LCT Engines

Service Manual

LCT

LIQUID COMBUSTION TECHNOLOGY

Safety Information

⚠ DANGER

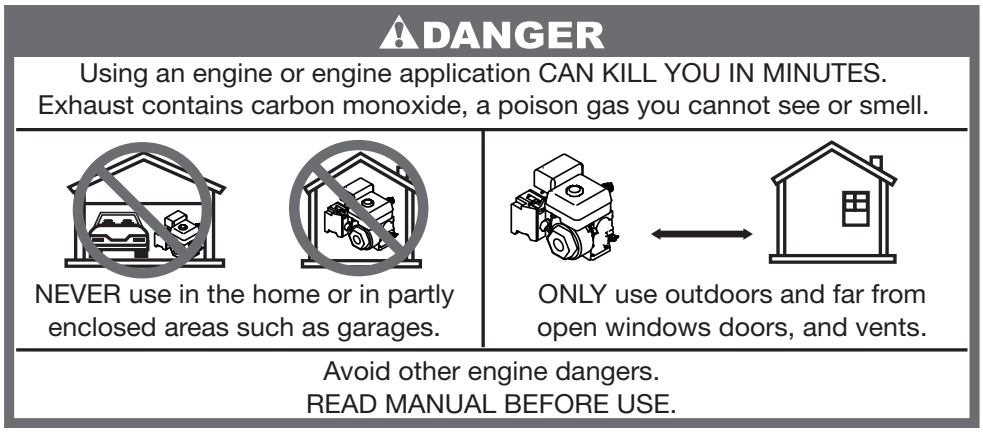
CARBON MONOXIDE HAZARD

Never use engine inside homes, garages, crawl spaces, or other partially enclosed areas. Poisonous gases that can be harmful or fatal can build up in these areas. Using a fan and opening doors or windows does not provide enough fresh air.

Engine exhaust contains carbon monoxide - a poisonous gas that can be harmful or fatal. You cannot see or smell this gas.

Use a battery-powered carbon monoxide detector when running an engine.

If you start to feel sick, dizzy, or weak while using an engine, shut it off and get to fresh air right away. See a doctor. You may have carbon monoxide poisoning.



Safety Information

When servicing this engine, your safety and the safety of others should be your top priority.

To assist you in making informed decisions regarding safety, we have provided operating procedures and other information on labels and in this manual. This information warns you of potential hazards that could hurt you or others.

Please stay safety conscious when servicing this engine.

We have provided important safety information in a variety of forms, including:

• Safety Labels: placed on the engine.
• Safety messages: preceded by a safety alert symbol and one of three signal words, DANGER, WARNING, or CAUTION. These safety alert symbols mean:

⚠ DANGER

If you do not follow instructions, it WILL cause you SERIOUS INJURY or DEATH.

⚠ WARNING

If you do not follow instructions, it MAY cause you SERIOUS INJURY or DEATH.

⚠ CAUTION

If you do not follow instructions, it may cause you SERIOUS INJURY or EQUIPMENT DAMAGE.

• Safety Headings: such as IMPORTANT SAFETY INSTRUCTIONS.
• Safety Section: such as ENGINE SAFETY.
• Instructions: How to service this engine correctly and safely.

Thoroughly read and review this manual to know how to stay safe and get maximum benefit and enjoyment from using this engine.

IMPORTANT SAFETY INSTRUCTIONS

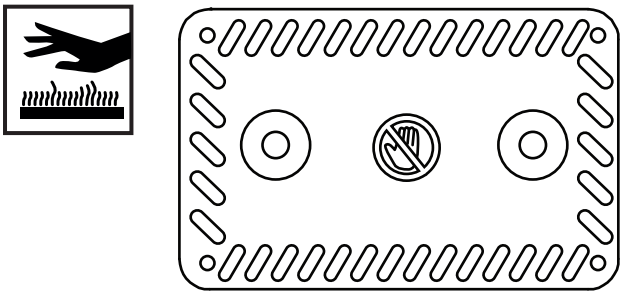
Accidents occur less frequently when instructions are followed, the operator is safety conscious and the engine is properly maintained. Some of the most common hazards are discussed below, along with the best way to protect yourself and others.

