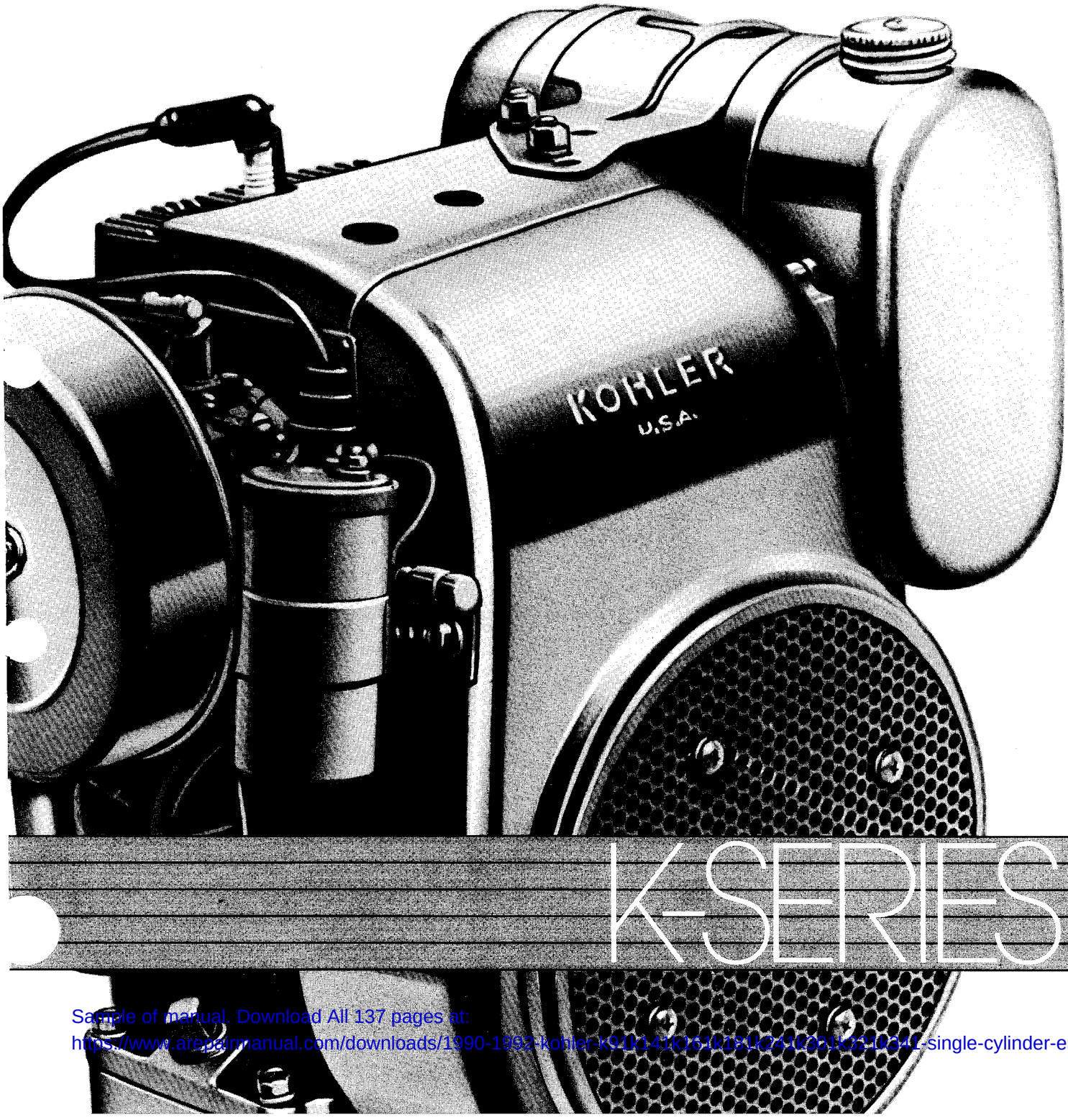
KOHLER engines

Single Cylinder Engine SERVICE MANUAL

K91, K141, K161, K181, K241, K301, K321, K341



K-SERIES

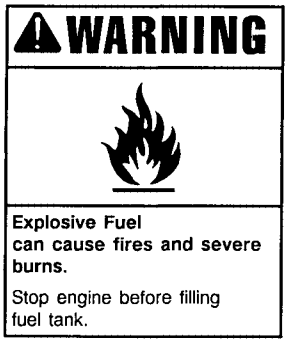
CONTENTS

SECTION 1
GENERAL INFORMATION

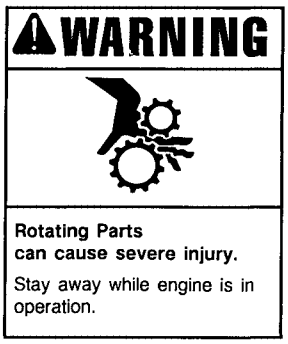
SAFETY INFORMATION

For Your Safety!

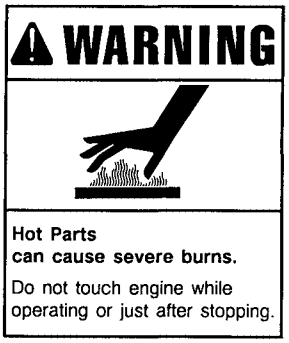
These safety precautions should be followed at all times. Failure to follow these safety precautions could result in serious injury to yourself and others.



WARNING: Explosive Fuel!
Gasoline is extremely flammable and its vapors can explode if ignited. Store gasoline only in approved containers, in well-ventilated, unoccupied buildings, away from sparks or flames. Do not fill the fuel tank while the engine is hot or running, since spilled fuel could ignite if it comes in contact with hot parts or sparks from ignition. Do not start the engine near spilled fuel. Never use gasoline as a cleaning agent.



WARNING: Rotating Parts!
Keep hands, feet, hair, and clothing away from all moving parts to prevent injury. Never operate the engine with covers, shrouds, or guards removed.



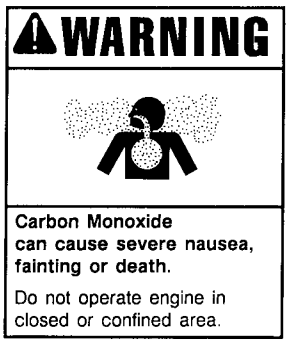
WARNING: Hot Parts!
Engine components can get extremely hot from operation. To prevent severe burns, do not touch these areas while the engine is running—or immediately after it is turned off. Never operate the engine with heat shields or guards removed.

WARNING: Accidental Starts!
Before servicing the engine or equipment, always disconnect the spark plug lead to prevent the engine from starting accidentally. Ground the lead to prevent sparks that could cause fires. Make sure the equipment is in neutral.

CAUTION: Electrical Shock!
Never touch electrical wires or components while the engine is running. They can be sources of electrical shock.

WARNING: Overspeed Is Hazardous!
Do not tamper with the governor setting. Overspeed is hazardous and could cause personal injury.

WARNING: Flammable Solvents!
Carburetor cleaners and solvents are extremely flammable. Keep sparks, flames, and other sources of ignition away from the area. Follow the cleaner manufacturer's warnings and instructions on its proper and safe use. Never use gasoline as a cleaning agent.



WARNING: Lethal Exhaust Gases!
Engine exhaust gases contain poisonous carbon monoxide. Carbon monoxide is odorless, colorless, and can cause death if inhaled. Avoid inhaling exhaust fumes, and never run the engine in a closed building or confined area.

WARNING: Spring Under Tension!
Retractable starters contain a powerful, flat wire recoil spring that is under tension. Do not remove the center screw from the starter until the spring tension is released. Removing the center screw before releasing spring tension, or improper starter disassembly, can cause the sudden and potentially dangerous release of the spring.

Always wear safety goggles when servicing retractable starters – full face protection is recommended.

To ensure personal safety and proper starter disassembly and reassembly, follow the procedures in this section carefully.

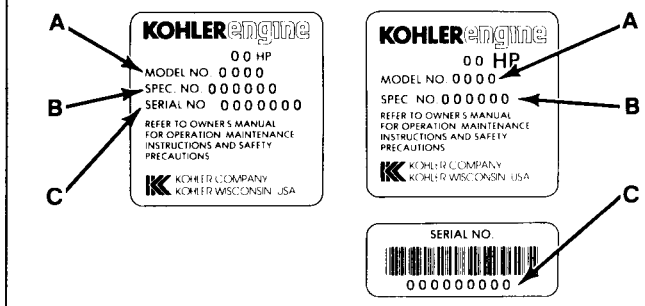
WARNING: Dangerous Acid, Explosive Gases!
Batteries contain sulfuric acid. To prevent acid burns, avoid contact with skin, eyes, and clothing. Batteries produce explosive hydrogen gas while being charged. To prevent a fire or explosion, charge batteries only in well-ventilated areas. Keep sparks, open flames, and other sources of ignition away from the battery at all times. Keep batteries out of the reach of children. Remove all jewelry when servicing batteries.

Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or gasoline vapors are present.

ENGINE IDENTIFICATION NUMBERS

When ordering parts, or in any communications involving an engine, always give the model, specification and serial number of the engine.

The engine identification numbers appear on a decal (or decals) affixed to the engine blower housing. Refer to Figure 1-1. The significance of these numbers is shown below:



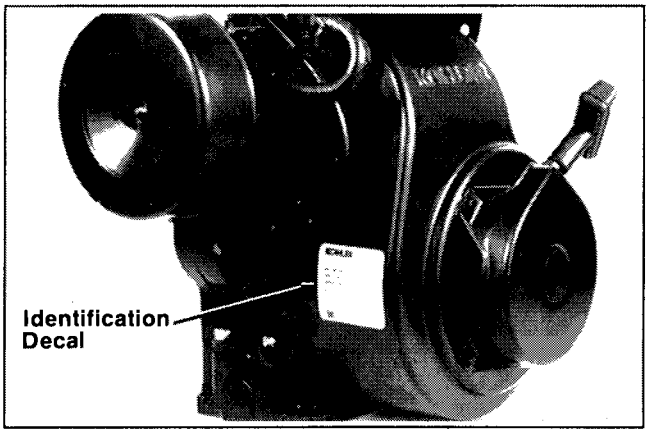


Figure 1-1. Location of Engine Identification Decal.

A. MODEL NO.

K 32 1 PT

- K: K-Series Engine
- 32: Approximate Displacement (Cu. In.)
- 1: Single Cylinder
- PT: Version Code

Version Code	
A	Special Oil Pan
C	Clutch Model
G	Generator Application
P	Pump Model
Q	Quiet Model
R	Reduction Gear
S	Electric Start
T	Retractable Start
ST	Electric Start And Retractable Start
EP	Electric Plant

B. SPEC NO.

Engine Model Code	
Code	Model
26, 27, 31	K91
28	K161
29	K141
30	K181
46	K241
47	K301
60	K321
71	K341

60 124B

- 124B: Variation of Basic Engine

C. SERIAL NO.

E - 1 7 2 4 5 2	9 0 7 6 4 3 0	1 0 0 2 6 6 9 2	1 5 0 1 8 9 7 5 9 1
A Letter	First Two Digits / If Seven Digit Number	First Three Digits / If Eight Digit Number	First Two Digits / If Ten Digit Number
A 1965	10-19 1969	100-109 1980	15 1985
B 1966	20-29 1970	110-119 1981	16 1986
C 1967	30-39 1971	120-129 1982	17 1987
D 1968	40-49 1972	130-139 1983	18 1988
E 1969	50-59 1973	140-149 1984	19 1989
	60-69 1974	150-159 1985	20 1990
	70-72 1975		21 1991
	73-79 1976		22 1992
	80-89 1977		23 1993
	90-94 1978		24 1994
	95-99 1979		25 1995

Remaining digits are a factory code.

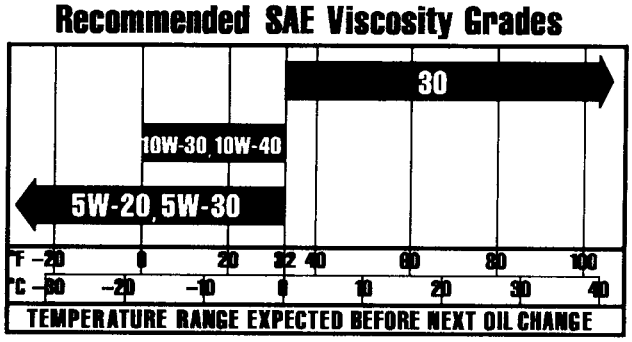
Figure 1-2. Engine Identification Decals.

OIL RECOMMENDATIONS

Using the proper type and weight of oil in the engine crankcase and in the gear reduction unit is extremely important, as is checking oil daily and changing oil regularly. Failure to use the correct oil or using dirty oil causes premature engine wear and failure.

Oil Type

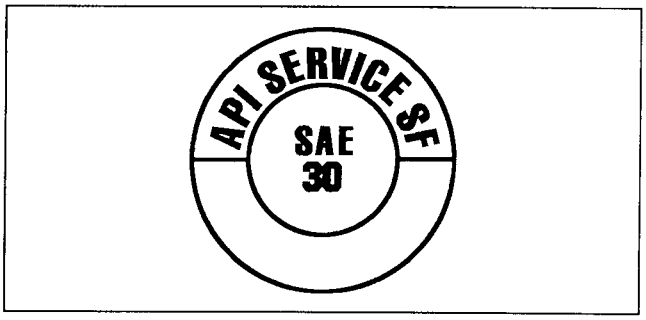
Use high-quality detergent oil of API (American Petroleum Institute) Service Class SF or SG. Select the viscosity based on the air temperature at the time of operation as shown in the table.



Straight 30-weight oil is preferred. SAE 10W-30 and 10W-40 are not recommended above 32°F (0°C). Using these oils substantially increases oil consumption and combustion chamber deposits.

NOTE: Using other than Service Class SF or SG oil or extending oil change intervals longer than recommended could cause engine damage which is not covered by the engine warranty.

A logo or symbol on oil containers identifies the API service class and SAE viscosity grade.