- Carefully read the owners manual.
- Always wear proper eye protection when servicing engines.
- Follow the instructions in this manual carefully.
- Familiarize yourself with all controls and know how to stop the engine quickly in case of an emergency.
- Keep children away from the engine and do not let them operate it. Keep children and pets away from the area of operation.
- Operate this engine in well-ventilated areas. NEVER run engine indoors.
- Stop engine and remove spark plug prior to servicing.
- Only use parts that meet LCT specifications.
- Only use tools designed for the product you're servicing.
- Always install new gaskets, o-rings, fittings, when reassembling.
- Always torque nuts and bolts with inner bolt or larger diameter bolt first. Check torque specification chart in the back of the manual for proper values. Tighten nuts and bolts diagonally to proper value.
- Always clean parts before reassembly in proper solvents.
- Always lubricate any moving parts before reassembly.

Safety Information

Exhaust / Muffler
Engine exhaust is dangerous because of intense heat and emission of carbon monoxide (poisonous gas).

- The muffler becomes very hot during operation and remains hot for a while after stopping the engine. Do not touch the muffler while it is hot. Do not store the engine until it is cool.



- To prevent fire hazards and for adequate ventilation, keep the engine at least 3 feet (1 meter) away from building walls and other equipment during operation. Do not place flammable objects close to the engine.

⚠ DANGER

- Carbon Monoxide Hazard: Exhaust gas contains carbon monoxide, a poisonous gas. Avoid inhalation of exhaust gas. Always run the engine in a well-ventilated area. Never run the engine indoors.

Other Equipment
Review the instructions provided with the equipment powered by this engine for any additional safety precautions that should be observed in conjunction with engine startup, shutdown, operation, or protective safety gear that may be needed to operate the equipment.

⚠ WARNING

Do not touch hot sections of engine (see muffler figure above). The hot sections of the engine can cause severe burns.

Refueling the Engine
Gasoline is extremely flammable, and gasoline vapor can explode. When refueling the engine, take the following precautions.

- Perform when the engine is cool.
- Refuel outdoors in well-ventilated areas.
- The engine should not be running.
- Make sure the engine is grounded to prevent static electrical spark.
- Do not smoke or use cell phones when refueling.
- Keep away from flames or sparks.
- If spillage occurs, be sure all areas are dry and vapor has dissipated prior to starting the engine.

General Specifications

Item	Specification
Maximum speed	3850±50rpm
Maximum Torque	9.25lb-ft @2600rpm
Maximum HP*	6.25hp @3600rpm
Idle speed	2100±50rpm
Compression ratio	8.5:1
Displacement	208cc
Cast iron sleeve	yes
Bore x stroke	70mm x 54mm
P.T.O Rotation	CCW (measured from PTO side)
Fuel	regular unleaded gasoline (do not use E85)
Fuel Capacity	0.91 gallons (measured from dry tank)
Compression release	yes
Dry weight	15kg - 33lbs
Low oil shut off	no
Oil Capacity	0.64 qts (measured from dry sump)
Fuel shut off valve	yes

***The Horse Power rating of the engine(s) is the measures output of a production engine in accordance with SAE J1349 at 3600 rpm. Performance may vary from one engine to another on this value due to manufacturing process variations. All attempts are made to be consistent during the manufacturing process to keep performance variation to a minimum. Actual power output of final application will vary based on many circumstances, including (but not limited to) the required operating speed of the application, environmental conditions and proper implementation of manufacturer's maintenance schedule recommendations.**

General Troubleshooting

Engine will not start:

1. Check oil level- Do you have the correct amount of oil? (Reference Oil Fill Section, pg. 12)
   Remedy: Oil should be visible and to the top 2 threads of the LOWEST oil fill spout.

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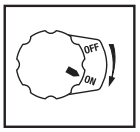
2. Is on/off switch on?
   Remedy: Turn to the on position.



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3. Do you have fuel in the fuel tank?
   Remedy: Add fuel.

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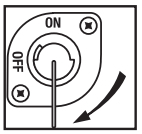
4. Is the fuel petcock turned to the on position?
   Remedy: Turn to the on position.



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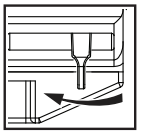
5. Was the engine choked?
   Remedy: When starting the engine the choke lever should be pushed left to the on position and after starting pushed right to the off position. If engine still does not start move to half choke and pull twice.



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6. Is the spark plug boot securely fastened to the spark plug?
   Remedy: Slide over spark plug and fit securely.