Check Oil Level

Check oil lever BEFORE EACH USE.

Check gear reduction uniot oil level by removing the drain plug on the lower part of the cover. Oil level should be up to the bottom of the plug hole. If oil level is low, remove the vented plug at the top of the cover, add oil until it reaches the bottom of the drain plug hole, and replace drain plug and vented plug.

NOTE: Do not operate the engine with the oil level below the "L" mark or over the "F" mark on the dipstick.

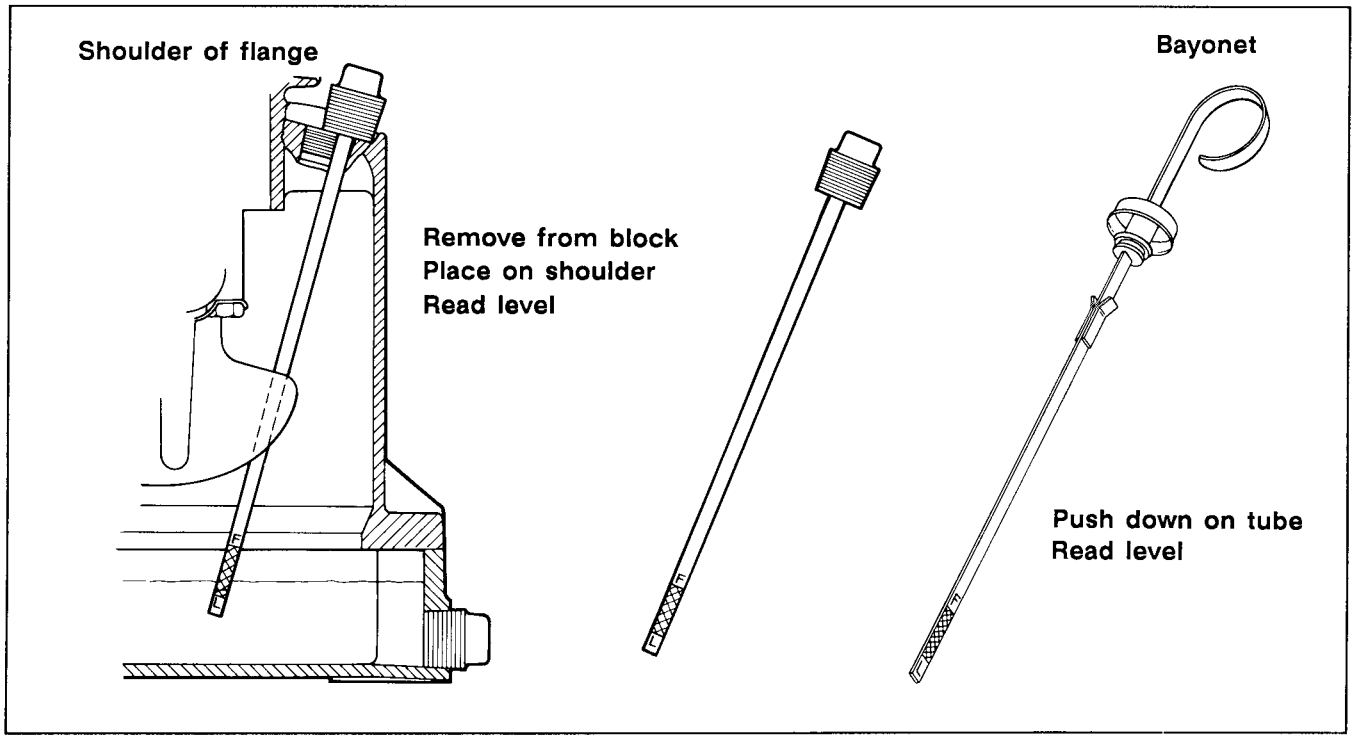


Figure 1-3. Dipsticks And Oil Fill Tubes.

Change Oil

For a new engine, change oil after the first 5 hours of operation. Change oil every 25 hours of operation thereafter.

For an overhauled engine or one rebuilt with a new shortblock or miniblock, use straight 30-weight Service Class SF or SG oil for the first 5 hours of operation. Change the oil after this initial run-in period. Refill with Service Class SF or SG oil as specified in the table. Change oil every 25 operating hours thereafter.

FUEL RECOMMENDATIONS

WARNING: Explosive Fuel!

Gasoline may be present in the carburetor and fuel system. Gasoline is extremely flammable and it can explode if ignited. Keep sparks, open flames, and other sources of ignition away from the engine. Disconnect and ground the spark plug lead to prevent the possibility of sparks from the ignition system.

General Recommendations

Purchase gasoline in small quantities and store in clean, approved containers. A container with a capacity of 2 gallons or less with a pouring spout is recommended. Such a container is easier to handle and helps eliminate spoilage during refueling.

Do not use gasoline left over from the previous season, to minimize gum deposits in your fuel system and to insure easy starting.

Do not add oil to the gasoline.

Do not overfill the fuel tank. Leave room for the fuel to expand.

Fuel Type

For best results, use only clean, fresh, unleaded gasoline with a pump sticker octane rating of 87 or higher. In countries using the Research method, it should be 90 octane minimum.

Unleaded gasoline is recommended, as it leaves less combustion chamber deposits. Leaded gasoline may be used in areas where unleaded is not available and exhaust emissions are not regulated. Be aware however, that the cylinder head will require more frequent service.

Gasoline/Alcohol blends

Gasohol (up to 10% ethyl alcohol, 90% unleaded gasoline by volume) is approved as a fuel for Kohler engines. Other gasoline/alcohol blends are not approved.

Gasoline/Ether blends

Methyl Tertiary Butyl Ether (MTBE) and unleaded gasoline blends (up to a maximum of 15% MTBE by volume) are approved as a fuel for Kohler engines. Other gasoline/ether blends are not approved.

OIL REFILL QUANTITIES (U.S. STANDARD QUARTS)

K91	K141, K161, K181	K241, K301, K321, K341	K241A, K301A, K321A, K341A
1/2 Quart	1 Quart	2 Quarts	1 Quart*

(After refilling, always check oil level -- DO NOT OVERFILL)

* A-type oil pan capacity varies from 1 to 1-3/4 quarts. On these add 1 quart of oil, check level, then add oil as necessary to bring up to full level.

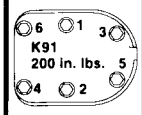
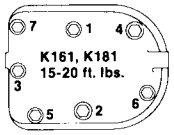
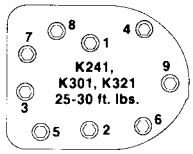
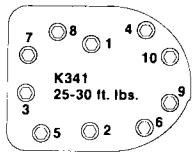
Figure 1-4.

HORSEPOWER (Maximum RPM) / Engine Model			4 / K91	7 / K161*	8 / K181	10 / K241	12 / K301	14 / K321	16 / K341
GENERAL	Bore x Stroke		2.375x2.000	2.938x2.500	2.938x2.750	3.251x2.875	3.375x3.250	3.500x3.250	3.750x3.250
	Displacement Cu. In.		8.86	16.94	18.64	23.85	29.07	31.27	35.90
	Max. Operating RPM		4000	3600	3600	3600	3600	3600	3600
BALANCE GEAR	Shaft O.D.	New	—	—	—	.4998/.5001	.4998/.5001	.4998/.5001	.4998/.5001
		Maximum Wear Limit	—	—	—	.4996	.4996	.4996	.4996
	End Play		—	—	—	.002/.010	.002/.010	.002/.010	.002/.010
CAMSHAFT	Sleeve I.D. Installed		—	—	—	—	—	—	—
	End Play		.005/.020	.005/.010	.005/.010	.005/.010	.005/.010	.005/.010	.005/.010
CONNECTING ROD	Running Clearance	Rod To Crank-Pin (New)	.001/.0025	.001/.002	.001/.002	.001/.002	.001/.002	.001/.002	.001/.002
		Rod To Crank-Pin Wear Limit	.003	.0025	.0025	.0025	.0025	.0025	.0025
		Rod To Piston Pin (New)	.0007/.0008	.0006/.0011	.0006/.0011	.0003/.0008	.0003/.0008	.0003/.0008	.0003/.0008
	Small End I.D. (New)		.5630/.5633	.6255/.6258	.6255/.6258	.8596/.8599	.8757/.8760	.8757/.8760	.8757/.8760
CRANKSHAFT	MAINS PTO & Flywheel End O.D.	New	.9841/.9844	1.1811/1.1814	1.1811/1.1814	1.5745/1.5749	1.5745/1.5749	1.5745/1.5749	1.5745/1.5749
		Maximum Wear Limit	.9841	1.1811	1.1811	1.5745	1.5745	1.5745	1.5745
	MAINS Max. Out of Round (Sleeve)		—	—	—	—	—	—	—
	MAINS Max. Taper (Sleeve)		—	—	—	—	—	—	—
	MAINS Running Clearance (Sleeve)	Maximum New	—	—	—	—	—	—	—
		Wear Limit ①	—	—	—	—	—	—	—
	MAINS New Sleeve Bearing I.D. Installed		—	—	—	—	—	—	—
	CRANKPIN New		.9360/.9355	1.1860/1.1855	1.1860/1.1855	1.5000/1.4995	1.5000/1.4995	1.5000/1.4995	1.5000/1.4995
	CRANKPIN Max. Wear Limit		.9350	1.1850	1.1850	1.4990	1.4990	1.4990	1.4990
	CRANKPIN Max. Out of Round		.0005	.0005	.0005	.0005	.0005	.0005	.0005
	CRANKPIN Max. Taper		.001	.001	.001	.001	.001	.001	.001
	End Play		.004/.023	.002/.023	.002/.023	.003/.020	.003/.020	.003/.020	.003/.020
CYLINDER BORE	Inside Diameter	New	2.3755/2.3745	2.9380/2.9370	2.9380/2.9370	3.2515/3.2505	3.3755/3.3745	3.5005/3.4995	3.7505/3.7495
		Maximum Wear Limit	2.378	2.941	2.941	3.254	3.378	3.503	3.753
	Max. Out of Round		.003	.003	.003	.003	.003	.003	.003
	Max. Taper		.003	.003	.003	.002	.002	.002	.002
CYLINDER HD.	Max. Out of Flatness		.003	.003	.003	.003	.003	.003	.003
IGNITION	Spark Plug Type & Gap	Type⑥	RCJ-8	RCJ-8	RCJ-8	RH-10	RH-10	RH-10	RH-10
		Battery	.025	.025	.025	.035	.035	.035	.035
		Magneto	.025	.025	.025	.025	.025	.025	.025
		Gaseous Fuels	.018	.018	.018	.018	.018	.018	.018
	Nominal Point Gap		.020	.020	.020	.020	.020	.020	.020
PISTON ⑦	Service Replacement Sizes		.003 — .010 — .020 — .030						
	Thrust Face O.D.⑦	New	2.371/2.369	2.9297/2.9281	2.9297/2.9281	3.2432/3.2413	3.368/3.365	3.4941/3.4925	3.7425/3.7410⑨
		Maximum Wear Limit	2.366	2.925	2.925	3.238	3.363	3.491	3.738⑨
	Thrust Face To Bore Clearance (New)①⑦		.0035/.006	.007/.010	.007/.010	.007/.010	.007/.010	.007/.010	.007/.010⑨
	Ring End Gap	New Bore	.007/.017	.007/.017	.007/.017	.010/.020	.010/.020	.010/.020	.010/.020
		Used Bore (Max.)	.027	.027	.027	.030	.030	.030	.030
	Max. Ring Side Clearance		.006	.006	.006	.006	.006	.006	.006
PISTON ⑨ 1½"	Service Replacement Sizes		.003 — .010 — .020 — .030						
	Thrust Face O.D.⑨	New	—	—	2.9329/2.9336	—	3.3700/3.3693	3.4945/3.4938	3.7465/3.7455
		Maximum Wear Limit	—	—	2.931	—	3.367	3.492	3.744
	Thrust Face To Bore Clearance (New)①⑨		—	—	.0034/.0051	—	.0045/.0062	.0050/.0067	.0030/.0050
	Ring End Gap	New Bore⑩	—	—	.010/.023	—	.010/.020	.010/.020	.010/.020
		Used Bore⑩ (Max.)	—	—	.032	—	.030	.030	.030
	Max. Ring Side Clearance		—	—	.006	—	.006	.006	.006
PISTON PIN	Outside Diameter		.5623/.5625	.6247/.6249	.6247/.6249	.8591/.8593	.8752/.8754	.8752/.8754	.8752/.8754
VALVES	Guide Reamer Size		.250	.3125	.3125	.3125	.3125	.3125	.3125
	Tappet Clearance (Cold)	Intake	.005/.009	.006/.008	.006/.008	.008/.010	.008/.010	.008/.010	.008/.010⑧
		Exhaust	.011/.015	.017/.019	.017/.019	.017/.019	.017/.019	.017/.019	.017/.019
	Minimum Lift (Zero Lash)	Intake	.2035	.2718	.2718	.318	.318	.318	.318
		Exhaust	.1768	.2482	.2482	.318	.318	.318	.318
	Minimum Valve Stem O.D.	Intake	.2478	.3103	.3103	.3103	.3103	.3103	.3103
		Exhaust	.2458	.3088	.3088	.3074	.3074	.3074	.3074
	Nominal Angle Valve Seat		45°	45°	45°	45°	45°	45°	45°
	Guide I.D. Maximum Wear Limit①	Intake	.005	.005	.005	.006	.006	.006	.006
		Exhaust	.007	.007	.007	.008	.008	.008	.008

① Maximum limits combination of I.D. and O.D. measurements
② Ball bearing 1.3779/1.3784, Maximum Wear 1.3779
③ Ball bearing 1.7716/1.7721, Maximum Wear 1.7716
④ Pre Series II 1.3733/1.3738, Maximum Wear 1.3728
⑤ Ball bearing .002/.023
⑥ Champion spark plugs or equivalent
⑦ Measure just below oil ring groove and at right angles to piston pin
⑧ 1800 RPM generator sets .005/.007
⑨ Measure ½" above the bottom of the piston skirt.
⑩ Top and center compression rings.

* Includes K141

Figure 1-5. Engine Specifications And Tolerances.

HORSEPOWER (Max. RPM) Engine Model		4 K91	7 * K161	8 K181	10 K241	12 K301	14 K321	16 K341
CONNECTING RODS①	Posi-lock②	—	—	New 140 in. lbs. Used 100 in. lbs.	New 260 in. lbs. Used 200 in. lbs.			
	Capscrew③	140 in. lbs.	200 in. lbs.		285 in. lbs.			
SPARK PLUGS		18-22 ft. lbs.	18-22 ft. lbs.		18-22 ft. lbs.			
CYLINDER HEAD①								
FLYWHEEL RETAINING	NUT	40-50 ft. lbs.	85-90 ft. lbs.⑥		50-60 ft. lbs.			
	SCREW	250 in. lbs.	—		22-27 ft. lbs.			
GOVERNOR BUSHING		70-90 in. lbs.	130-150 in. lbs.		100-120 in. lbs.			
GRASS SCREEN	Metal	—	70-140 in. lbs.		70-140 in. lbs.			
	Plastic	—	—		20-30 in. lbs.			
OIL PAN	Aluminum	—	—		—			
	Cast Iron	250 in. lbs.	Grade 5–250 in. lbs. Grade 8–350 in. lbs.		35 ft. lbs.			
	Sheet Metal④	—	—		200 in. lbs.			
MANIFOLD SCREW/NUT		—	—		—			
CAMSHAFT NUT		—	—		—			
NON METALLIC FUEL PUMP MOUNTING SCREWS		—	37-45 in. lbs.		37-45 in. lbs.			

USE STANDARD TORQUE SETTINGS WHEN SPECIFIC VALUES ARE NOT SPECIFIED.

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.	40 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.

Aluminum

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

*Also Self Tapping Screws

Conversions
in. lbs. x .083 = ft. lbs.
ft. lbs. x 12 = in. lbs.
ft. lbs. x .1383 = kgm
ft. lbs. x 1.3558 = N m

OIL DRAIN PLUGS (Oil at Assembly)

Size	Tightening Torque Cast Iron Pans	Aluminum Pans
1/4"	150 in. lb.	100 in. lb.
3/8"	180 in. lb.	120 in. lb.
1/2"	20 ft. lbs.	13 ft. lbs.
3/4"	25 ft. lbs.	16 ft. lbs.
X-708-1⑤	20-25 ft. lbs.	20-25 ft. lbs.

① Lubricate with engine oil
② DO NOT overtorque — loosen — and retorque the hex nuts on Posi-Lock connecting rods.
NEW — Component directly from stock.
USED — Component that was in a running engine.
③ Overtorque 20%, loosen below torque value and retorque to final torque value
④ Torque twice with minimum of one minute interval
⑤ 3/8-16 thread with hex head nut and fibre gasket
⑥ Prior to Ser. #23209832 45-55 ft. lbs.

* Includes K141

Figure 1-6. Torque Values & Sequences For Fasteners.

SECTION 2
SPECIAL TOOLS

SPECIAL SERVICE TOOL KIT NO. 3211-A

These quality tools are designed to help you perform specific disassembly, repair and reassembly procedures. By using tools designed for the job, you can service engines easier, faster and safer! In addition, you'll increase your service capabilities and customer satisfaction by decreasing engine down time.

The Special Service Tool Kit No. 3211-A can be ordered complete as shown in Figure 2-1 or the tools can be ordered individually. Contact your Kohler Engine Distributor for price and availability.

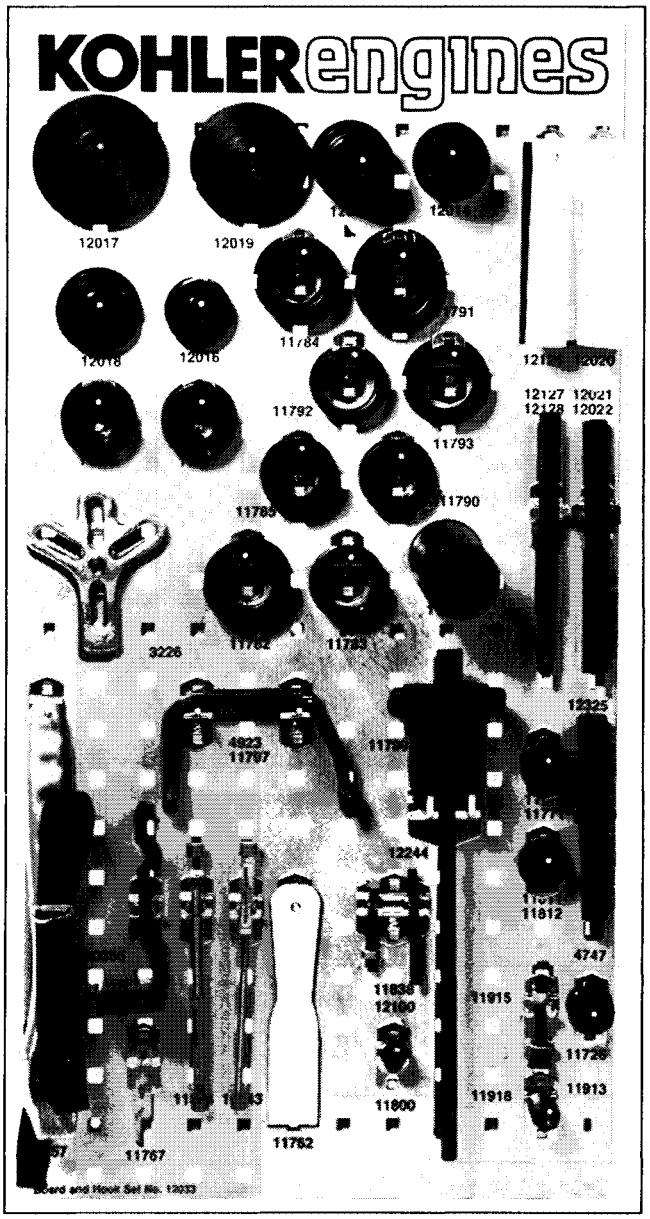
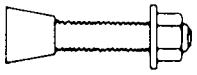
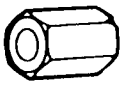
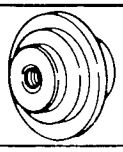
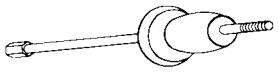
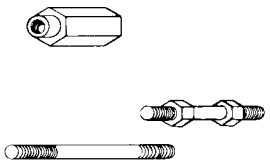
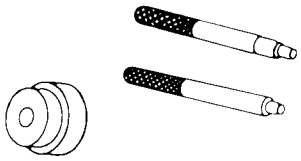
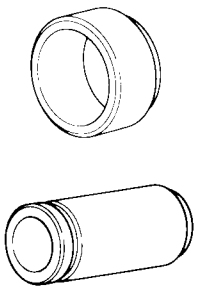


Figure 2-1. Special Service Tool Kit

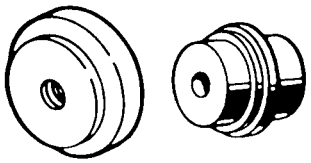
VALVE SERVICE TOOLS

TOOL NO. & NAME	APPLICATION	ILLUSTRATION
VALVE SEAT PULLERS 11726 11913	Removal of valve seats, Use 11918 adapter, 3222 slide hammer & 11915 forcing screw	
FORCING SCREW 11915	Used with valve seat pullers 11726 & 11913	
ADAPTER 11918	Used to connect valve seat pullers to slide hammer	
VALVE SEAT INSTALLER 11811 11812	Used to install intake and exhaust seats. Use with 4747 handle	
3222 SLIDE HAMMER 11799 Weight 12244 Slide Bolt	Provides pulling force for valve seat and guide removal. Use 4747 handle.	
3268 VALVE GUIDE REMOVAL KIT 11838 Stud 3 1/2" 12100 Stud 2 1/2" 11800 Adapter 0917 Nut 12008 Nut	Used to pull valve guides with 3222 slide hammer	
3224 VALVE GUIDE INSTALLER KIT 12325 Driver 11763 Driver 11770 Gage 11771 Gage	Used to install valve guides to proper depth. Use 11763 driver with 11770 & 11771 depth gages	
REAMERS (Valve Guide) 11843 5/16" 11844 1/4"	To ream valve guides	

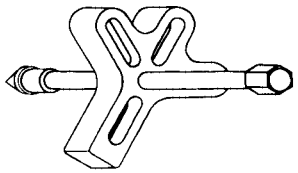
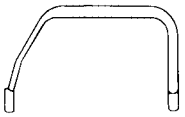
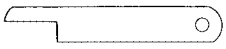
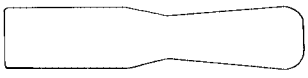
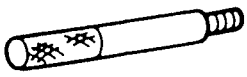
SEAL AND BEARING INSTALLERS

3223 SEAL INSTALLER KIT 11782 Seal Installer 11783 Seal Installer 11784 Seal Installer 11785 Seal Installer 11786 Seal Installer 11787 Seal Installer 11790 Seal Installer 11791 Seal Installer 11792 Seal Installer 11793 Seal Installer 11795 Handle	Used to install seals without damage and to proper depth. Use 11795 handle with installers	

SEAL AND BEARING INSTALLERS

TOOL NO. & NAME	APPLICATION	ILLUSTRATION
3242 SEAL PROTECTOR SLEEVE KIT 12020 .75" 12021 1.00 12022 1.25 12126 1.12 12127 1.50 12128 1.44	Used on crankshaft when installing seals to prevent damage	
3241 BEARING INSTALLING KIT 12014 Ins. (Crank Bushing) 12015 Ins. (Cam Bushing) 12016, 12017, 12018 & 12109 Brg. Installers	Used to install & remove engine bearings and bushings	

OTHER APPLICATIONS

3226 FLYWHEEL PULLER KIT 12485 Puller w/forcing screw 5108 Bolt - 1/4" w/washer (3) 12505 Bolt - 10-24 w/washer (2) 12504 Bolt - 3/8" w/washer (2) 12506 Storage Bag	Used to remove flywheels and bearing plates from engine	
FLYWHEEL STRAP WRENCH 10357	Used to hold flywheel for nut removal	
OFFSET WRENCH 11797 Wrench 1/2" 4923 Wrench 9/16"	Used to remove & install cylinder barrel retaining nuts	
FEELER GAGE 11767	Used to set oil pump drive gear backlash on twin cylinder engine	
TIMING GAGE 10355 Timing Gage	Used to hold balance gears in timed position when assembling engine	
SCRAPER 11762	Used to scrape machined surfaces without damage	
HANDLE 4747 Handle	Used with bearing installers, slide hammer, and valve seat installers	
TOOL BOARD AND HOOK SET 12033	Used to store and identify tools	**SEE FRONT PAGE**

KIT NO. 3211-A	TOOL USAGE CHART										
PART NO & NAME	MODEL (" K" SERIES)										
VALVE TOOLS	K-91	K-161	K-181	K-241	K-301	K-321	K-341	KT-17	KT-19	K-532	K-582
11726 Valve Seat Puller		●	●	●	●	●	●	●	●	●	●
11913 Valve Seat Puller		●	●	●	●	●					
11915 Forcing Screw		●	●	●	●	●	●	●	●	●	●
11918 Adapter		●	●	●	●	●	●	●	●	●	●
11811 Valve Seat Installer		●	●	●	●	●	●	●	●	●	●
11812 Valve Seat Installer	●										
3222 Slide Hammer		●	●	●	●	●	●	●	●	●	●
3268 Valve Guide Removal Kit		●	●	●	●	●	●	●	●	●	●
12325 Valve Guide Driver		●	●	●	●	●	●			●	●
11763 Valve Guide Driver (depth)								●	●		
11770 Valve Guide Depth Gage								●	①		
11771 Valve Guide Depth Gage									●		
11843 Valve Guide Reamer 5/16"		●	●	●	●	●	●	●	●	●	●
11844 Valve Guide Reamer 1/4"	●										

[1] KT19 engines prior to Series II (Spec No. 49199 and lower).

BEARING AND SEAL INSTALLERS

12014 Installer — Crank Bushing										●	●
12015 Installer — Cam Bushing										●	●
12016 Installer — Bearing	●										
12017 Installer — Bearing (PTO)										●	●
12018 Installer — Bearing		●	●								
12019 Installer — Bearing				●	●	●	●				
11782 Installer — Seal (PTO)								●	●		
11783 Installer — Seal (Flywheel)								●	●		
11784 Installer — Seal (PTO)				●	●	●	●				
11785 Installer — Seal (PTO)		●	●								
11786 Installer — Seal (Flywheel)	●										
11787 Installer — Seal (PTO)	●										
11790 Installer — Seal (Flywheel)		●	●								
11791 Installer — Seal (PTO)										●	●
11792 Installer — Seal (Flywheel)				●	●	●	●				
11793 Installer — Seal (Flywheel)										●	●
11795 Handle — Installer Seal	●	●	●	●	●	●	●	●	●	●	●
12020 Seal Sleeve				USE AS REQUIRED							
12021 Seal Sleeve				USE AS REQUIRED							
12022 Seal Sleeve				USE AS REQUIRED							
12126 Seal Sleeve				USE AS REQUIRED							
12127 Seal Sleeve				USE AS REQUIRED							
12128 Seal Sleeve				USE AS REQUIRED							

MISCELLANEOUS TOOLS

10357 Flywheel Strap Wrench 1/2"	●	●	●	●	●	●	●	●	●	●	●
11797 Offset Wrench ½"								●	●		
4923 Offset Wrench 9/16"								●	●		
11767 Feeler Gauge-Crank(Oil Pump)										●	●
10355 Timing Tool (Balance Gear)				●	●	●	●				
11762 Scraper	●	●	●	●	●	●	●	●	●	●	●
4747 Drive Handle	●	●	●	●	●	●	●	●	●	●	●
3226 Flywheel Puller Kit	●	●	●	●	●	●	●	●	●	●	●

NOTE: K141 requires same tools as K161.