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7. Has the fuel being used been purchased within the last three months and was it stored in a plastic container?
   Remedy: Replace old fuel with new fuel.

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8. Is the engine flooded?
   Remedy: Remove spark plug and replace with any of the following plugs.
   - BPR6ES (NGK) / Torch Plug
   - Champion Model: RN9YC (some tables show RN9YCC)
   - NGK Model: BPR6ES
   - BOSCH Model: WR6DC

⚠ NOTICE
Using an incorrect spark plug may cause engine damage.

General Troubleshooting

Engine stops running:

1. Has the fuel being used been purchased within the last three months and was it stored in a plastic container?
   Remedy: Replace old fuel with new fuel.

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2. Is the air filter dirty?
   Remedy: Replace air filter element if dirty. Clean prefilter of any dirt or dust. (See pg. 13)

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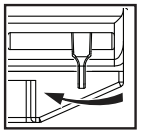
3. Was the engine choked?
   Remedy: When starting the engine the choke lever should be pushed left to the on position and after starting pushed right to the off position. If engine still does not start move to half choke and pull twice.



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4. Is the spark plug corroded?
   Remedy: Remove spark plug and replace with any of the following plugs.
   - BPR6ES (NGK) / Torch Plug
   - Champion Model: RN9YC (some tables show RN9YCC)
   - NGK Model: BPR6ES
   - BOSCH Model: WR6DC
   - Denso Model: XXXX

⚠ NOTICE
Using an incorrect spark plug may cause engine damage.

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5. Has the engine run out of fuel?
   Remedy: Refuel engine.

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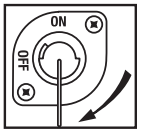
6. Is the fuel petcock turned to the on position?
   Remedy: Turn to the on position.



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7. Is the throttle set too low?
   Remedy: Increase the throttle.

Standard and Service Limit Specifications

Crankshaft	Crankshaft O.D.	30.985mm
Valves	Valves clearance IN	
	Intake	0.15±0.02 mm
	Exhaust	0.2±0.02 mm
	Stem OD	
	Intake	5.49mm
	Exhaust	5.45mm
	Guide ID	
	Intake	5.50mm
	Exhaust	5.50mm
	Stem Clearance	
	Intake	0.01—0.04mm
	Exhaust	0.05—0.08mm
	Seat width	1.1mm
	Spring free length	31mm
Camshaft	Cam height	
	Intake	27.6-27.8mm
	Exhaust	27.7-27.8mm
	Camshaft O.D.	14.984mm
Crankcase cover	Camshaft holder I.D.	15mm
Spark plug	Gap	0.7-0.8mm
Spark plug cap	Resistance	7.5-12.5
Ignition coil	Resistance primary coil	0.8-1.0Ω
	Secondary coil	5.9-7.1kΩ
	Air gap (at flywheel)	0.4±0.2

Advanced Troubleshooting – For Authorized LCT Technicians

ENGINE		
Complaint	Symptom and possible causes	Remedy
Engine will not start, or is hard to start	Compression too low	
	1. Valves out of adjustment	Adjust
	2. Worn valve guides or poor seating of valves	Repair or Replace
	3. Mistiming valves	Adjust
	4. Excessively worn piston rings	Replace
	5. Worn-down cylinder bore	Replace
	6. Poor seating of spark plug	Retighten
	7. Failed head gasket	Replace
	Plug not sparking	
	1. Fouled spark plug	Replace
	2. Wet spark plug	Dry off
	3. Defective ignition coil	Replace
	4. Spark plug wire damaged	Replace
	5. Kill switch in “OFF” position	Switch to “On”
	6. Ignition coil air gap is too wide	Reset
	7. Ignition coil failure	Replace
	No fuel reaching the intake manifold	
	1. Clogged fuel filter or fuel line	Replace
	2. Dirty/gummed up carburetor	Clean
	3. Fuel petcock is turned off	Turn on
	4. Fuel tank is empty	Fill
Engine idles poorly	1. Out of adjustment tappet clearance	Adjust
	2. Poor seating of valves	Replace or Repair
	3. Defective valve guides	Replace
	4. Worn down camshaft	Replace
	5. Too wide spark plug gap	Adjust or replace
	6. Defective ignition coil	Replace
	7. Ignition coil air gap too wide	Adjust
	8. Dirty/gummed up carburetor	Clean
	9. Stale fuel	Replace
Engine stalls easily	1. Dirty/gummed up carburetor	Clean
	2. Fouled spark plug	Replace
	3. Clogged fuel line	Replace
	4. Valves out of adjustment	Adjust