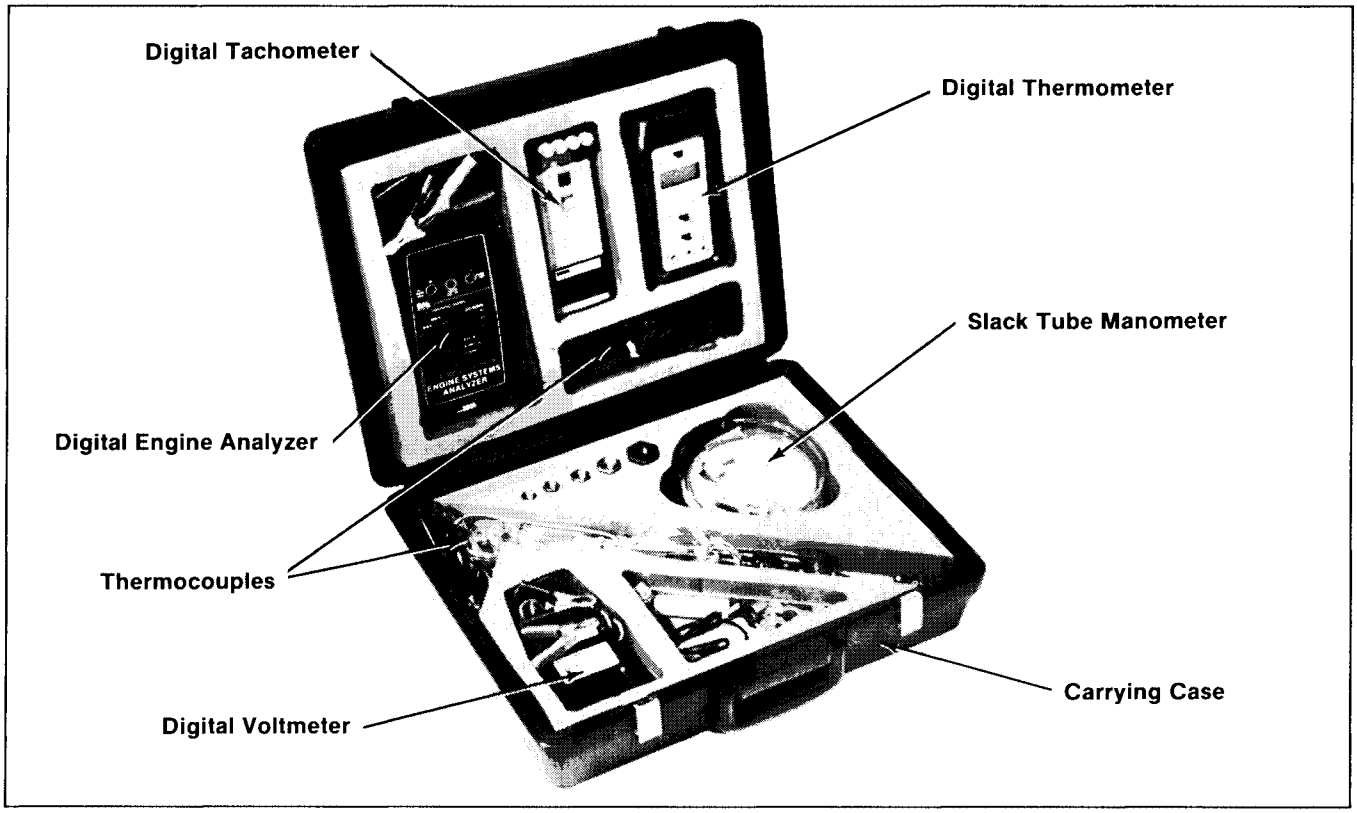


Figure 2-2. Engine Analysis Kit

The Kohler Engine Analysis Kit contains a selection of instruments which will enable you to measure critical items that relate to engine performance. You will find many uses for these instruments — from basic crankcase vacuum checks to sophisticated application tests.

The kit includes the following:

Qty.	Description
1	Digital Voltmeter
1	Digital Tachometer
1	Digital Thermometer
1	Digital Engine Analyzer
1	Slack Tube Manometer
1	8 Ft. Lead With Plug
3	14 mm Spark Plug Thermocouple
2	Head Bolt Thermocouple
1	Oil Sump Thermocouple
1	1/4" x 1/8" Bushing
1	3/8" x 1/8" Bushing
1	1/2" x 1/8" Bushing
1	3/4" x 1/8" Bushing
1	Tube With Fittings
1	Carrying Case
3	Plain Thermocouple

The voltmeter, tachometer, thermometer and engine analyzer feature state of the art electronic circuitry and digital readouts. Guidelines for using the instruments and for testing are included. Using the instruments in the kit you will be able to:

- Measure temperatures of —
  - spark plug base gasket/cylinder head bolt.
  - oil sump.
  - air into flywheel and carburetor.
- Measure engine speed (RPM).
- Measure crankcase vacuum and exhaust system back pressure.
- Measure voltage.
- Measure charging system current.
- Measure electric starter current (Amp) draw.

The Engine Analyzer Kit can be ordered complete as shown, or the instruments can be ordered individually. Contact your Kohler Distributor for price and availability.

SECTION 3
PERIODIC MAINTENANCE

REQUIRED MAINTENANCE

These required maintenance procedures should be performed at the frequency stated in the table:

Required Maintenance	Frequency
Check Oil Level	Daily
Clean Grass Screen	Daily*
Clean/Replace Fuel Filter	As Required
Clean Foam Precleaner	25 Hours*
Change Oil	25 Hours
Check Optional Reduction Gear Unit	50 Hours
Clean Cooling Fins and External Surfaces	50 Hours*
Clean Paper Air Cleaner Element	100 Hours*
Check Spark Plug	100 Hours
Check Valve-To-Tappet Clearance	500 Hours
Clean Cylinder Head and Combustion Chamber*	500 Hours**
Service Starter Motor Drive	Annually or 500 Hours

* Perform these maintenance procedures more frequently when engine is operated under extremely dusty and dirty conditions.

** 250 Hours when leaded gasoline is used.

WARNING: Accidental Starts!

Before servicing the engine or equipment, always remove the spark plug to prevent the engine from starting accidentally. Ground the lead to prevent sparks that could cause fires.

CHECK OIL LEVEL

The importance of checking and maintaining the proper oil level in crankcase cannot be overemphasized. Check oil BEFORE EACH USE as follows:

1. Make sure the engine is stopped, level, and is cool so the oil has had time to drain into the sump.
2. Clean the area around oil fill cap/dipstick before removing to keep dirt, grass clippings, etc., out of the engine.
3. Remove oil fill cap/dipstick; wipe oil off. Reinsert dipstick and push it all the way down into tube. Remove dipstick and check the level.
4. On engines with threaded type plug dipstick, shoulder plug on top of hole to observe level.

The oil level should be up to, but not over, the "F" mark on the dipstick. Refer to Figure 3-1.

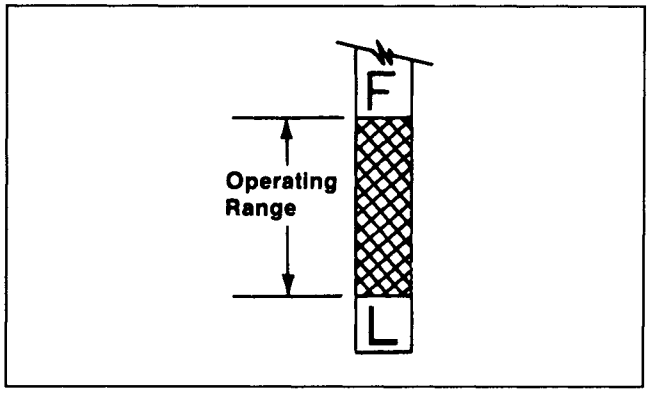


Figure 3-1. Oil Level Range.

5. Add the proper type of oil if the level is low. Always check the level with dipstick before adding more oil.

CAUTION: Never operate the engine with the oil level below "L" mark or over "F" mark on dipstick.

CHANGE OIL

For a new engine, change oil after the first 5 hours of operation. Change oil every 25 operating hours thereafter. For an overhauled engine or those rebuilt with a new shortblock or miniblock, use straight 30-weight Service Class SF or SG oil for the first 5 hours of operation. Change the oil after this initial run-in period. Change oil every 25 hours thereafter. Drain oil while the engine is still warm from operation. The oil will flow freely and carry away more impurities. Change oil as follows:

1. Remove the oil drain plug and dipstick. Tilt the engine slightly towards the drain hole to obtain better drainage.
2. Reinstall the drain plug. Make sure it is tightened securely.
3. Fill with new oil of the proper type to the "F" mark on the dipstick. Always check the level on dipstick before adding more oil. Make sure the engine is level when filling and checking oil.

SERVICE AIR CLEANER

K-Series engines are equipped with a high-density paper air cleaner element. Some specifications are also equipped with an oiled foam precleaner which surrounds the paper element. Refer to Figure 3-2.

Precleaner

If so equipped, wash and reoil the precleaner every 25 operating hours (more often under extremely dusty, dirty conditions).

1. Remove precleaner from paper element. Wash the precleaner in warm water with detergent.
2. Rinse precleaner thoroughly until all traces of detergent are eliminated. Squeeze out excess water (do not wring). Allow precleaner to air dry.
3. Saturate precleaner in clean, fresh engine oil. Squeeze out excess oil.
4. Reinstall precleaner over paper element.

Paper Element

Every **100 hours** of operation (more often under extremely dusty or dirty conditions), check the paper element. Replace the element as necessary.

1. Remove the precleaner (if so equipped), element cover, and paper element.
2. Replace a dirty, bent, or damaged element with a genuine Kohler element. Handle new elements carefully; do not use of the sealing surfaces are bent or damaged.

NOTE: Do not wash the paper element or use compressed air as this will damage element.

3. Reinstall the paper element.
4. Install the precleaner (cleaned and oiled) over the paper element.
5. Install the air cleaner cover and wing nut. Tighten wing nut. Make sure element is sealed tightly against air cleaner base.

Inspect Air Cleaner Components

Whenever the air cleaner cover is removed, or servicing the element or precleaner, check the following components:

Air Cleaner Base - Make sure it is secured tightly to carburetor and is not bent or damaged.

Element Cover and Element Cover Nut - On K181 New Look engines only, make sure element cover is not bent or damaged. Check that element cover nut is secured tightly to seal element between air cleaner base and element cover. Tighten nut to 50 in. lb. torque.

Breather Tube - Make sure it is sealed tightly in air cleaner base and breather cover.

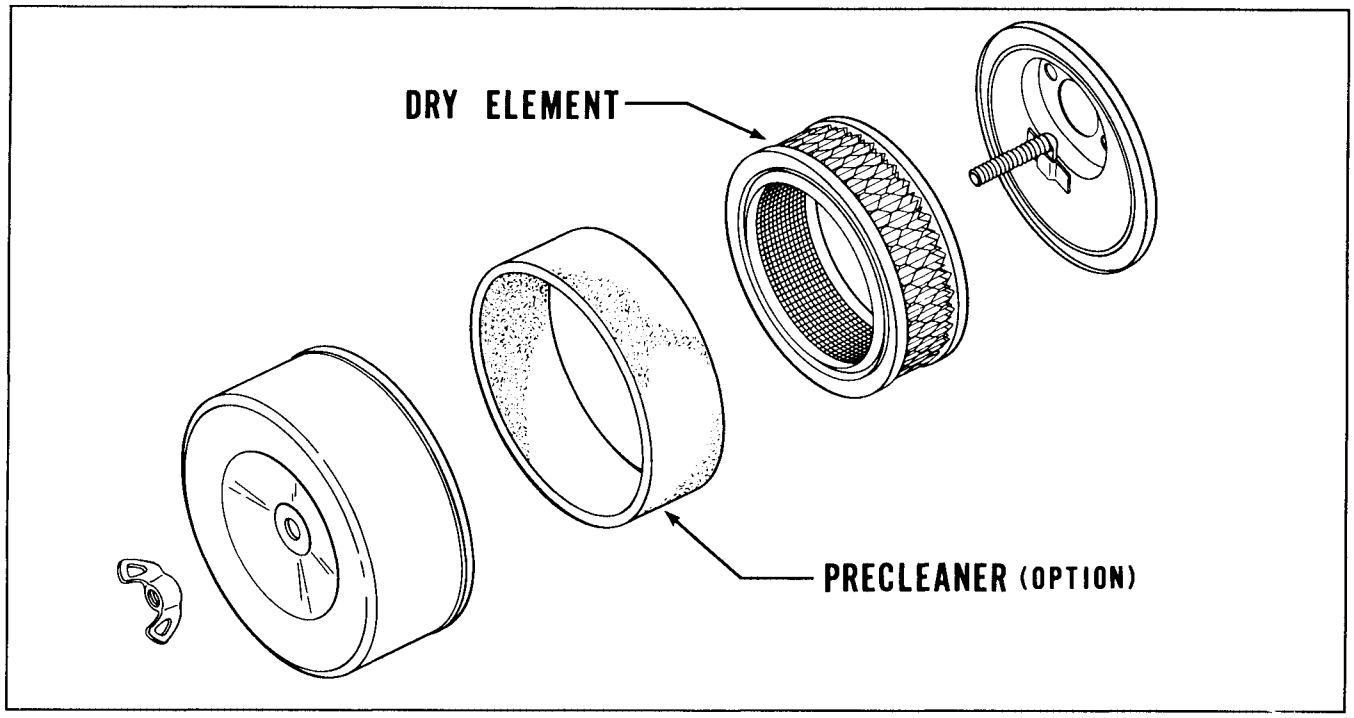


Figure 3-2. Air Cleaner Components.

NOTE: Damaged, worn, or loose air cleaner components could allow unfiltered air into the engine causing premature wear and failure. Replace all damaged or worn components.

CLEAN AIR INTAKE/COOLING AREAS

To ensure proper cooling, make sure the grass screen, cooling fins, and other external surfaces of engine are kept clean at all times. Every 50 operating hours (more often under extremely dusty, dirty conditions), remove the blower housing and other cooling shrouds. Clean the cooling fins and external surfaces as necessary. Make sure the cooling shrouds are reinstalled. Refer to the "Disassembly" and "Reassembly" sections for cooling shroud removal and installation procedures.

NOTE: Operating the engine with a blocked grass screen, dirty or plugged cooling fins, and/or cooling shrouds removed will cause engine damage due to overheating.

CHECK SPARK PLUG

Every 100 operating hours, remove the spark plug, check its condition, and reset gap or replace with new plug as necessary. Refer to Figure 3-3.

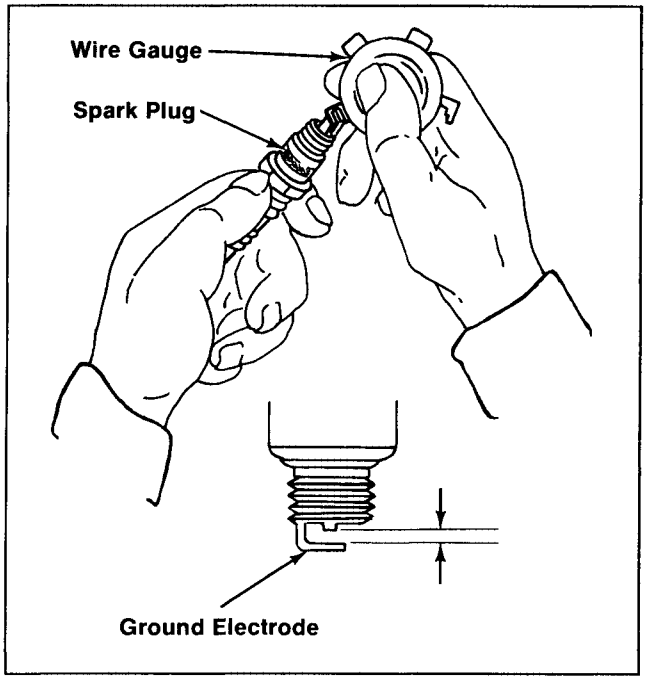


Figure 3-3. Servicing Spark Plug.

1. Before removing spark plug, clean the area around the base of plug to keep dirt and debris out of engine.
2. Remove the plug and check its condition. Replace the plug if worn or if reuse is questionable.

NOTE: Do not clean the spark plug in a machine using abrasive grit. Some grit could remain in spark plug and enter the engine causing extensive wear and damage.

3. Check gap using a wire feeler gauge. Adjust gap by carefully bending the ground electrode.

4. Reinstall spark plug into cylinder head. Torque plug to **18/22 ft. lb.**

SERVICE OPTIONAL REDUCTION GEAR UNIT

On engines equipped with a reduction gear unit, check the oil level in unit every 50 operating hours. Refer to Figure 3-4.

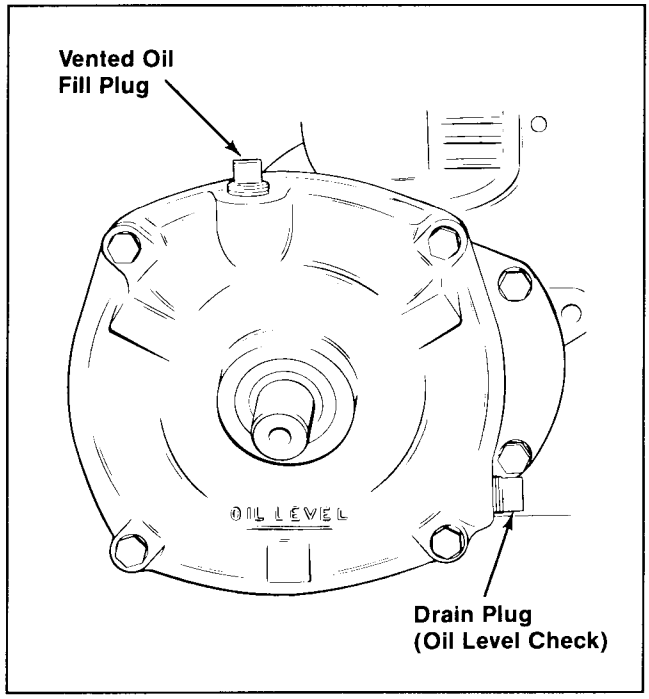


Figure 3-4. Reduction Gear Unit.

1. Remove the plug on the lower part of gear unit cover. With engine level, the oil should be up to the bottom of the plug hole.

2. To add oil, remove the vented fill plug at the top of the unit. Use the same type of oil as used in the engine crankcase.

3. Reinstall and tighten the plugs securely.

CHECK FUEL FILTER

Some engines are equipped with an in-line fuel filter. Visually inspect the filter periodically. Replace when dirty with a genuine Kohler filter. Refer to Figure 3-5.

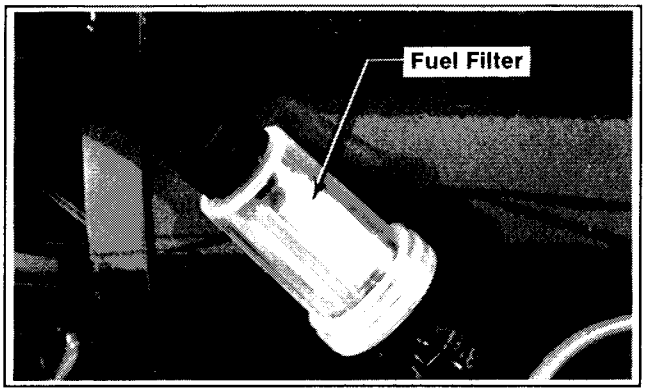


Figure 3-5. In-line Fuel Filter.

SERVICE STARTER MOTOR DRIVE

Every 500 operating hours or annually (whichever occurs first), clean and lubricate the drive splines of the Bendix-drive electric starter motor.

1. Remove starter from crankcase. (Refer to appropriate "Disassembly" section.)

2. Remove dust cover, stop nut, stop gear spacer, spring, dust cover spacer, and drive pinion.

3. Clean the drive shaft splines with solvent. Dry solvent thoroughly.

4. Apply a small amount of Kohler electric starter drive lubricant (Part No. 52 357 01) to splines.

NOTE: Kohler starter drive lubricant (Part No. 52 357 01) must be used on all Kohler electric starter drives. The use of other lubricants can cause the drive to stick or bind.

5. Apply a small amount of Loctite® No. 271 to stop nut threads. Assemble drive parts in reverse order of removal. Torque stop nut to 160 in. lb.

6. Reinstall starter to crankcase. (Refer to appropriate "Reassembly" section.)

CLEAN CYLINDER HEAD AND COMBUSTION CHAMBER

Every 500 operating hours (250 hours when leaded gasoline is used), remove cylinder head and clean combustion chamber. Refer to Figure 3-6.

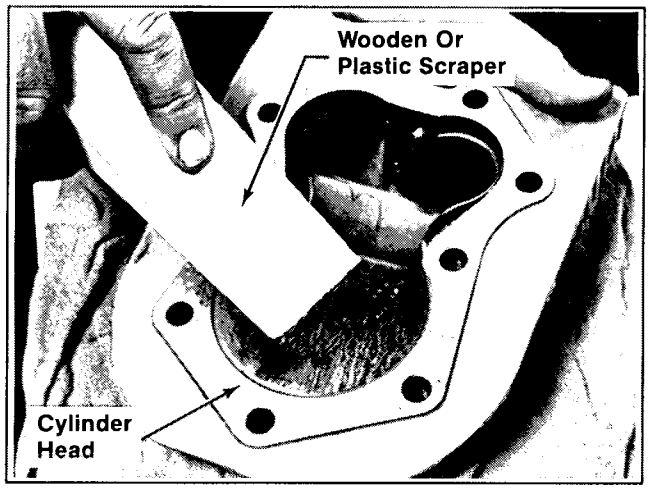


Figure 3-6. Cleaning Cylinder Head And Combustion Chamber.

1. Remove the cylinder head baffle and cylinder head.

2. Clean away combustion deposits using a wooden or plastic scraper.

3. Reinstall the cylinder head using a new gasket. Torque the cylinder head fasteners in sequence to the values specified in Figure 3-7.

CHECK VALVE-TO-TAPPET CLEARANCE

Every 500 operating hours, remove breather/valve cover and check valve-to-tappet clearance with a flat feeler gauge. Refer to Figure 3-8. The engine must be cold when checking this clearance.

1. Remove the air cleaner assembly, carburetor, and breather assembly. (Refer to appropriate "Disassembly" section.)

2. Position the crankshaft so the piston is at top of compression stroke (cam has no effect on tappets).

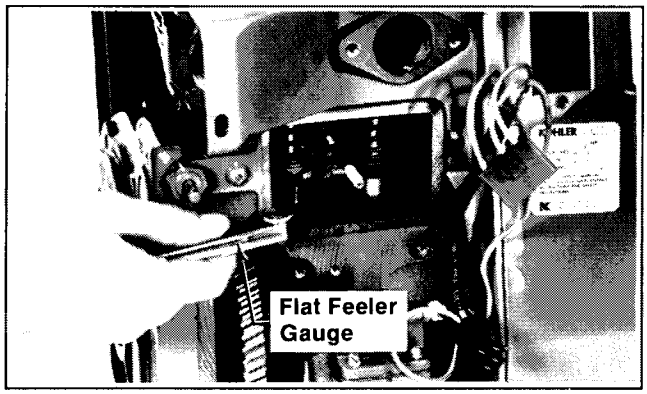
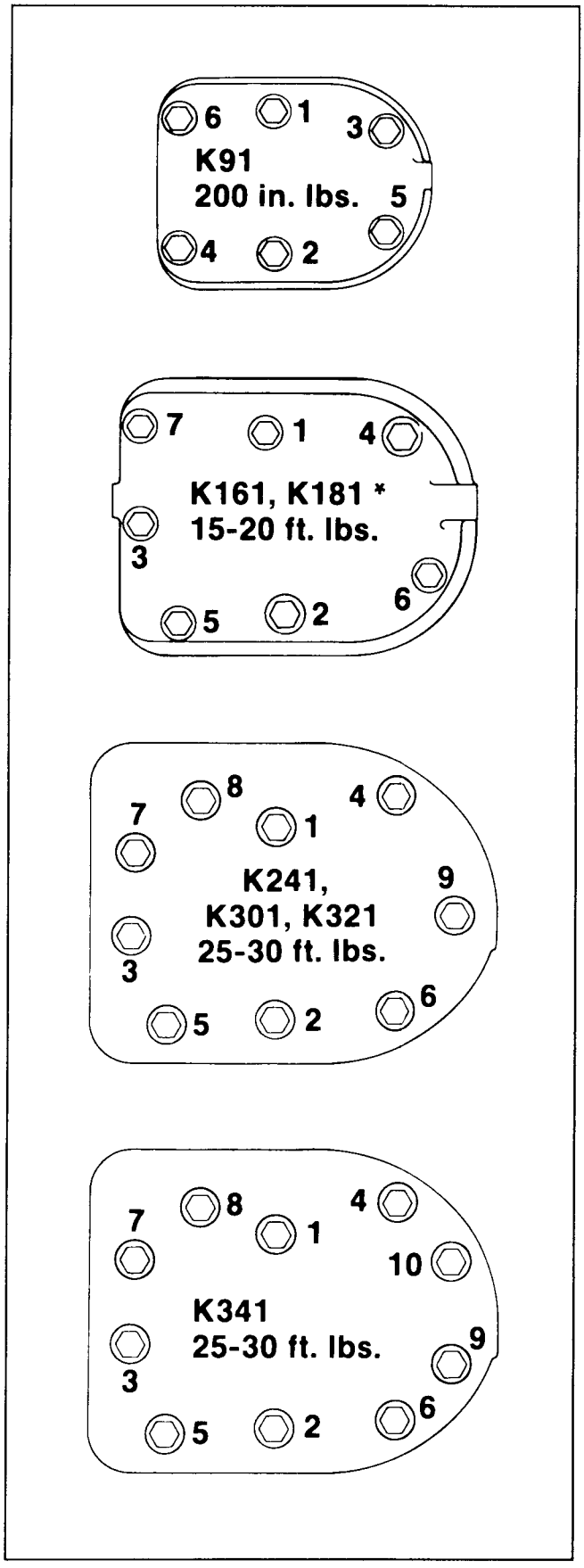


Figure 3-8. Measuring Valve-To-Tappet Clearance.



* Includes K141

Figure 3-7. Cylinder Head Fastener Tightening Sequence.

3. Measure valve-to-tappet clearance with a flat feeler gauge.
   On Model K91, K141, K161, K181 – *If the clearance is too small,* remove the valves and grind the valve stems until the correct clearance is obtained. Make sure valve stems are ground perfectly flat and smooth.

Model	Intake Valve	Exhaust Valve
K91	.005"/.009"	.011"/.015"
K161, K181	.006"/.008"	.017"/.019"
K241, K301 K321, K341	.008"/.010"	.017"/.019"

Figure 3-9. Valve Clearances

If clearance is too large, replace the valves and recheck clearance.

NOTE: Large clearances can also be reduced by grinding the valves and/or valve seats. Refer to the "Inspection And Repair/Reconditioning" section for valve specifications.

On Models K241, K301, K321, K341 – Adjust the clearance by turning the adjusting screw on tappets. Refer to Figure 3-9.