Noisy Engine	Excessive Valve Chatter	
	1. Too large valve clearance	Adjust
	2. Weakened or broken valve spring	Replace
	3. Worn tappet or cam lobe	Replace
	4. Worn and burnt camshaft journal	Replace
	Noise seems to come from piston	
	1. Worn down piston or cylinder	Replace
	2. Fouled with carbon combustion chamber	Clean
	3. Worn piston pin or piston pin bore	Replace
	4. Worn piston rings or ring grooves	Replace
	Noise seems to come from crankshaft	
	1. Rattling bearings due to wear	Replace
	2. Worn and burnt main bearings	Replace
	3. Worn and burnt pin bearing	Replace
	4. Too large endplay	Adjust
	Noise seems to come from outside of engine	
	1. Loose trim item	Tighten
Engine runs poorly in high speed range	Defective engine internal/electrical parts	
	1. Weakened valve springs	Replace
	2. Worn camshaft	Replace
	3. Valve timing out of adjustment	Adjust
	4. Too narrow spark plug gaps	Adjust
	5. Defective ignition coil	Replace
	6. Clogged air cleaner element	Replace
	7. Clogged fuel line, resulting in inadequate fuel supply to carburetor	Replace
	8. Worn bearings	Replace
	9. Blown head gasket	Replace
	10. Ignition coil air gap too wide	Adjust
	11. Dirty/gummed up carburetor	Clean
	12. Stale fuel	Replace
	Defective air flow system	
	1. carburetor gasket leak - sucking air causing engine to run lean	Replace
Engine lacks power	Defective engine internal/electrical parts	
	1. Loss of valve clearance	Adjust
	2. Weakened valve springs	Replace
	3. Out of adjustment valve timing	Adjust
	4. Worn piston ring or cylinder	Replace
	5. Poor seating of valves	Replace
	6. Fouled spark plug	Replace
	7. Incorrect spark plug	Replace
	8. Clogged air filter element	Replace
	9. Carburetor gasket leak - sucking air causing engine to run lean	Replace
	10. Too much engine oil	Adjust
	11. Air fins clogged on engine causing to overheat	Remove debris
	12. Not enough oil in engine	Adjust

Dirty or heavy exhaust smoke	1. Too much engine oil in the engine	Adjust
	2. Worn piston rings or cylinder	Replace
	3. Worn valve guides	Replace
	4. Scored or scuffed cylinder wall	Replace
	5. Worn valve stems	Replace
	6. Defective stem seal	Replace
	7. Worn oil ring side rails	Replace
No sparking or poor sparking	1. Defective ignition coil	Replace
	2. Defective spark plug	Replace
	3. Open-circuit wiring connection	Check and repair
Spark plug soon become fouled with carbon	1. Incorrect gasoline	Replace
	2. Dirty air cleaner element	Replace
	3. Too cold spark plug	Use hotter plug
Spark plug become fouled too soon	1. Worn piston rings	Replace
	2. Worn piston or cylinder	Replace
	3. Excessive clearance of valve stems in valve guides	Replace
	4. Worn valve stem oil seal	Replace
Spark plug electrodes overheat or burn	1. Too hot spark plug	Use colder plug
	2. Overheated the engine	Tune up
	3. Loose spark plug	Tighten
	4. Too lean fuel mixture	Check for air leak

Spark Plug Service

Recommended spark plugs: **BPR6ES (NGK) / Torch Plug**

Cross References

- **Champing plug cross reference is: RN9YC (some tables show RN9YCC)**
- **NGK plug cross reference is: BPR6ES**
- **BOSCH plug cross reference is: WR6DC**

⚠ NOTICE

Using an incorrect spark plug may cause engine damage.

1. When engine is cool, disconnect the spark plug cap and remove any debris from the spark plug area with high pressure air.
2. Remove the spark plug with a 13/16-inch spark plug wrench.
3. Inspect the spark plug. Replace it if the electrodes are worn or if the insulator is cracked or chipped. Spark plug gap should be set to 0.027 - 0.030 inches.
4. Install the spark plug carefully to avoid cross threading. Screw in spark plug by hand until it stops turning.
5. Tighten the spark plug with a 13/16-inch spark plug wrench. Tighten 1/4 turn after the spark plug seats.