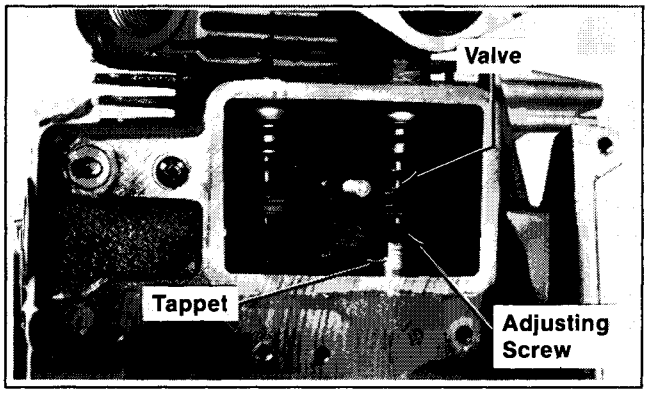


Figure 3-10. Adjusting Valve-To-Tappet Clearance – Models K241 Through K341.

STORAGE

If the engine will be out of service for approximately two months or more, use the following storage procedure.

1. Change the oil when engine is still warm from operation. Refer to "Change Oil."

2. Change the oil in reduction gear unit, if so equipped. Refill with the same oil as used in engine crankcase for season of operation. Refer to "Service Optional Reduction Gear Unit." Run engine for a few minutes to distribute clean oil throughout engine.

3. Drain the fuel tank and fuel system (or run engine until fuel tank and fuel system are empty).

4. Remove the spark plug. Add one tablespoon of engine oil into the spark plug hole. Install plug, by do not connect plug lead. Crank the engine two or three revolutions.

5. Remove the spark plug. Cover the spark plug hole with thumb and turn engine over until the piston is at the top of its stroke (pressure against thumb is greatest). Reinstall plug, but do not connect plug lead.

6. Clean the exterior surfaces of engine. Spread a light film of oil over any exposed metal surfaces of engine to prevent rust.

7. Store the engine in a clean, dry place.

SECTION 4
TROUBLESHOOTING

TROUBLESHOOTING GUIDE

When trouble occurs, be sure to check the simple causes which, at first, may seem too obvious to be considered. For example, a starting problem could be caused by an empty fuel tank.

Some common causes of engine troubles are listed below. Use this as a guide to locate trouble causing factors.

Engine Cranks But Will Not Start

1. Empty fuel tank.
2. Fuel shutoff valve closed.
3. Clogged fuel line.
4. Spark plug lead disconnected.
5. Keyswitch or kill switch in "off" position.
6. Faulty spark plug.
7. Faulty ignition.
8. Dirt or water in fuel system.

Engine Starts But Does Not Keep Running

1. Restricted fuel tank vent.
2. Dirt or water in fuel system.
3. Faulty choke or throttle controls/cables.
4. Loose wires or connections shorting ignition to ground.
5. Carburetor improperly adjusted.
6. Faulty cylinder head gasket.
7. Faulty fuel pump.

Engine Starts Hard

1. Hydrostatic transmission not in neutral/PTO drive is engaged.
2. Loose wires or connections.
3. Dirt or water in fuel system.
4. Clogged or restricted fuel lines.
5. Faulty choke or throttle controls/cables.
6. Faulty spark plug.
7. Carburetor improperly adjusted.
8. Incorrect valve-to-tappet clearance.
9. Low compression.
10. Faulty ACR mechanism.

Engine Will Not Crank

1. Hydrostatic transmission is not in neutral/PTO drive is engaged.
2. Battery is discharged.
3. Safety interlock switch is "engaged".
4. Loose or faulty wires or connections.
5. Faulty keyswitch or ignition switch.
6. Faulty electric starter/starter solenoid.
7. Retractable starter not engaging in drive cup.
8. Seized internal engine components.

Engine Runs But Misses

1. Dirt or water in fuel system.
2. Spark plug lead loose.
3. Loose wires or connections intermittently shorting ignition to ground.
4. Carburetor improperly adjusted.
5. Engine overheating.
6. Incorrect valve-to-tappet clearance.

Engine Will Not Idle

1. Idle speed adjusting screw improperly set.
2. Dirt or water in fuel system.
3. Idle fuel adjusting screw improperly set.
4. Fuel tank vent restricted.
5. Faulty spark plug.
6. Incorrect valve-to-tappet clearance.
7. Low compression.

Engine Overheats

1. Grass screen, cooling fins or shrouding clogged.
2. Excessive engine load.
3. Low crankcase oil level.
4. High crankcase oil level.
5. Carburetor improperly adjusted.

Engine Knocks

1. Low crankcase oil level.
2. Excessive engine load.

Engine Loses Power

1. Low crankcase oil level.
2. High crankcase oil level.
3. Restricted air cleaner element.
4. Dirt or water in fuel system.
5. Excessive engine load.
6. Engine overheating.
7. Faulty spark plug.
8. Carburetor improperly adjusted.

9. Low compression.

Engine Uses Excessive Amount of Oil

1. Incorrect oil viscosity or type.
2. Clogged or improperly assembled breather system.
3. Worn or broken piston rings.
4. Worn cylinder bore.
5. Worn valve stems and/or guides.

EXTERNAL ENGINE INSPECTION

☐ Before cleaning or disassembling the engine, check its external appearance and condition. This inspection can give clues to what might be found inside the engine (and the cause) once it is disassembled.

☐ Check for buildup of dirt and debris on the crankcase, cooling fins, grass screen and other external surfaces. Dirt or debris in these areas are causes of overheating.

☐ Check for obvious fuel and oil leaks and damaged components. Excessive oil leakage can indicate a clogged or improperly assembled breather, worn or damaged seals and gaskets or loose or improperly torqued fasteners.

☐ Check the air cleaner cover, element cover and air cleaner base for damage or indications of improper fit or seal.

☐ Check the air cleaner element. Look for holes, tears, cracked or damaged sealing surfaces or other damage that could allow dirt to enter the engine. Also note if the element is clogged or restricted. These conditions could indicate that the air cleaner has been underserviced.

☐ Check the carburetor throat for dirt. Dirt in the throat is further indication that the air cleaner is not functioning properly.

☐ Check the oil level. Note if the oil level is within the operating range on the dipstick, or if it is low or overfilled.

☐ Check the condition of the oil. Drain the oil into a container – it should flow freely. Check for metal chips and other foreign particles.

NOTE: It is good practice to drain oil at a location away from the workbench. Be sure to allow ample time for complete drainage.

Sludge is a natural by-product of combustion; a small accumulation is normal. Excessive sludge formation could indicate that the oil has not been changed as recommended, an incorrect type or weight of oil has been used, over-rich carburetor settings or weak ignition, to name a few.

CLEANING THE ENGINE

After inspecting the external condition of the engine, clean it thoroughly before disassembling. Also clean individual components as the engine is disassembled. Only clean parts can be accurately inspected and gauged for wear or damage.

There are many commercially available cleaners that quickly remove grease, oil and grime from engine parts. When such a cleaner is used, follow the manufacturer's instructions carefully. Make sure 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 oil.

BASIC ENGINE TESTS

Fuel System Test

To determine if fuel is getting to the carburetor, disconnect the fuel line at inlet to carburetor – if fuel does not flow out of line, check system back to tank for clogged lines, wrong (unvented) filler cap, blocked filter screen, faulty fuel pump, etc. If fuel is getting as far as the carburetor, remove the spark plug, crank engine and check for fuel inside combustion chamber. If no fuel is present here, check for faulty carburetor.

Ignition System Test

To determine if the ignition system is good, remove the spark plug and place plug with side electrode against cylinder head then crank engine at sufficient speed to produce a good spark. If a sharp, snappy spark is noted, this eliminates the ignition system components as the cause, although the ignition timing could be off.

If no spark or a weak spark is produced, check the ignition system further. If points are pitted, don't attempt to service them – replace points in bad shape. Dirty points may be cleaned. A bad condenser will cause premature failure of points. Check the breaker push rod for evidence of binding or sticking – replace as needed. Condenser can be tested on commercial tester per tester manufacturer's instructions. Check ignition coil on coil tester for continuity.

Crankcase Vacuum

A partial vacuum should exist in the crankcase when the engine is operating at normal temperatures. Pressure in the crankcase (usually caused by a clogged or improperly assembled breather) can cause oil to be forced out at oil seals, gaskets or other available spots.

Crankcase vacuum is best measured with a slack tube manometer. The manometer included in the

Kohler Engine Analysis Kit is recommended. Refer to the "Special Tools" section for more information.

Crankcase Vacuum Test

To test crankcase vacuum with the manometer:

1. Insert the stopper hose into the oil fill hole. Leave the other vent of the manometer open to the atmosphere. Make sure the shutoff clamp is closed.
2. Start the engine and run at high speed (3200 to 3600 RPM).
3. Open the clamp and note the water level in the tube. The level in the engine side should be 5 to 10 inches above the level in the open side. If there is no vacuum (level in engine side is the same as in open side) or a positive pressure (level in open side is higher than in engine side) check for the conditions in the following table.
4. Close the shutoff clamp before shutting off the engine.

Compression Test

Because these engines are equipped with an automatic compression release mechanism (ACR), it is difficult to obtain an accurate compression reading.

To check the condition of the combustion chamber and related mechanisms, physical inspection and a crankcase vacuum test are recommended.

4

NO CRANKCASE VACUUM/PRESSURE IN CRANKCASE

Possible Cause	Solution
1. Crankcase breather clogged or inoperative.	1. Disassemble breather, clean parts thoroughly, reassemble, and recheck pressure.
2. Seals and/or gaskets leaking. Loose or improperly torqued fasteners.	2. Replace all worn or damaged seals and gaskets. Make sure fasteners are tightened securely. Use appropriate torque values and sequences when necessary.
3. Piston blowby or leaky valves. (Confirm by inspecting components.)	3. Recondition piston, rings, cylinder bore, valves, and valve guides.
4. Restricted exhaust.	4. Replace restricted muffler/exhaust system.

Figure 4-1.

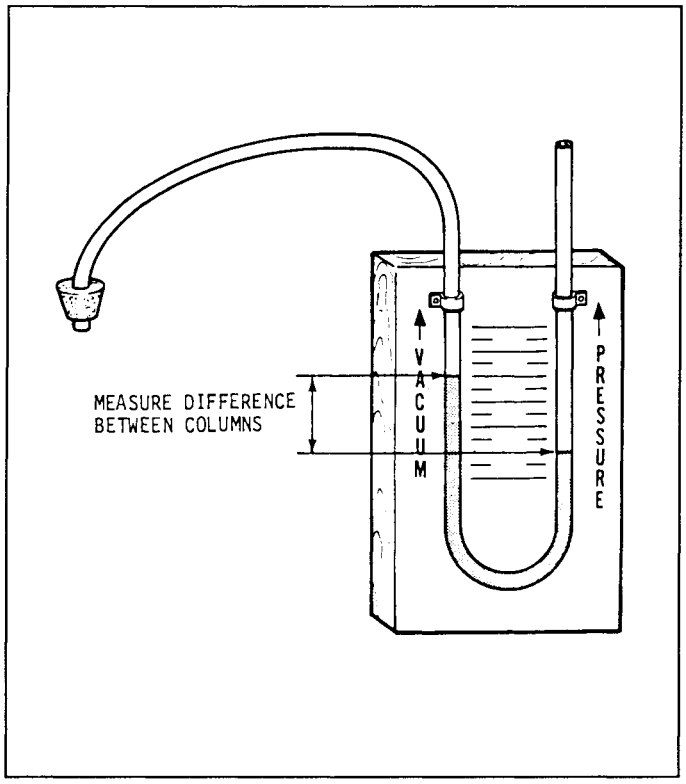


Figure 4-2. "U" Tube Manometer

SECTION 5
AIR CLEANER AND AIR INTAKE SYSTEM

K series engines are equipped with a high-density paper air cleaner element. Engines of some specifications are also equipped with an oiled foam precleaner that surrounds the paper element. Refer to Figure 5-1.

AIR CLEANER DISASSEMBLY

1. Remove the wing nut and air cleaner cover.
2. Remove the precleaner (if so equipped), paper element and seal.
3. Remove the base screws, air cleaner base, gasket and hose.

AIR CLEANER SERVICE

Precleaner

If so equipped, wash and re-oil the precleaner every 25 operating hours (more often under extremely dusty or dirty conditions).

1. Wash the precleaner in warm water and detergent.
2. Rinse the precleaner thoroughly until all traces of detergent are eliminated. Squeeze out excess water (do not wring). Allow precleaner to dry.
3. Saturate the precleaner with clean, fresh engine oil. Squeeze out excess oil.
4. Reinstall the precleaner over the paper element.

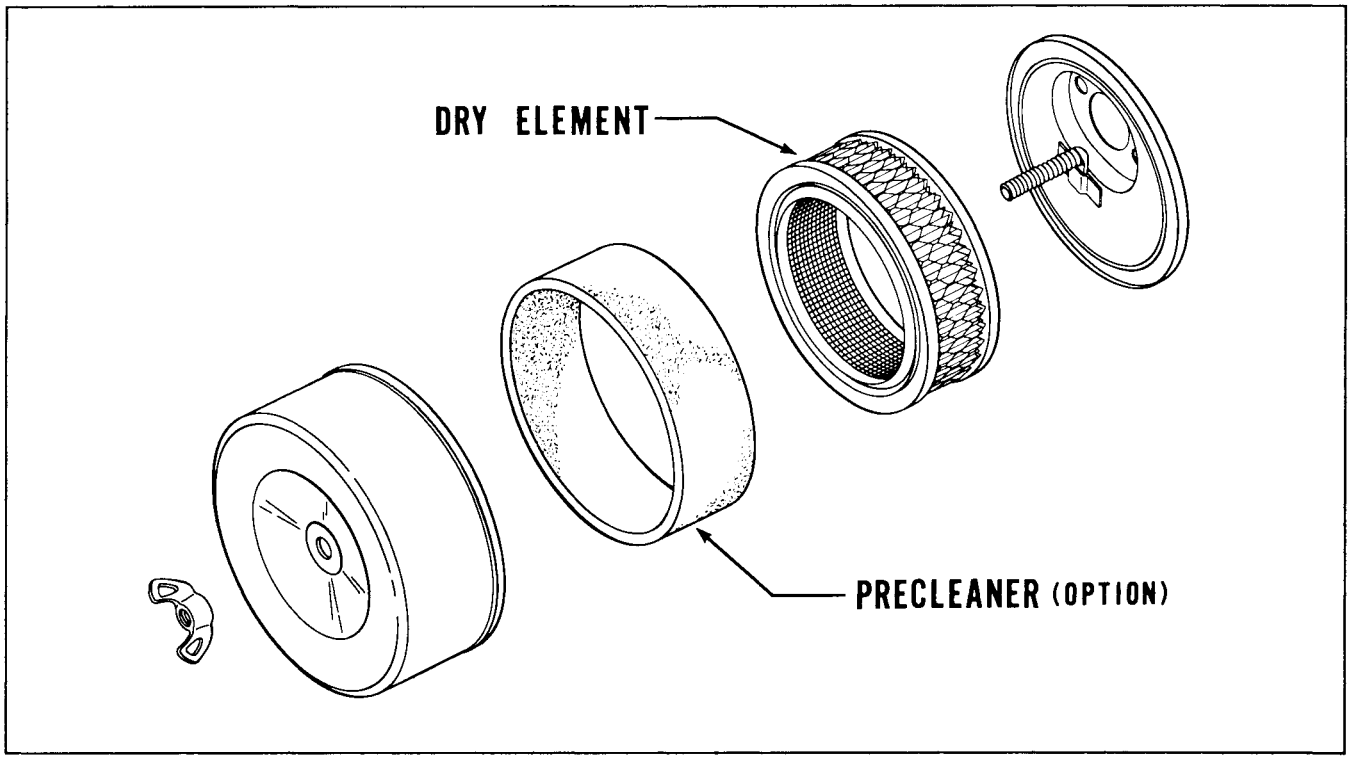


Figure 5-1. Air Cleaner Assembly - Exploded View.

Paper Element

Every 100 operating hours (more often under extremely dusty or dirty conditions) check the paper element. Replace the element as follows:

1. Remove the precleaner (if so equipped), element cover nut, element cover and paper element.
2. **Replace a dirty, bent or damaged element with a new genuine Kohler element. Handle new elements carefully; do not use if surfaces are bent or damaged.**

NOTE: Do not wash the paper element or use compressed air as this will damage the element.

3. Reinstall the paper element.
4. Install the precleaner (cleaned and oiled) over the paper element.
5. Install the air cleaner cover and wing nut. Tighten wing nut. Make sure element is sealed tightly against air cleaner base.

Inspect Air Cleaner Components

Whenever the air cleaner cover is removed, or when servicing the paper element or precleaner, check the following components:

1. **Air Cleaner Base** – Make sure it is secured tightly to carburetor and is not bent or damaged.
2. **Element Cover and Element Cover Nut** – On K181 New Look engines only, make sure element cover is not bent or damaged. Check that element cover nut is secured tightly to seal element between air cleaner base and element cover. Tighten nut to 50 in. lb. torque. Refer to Figure 5-2.
3. **Breather Tube** – Make sure it is sealed tightly in the air cleaner base and breather cover.

NOTE: On Model K181 New Look engines of certain specifications, the element cover may contact the breather tube, making it impossible to maintain crankcase vacuum. To prevent this problem, cut the end of the breather tube that protrudes through the air cleaner base at approximately a 45 degree angle.

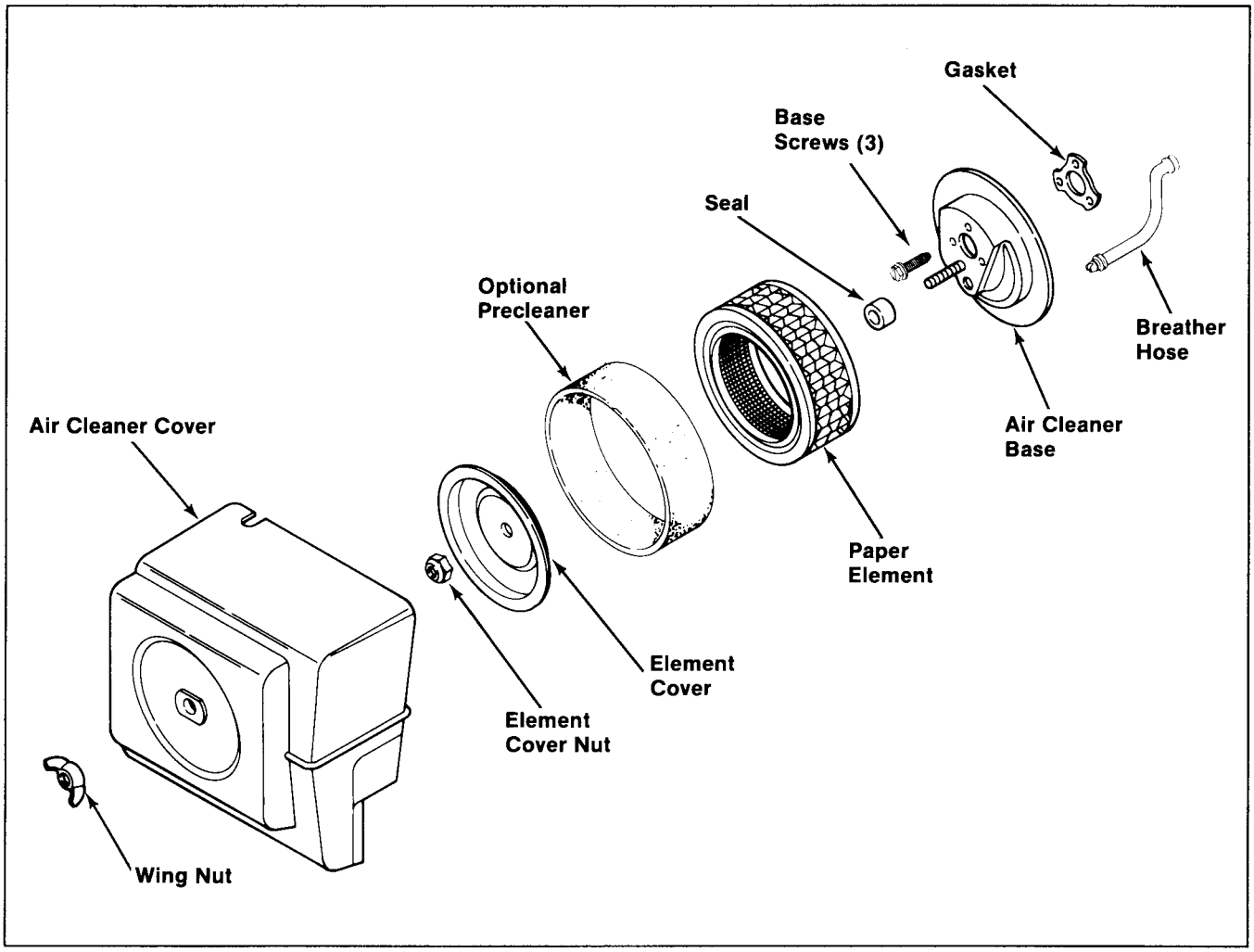


Figure 5-2. K181 New Look, Air Cleaner Assembly.

NOTE: Damaged, worn or loose air cleaner components could allow unfiltered air into the engine causing premature wear and failure. Replace all damaged or worn components.

OPTIONAL OIL BATH AIR CLEANER

If the engine has an oil bath type air cleaner, clean and service it after every 25 hours of operation or more frequently if conditions warrant. Refer to Figure 5-3.

1. Remove the cover, lift the element out of the bowl and drain the oil from the bowl.
2. Thoroughly wash bowl and cover in clean solvent. Swish the element in the solvent and allow it to dry.

NOTE: Do not use compressed air to dry the element. The filtering material could be damaged.

3. Lightly re-oil the element with engine oil.
4. Inspect base and cover gaskets. Replace if damaged.
5. Install base gasket and place filter on air horn.
6. Add engine oil to filter and fill to the OIL LEVEL mark.
7. Install filter element, cover gasket and cover. Secure with wing nut finger tight only.

COOLING AIR INTAKE SYSTEM

Effective cooling of an air cooled engine depends on an unobstructed flow of air over the cooling fins. Air is drawn into the cooling shroud by fins located on the flywheel. The blower housing, cooling shroud, air screen covering the flywheel and cooling fins on the cylinder and cylinder head must be kept clean and unobstructed at all times.

Never operate the engine with the blower housing or cooling shroud-removed. These devices direct air flow over the cooling fins.

NOTE: Some engines use a plastic grass screen and some use metal. The two are not interchangeable unless other modifications are made to the engine.

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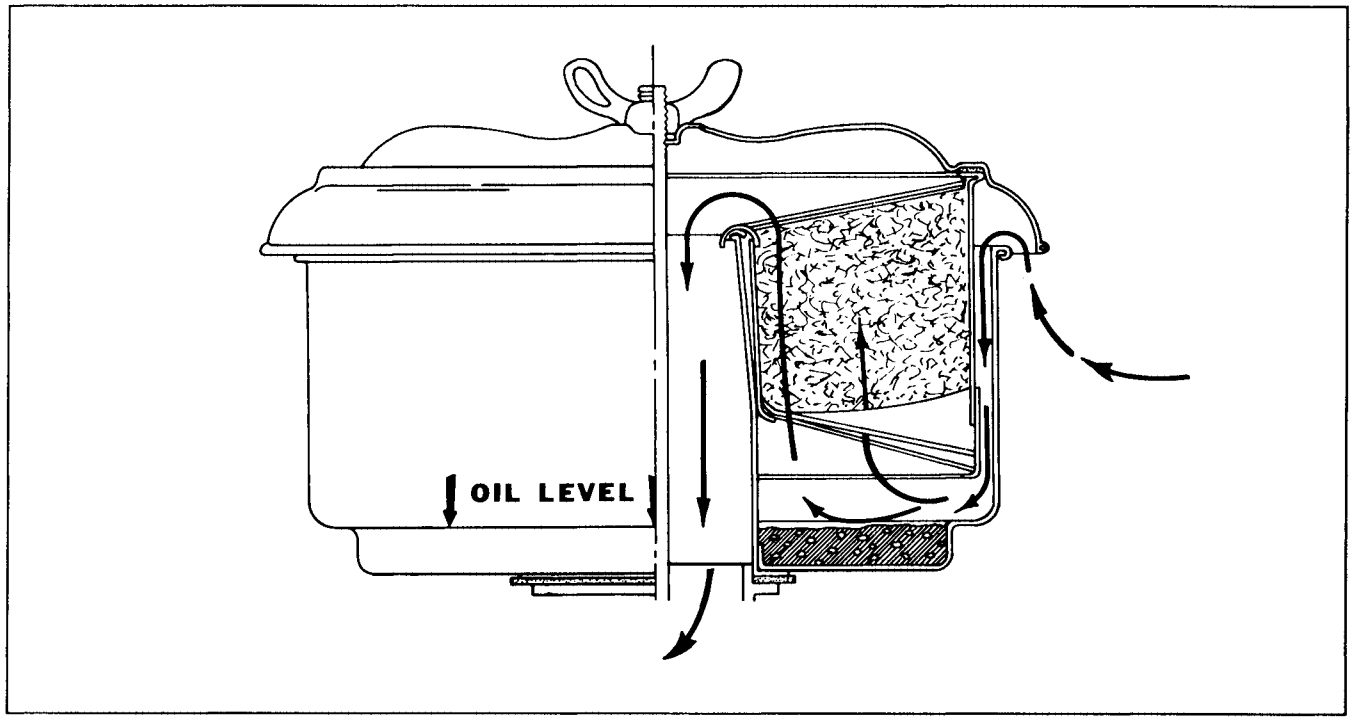

Figure 5-3. Optional Oil Bath Air Cleaner.

SECTION 6
FUEL SYSTEM AND GOVERNOR

FUEL SYSTEM – GASOLINE

The typical gasoline fuel system and related components include the fuel tank with vented cap, shutoff valve with screen, in-line fuel filter, fuel pump (some models), carburetor and interconnecting fuel line.

Operation

The fuel from the tank is moved through the screen and shutoff valve, in-line filter and fuel lines by the fuel pump (if so equipped) or gravity. Fuel enters the carburetor float bowl and is moved into the carburetor body where it is mixed with air. The fuel-air mixture is drawn into the combustion chamber where it is compressed, then ignited by the spark plug.

Troubleshooting

Use the following procedure to check that fuel is reaching the combustion chamber.

WARNING: Explosive Fuel!
Gasoline may be present in the carburetor and fuel system. Gasoline is extremely flammable and it can explode if ignited. Keep sparks, open flames, and other sources of ignition away from the engine. Disconnect and ground the spark plug lead to prevent the possibility of sparks from the ignition system.

6

Test	Conclusion
1. **Check for the following:** A. Make sure the tank contains fuel. B. Make sure the fuel cap vent is open. C. Make sure the fuel shutoff valve is open.	
2. **Check for fuel in the combustion chamber.** A. Disconnect the spark plug lead. B. Close the choke on carburetor. C. Crank the engine several times. D. Remove the spark plug and check for fuel at tip.	2. If there **is** fuel at tip of spark plug, fuel is reaching the combustion chamber. If there is **no** fuel at tip of spark plug, check for fuel from the fuel tank. (Test 3).
3. **Check for fuel flow from tank to fuel pump.** A. Remove fuel line from inlet fitting at fuel pump. B. Hold line below bottom of tank. Open shutoff valve and observe flow.	3. If fuel **does** flow from line, check for faulty fuel pump. (Test 4). If fuel **does not** flow from line, check for clogged fuel tank vent, shutoff valve screen, and fuel lines. If the fuel tank cap vent does not allow air to escape from the tank, modify the vent for proper operation by cutting 1/32" to 1/16" off the bottom. Refer to Figure 6-1.
4. **Check operation of fuel pump** A. Remove fuel line from inlet fitting at carburetor. B. Crank engine several times and observe flow.	4. If fuel **does not** flow from line, check for clogged fuel line. If line is unobstructed, fuel pump is faulty and must be replaced. If fuel **does** flow from fuel line, the carburetor probably is faulty. Refer to the "Carburetor" portion of this section.

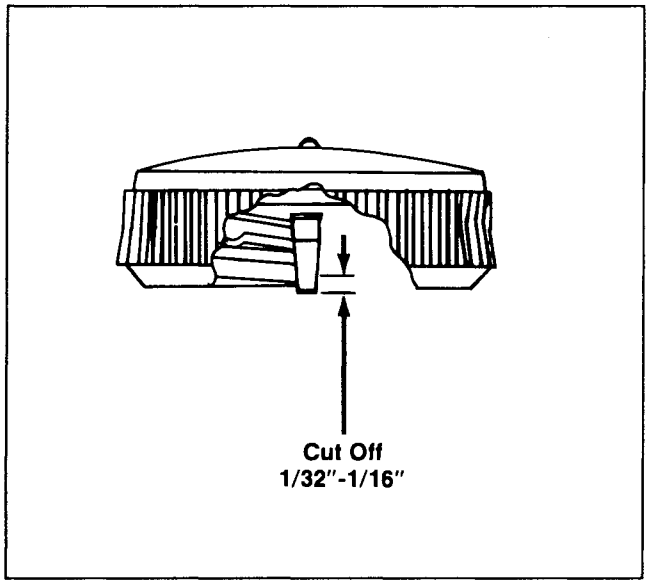

Figure 6-1. Fuel Tank Cap. ("New Look" Only)

FUEL TANK

Engine-mounted fuel tanks on K series engines are constructed of steel. They are fitted with a vented cap. The venting properties of the cap should be checked regularly. A clogged vent can cause pressure buildup in the tank, which could result in fuel spraying from the filler when the cap is loosened. It can also cause a partial vacuum in the tank, stopping the engine.

Fuel Shutoff Valve

Some engines are equipped with a fuel shutoff valve with a wire mesh screen. On engines without a shutoff valve, a straight outlet fitting is used. The wire mesh prevents relatively large particles in the tank from reaching the carburetor. The shutoff valve permits work on the fuel system without the need for draining the tank.

FUEL FILTER

Some engines covered by this manual may be equipped with a see-through inline fuel filter. When the interior of the filter appears to be dirty, it should be replaced.

FUEL PUMP

All K series engines except the K91 have provisions for mounting a mechanically operated fuel pump. If no fuel pump is mounted on these engines, a cover is placed over the pump mounting pad on the crankcase.

Older fuel pumps have a metal body. Later models have a body made of plastic. The plastic body better insulates the fuel from the hot engine, minimizing the chance of vapor lock.

Operation

The mechanical fuel pump is operated by a lever that rides on the engine camshaft. The lever transmits a pumping action to the flexible diaphragm inside the pump body. The pumping action draws fuel in through the inlet check valve on the downward stroke of the diaphragm. On the upward stroke, the fuel is forced out through the outlet check valve. Refer to Figure 6-2.

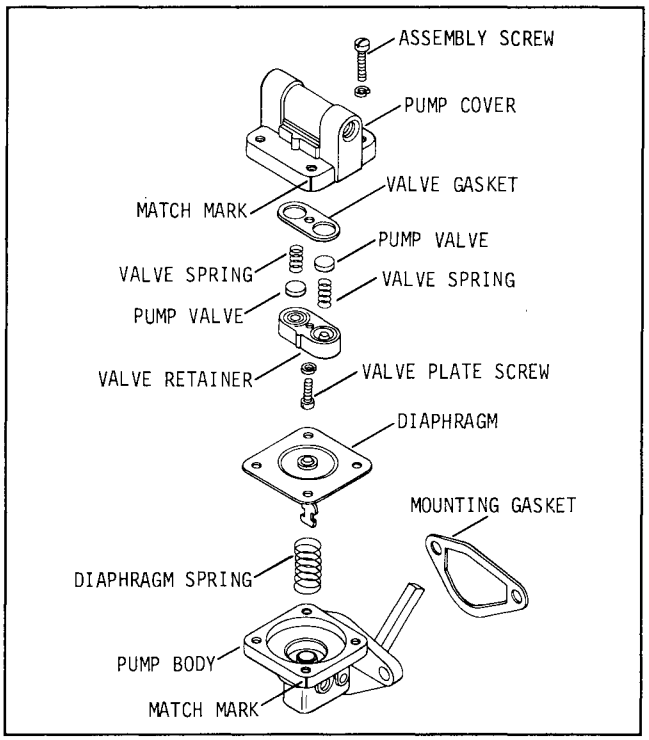

Figure 6-2. Mechanical Fuel Pump.

Removal

1. Disconnect the fuel lines from the inlet and outlet fittings of the pump.
2. Remove the fillister head sems screws, flat washers, fuel pump and gasket.
3. If required, remove the fittings from the pump body.

Repair

Plastic bodied fuel pumps are not serviceable and must be replaced when faulty. Replacement pumps are available in kits which include the pump, mounting gasket and plain washers.

Installation

1. Fittings - Apply a small amount of Permatex® Aviation Perm A Gasket (or equivalent gasoline resistant thread sealant) to fittings. Turn fittings into pump **six full turns;** continue turning fittings in the same direction until desired direction is reached.
2. Install new gasket, fuel pump, flat washers, lock washers and fillister head sems screws. Refer to Figure 6-3.

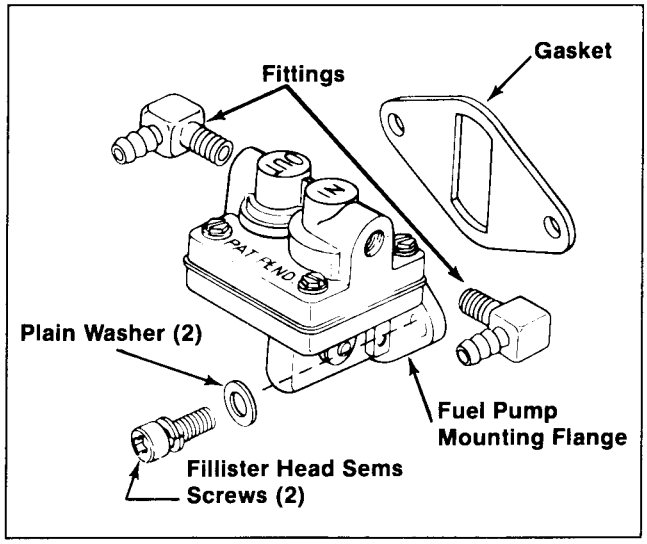

Figure 6-3. Installing Fuel Pump.

NOTE: Make sure that the fuel pump lever is positioned above the camshaft. Damage to the fuel pump and severe damage to the engine could result if the lever is positioned below the camshaft.

Make sure that the flat washers are installed next to the mounting flange to prevent damage from the lock washers.

If a metal bodied pump was replaced by a plastic bodied pump, make sure that the old thick gasket is discarded and the new thin gasket is used.

3. Torque screws to **37 - 45 in./lb.**

4. Connect fuel lines to inlet and outlet fittings.

CARBURETOR - GASOLINE

WARNING: Explosive Fuel!

Gasoline may be present in the carburetor and fuel system. Gasoline is extremely flammable and it can explode if ignited. Keep sparks, open flames, and other sources of ignition away from the engine. Disconnect and ground the spark plug lead to prevent the possibility of sparks from the ignition system.

Adjustment

The carburetor is designed to deliver the correct fuel/air mixture to the engine under all operating conditions. Carburetors are set at the factory and normally do not need adjustment. If the engine exhibits conditions like those found in the table that follows, it may be necessary to adjust the carburetor.

In general, turning the adjusting needles in (clockwise) decreases the supply of fuel to the carburetor. This gives a *leaner* fuel-to-air mixture. Turning the adjusting needles **out** (counterclockwise) increases the supply of fuel to the carburetor. This gives a *richer* fuel-to-air mixture. Setting the needles midway between the lean and rich positions will usually give the best results. Adjust the carburetor as follows:

1. With the engine stopped, turn the low idle fuel adjusting needle **in** (clockwise) until it bottoms lightly.

NOTE: The tip of the low idle fuel and high idle fuel adjusting needles are tapered to critical dimensions. Damage to the needles and the seats in carburetor body will result if the needles are forced.

2. Preliminary Settings: Turn the adjusting needles **out** (counterclockwise) from lightly bottomed according to the table shown in Figure 6-4.

3. Start the engine and run at half throttle for five to ten minutes to warm up. The engine must be warm before making final settings (Steps 4, 5, 6, and 7).

4. High Idle Fuel Needle Setting: This adjustment is required only for adjustable high idle (main) jet carburetors. If the carburetor is a fixed main jet type, go to step 5.

Place the throttle into the "fast" position. If possible, place the engine under load.

Turn the high idle fuel adjusting needle **out** (counterclockwise) from the preliminary setting until the engine speed decreases (rich). Note the position of the needle.

Now turn the adjusting needle **in** (clockwise). The engine speed may increase, then it will decrease as the needle is turned in (lean). Note the position of the needle.

Set the adjusting needle **midway** between the rich and lean settings. See Figure 6-5.

5. Low Idle Speed Setting: Place the throttle control into the "idle" or "slow" position. Set the low idle speed to **1200 rpm*** (+ or - 75 rpm) by turning the low idle speed adjusting screw **in or out**. Check the speed using a tachometer.

NOTE: The actual low idle speed depends on the application. Refer to the equipment manufacturer's instructions for specific low idle speed settings. The recommended low idle speed for Basic Engines is 1200 rpm. To ensure best results when setting the low idle fuel needle, the low idle speed must not exceed 1500 rpm.

PRELIMINARY SETTINGS – K-SERIES MODELS

	KOHLER ADJUSTABLE JET		WALBRO FIXED JET	
	Low Idle	High Idle	Low Idle	
K91	1–1/2 turns	2 turns	NOT APPL.	NOTE: Refer to publication TP2377B Carburetor Reference Manual for additional information.
K141	1–1/2 turns	3 turns	NOT APPL.	
K161*	1–1/2 turns	3 turns	NOT APPL.	
K181*	1–1/4 turns	2 turns	2–1/2 turns	
K241	2–1/2 turns	2 turns	1–1/4 turns	
K301	2–1/2 turns	2 turns	1–1/4 turns	
K321	2–1/2 turns	3–1/4 turns	1–1/2 turns	
K341	2–1/2 turns	3–1/2 turns	1 turn	

* Includes "New Look" Models

Figure 6–4. Preliminary Low Idle And High Idle Fuel Needle Settings.

6. Low Idle Fuel Needle Setting: Place the throttle into the "idle" or "slow" position.

Turn the low idle fuel adjusting needle **out** (counterclockwise) from the preliminary setting until the engine speed decreases (rich). Note the position of the needle.

Now turn the adjusting needle **in** (clockwise). The engine speed may increase, then it will decrease as the needle is turned in (lean). Note the position of the needle.

Set the adjusting needle **midway** between the rich and lean settings. See Figure 6–5.

7. Recheck the low idle speed using a tachometer. Readjust the speed as necessary.

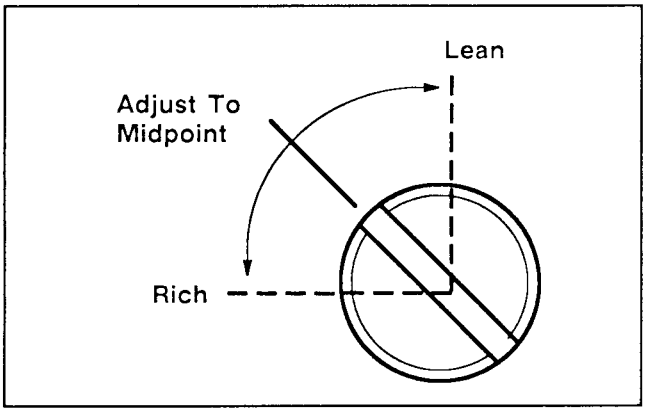

Figure 6–5. Optimum Low Idle Fuel Setting.

Disassembly

(Refer to Figure 6–7)

1. Remove the bowl retaining screw, retaining screw gasket and fuel bowl.
2. Remove the float pin, float, fuel inlet needle, baffle gasket and bowl gasket.
3. Remove the fuel inlet seat and inlet seat gasket. Remove the idle fuel and main fuel adjusting needles and springs. Remove the idle speed adjusting screw and spring.
4. Further disassembly to remove the throttle and choke shafts is recommended only if these parts are to be replaced. Refer to "Throttle and Choke Shaft Replacement" later in this section.

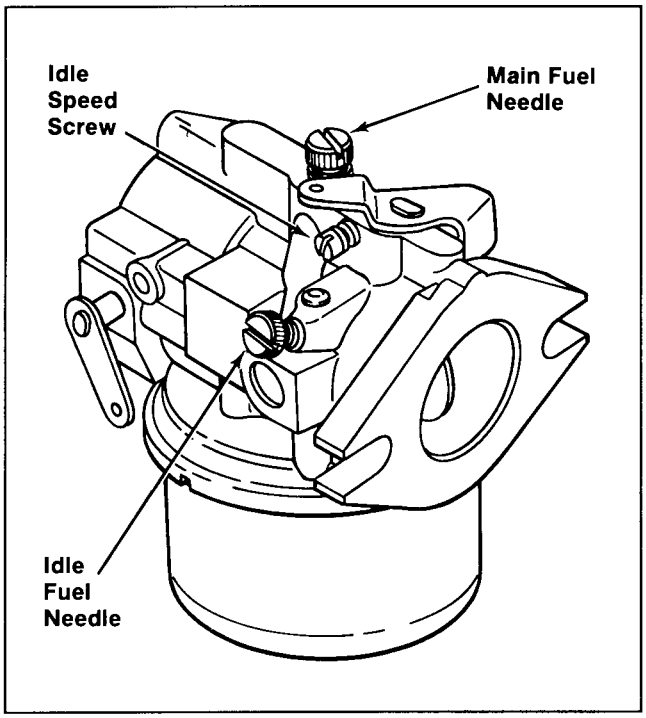

Figure 6–6. Kohler–Built Adjustable Jet Carburetor.