⚠ NOTICE

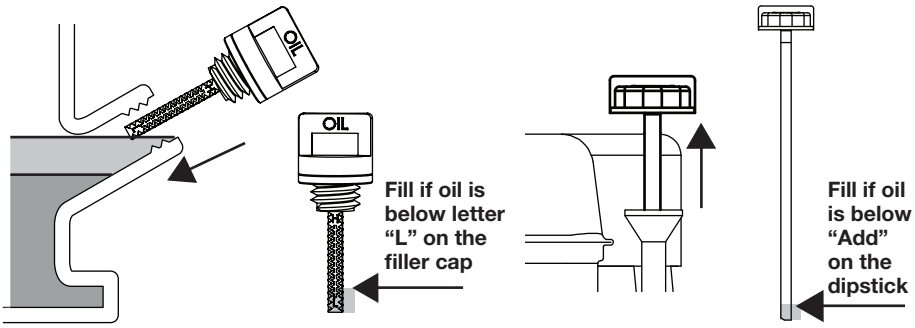
A loose spark plug can overheat and damage the engine. Over-tightening the spark plug can damage the threads in the cylinder head.

6. Attach the spark plug cap. Ensure spark plug cap snaps into place securely.

Engine Oil Level Check

Check the engine oil level with the engine stopped and with the engine in a level position.

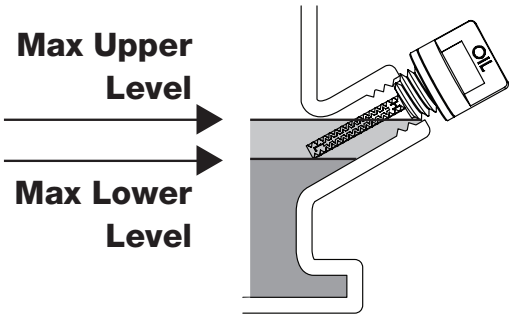
1. Remove either side mounted filler cap dipstick or high oil fill dipstick and wipe it clean.
2. Insert and remove the dipstick without screwing it into the filler neck. Check the oil level shown on the dipstick.
3. If the oil level is low, fill to the edge of the oil filler hole with the recommended oil.
4. Securely screw in the filler cap/dipstick. Running the engine with a low oil level can cause engine damage. Always check the engine oil before start up.



Engine Oil Change

Drain the used oil while the engine is warm. Warm oil drains quickly and completely. Avoid contact with hot oil.

1. Place a suitable container below the engine to catch the used oil then remove the filler cap/dipstick and the drain plug.
2. Allow the used oil to drain completely, then reinstall the drain plug, and tighten it securely. Do not over tighten. Dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw used oil in the trash, pour it on the ground, or pour down a drain.
3. With the engine in a level position, fill to the outer edge of the oil filler hole with the recommended oil. (see fill limits right)



⚠ NOTICE
Running the engine with a low oil level can cause engine damage.

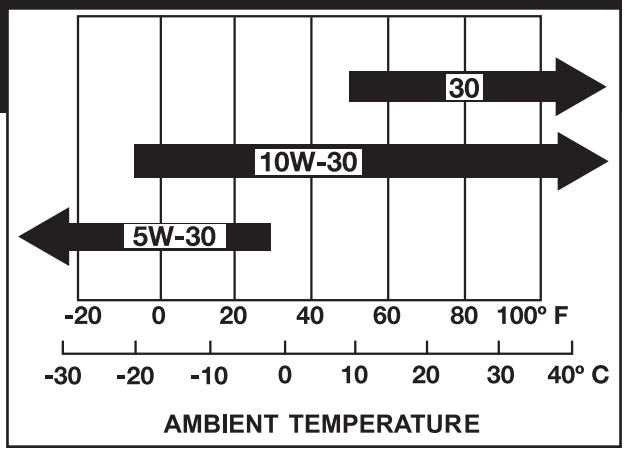
4. Securely screw in the filler cap/dipstick.

Engine Oil Recommendations

Engine oil affects performance and service life. Use 4-stroke automotive detergent oil.

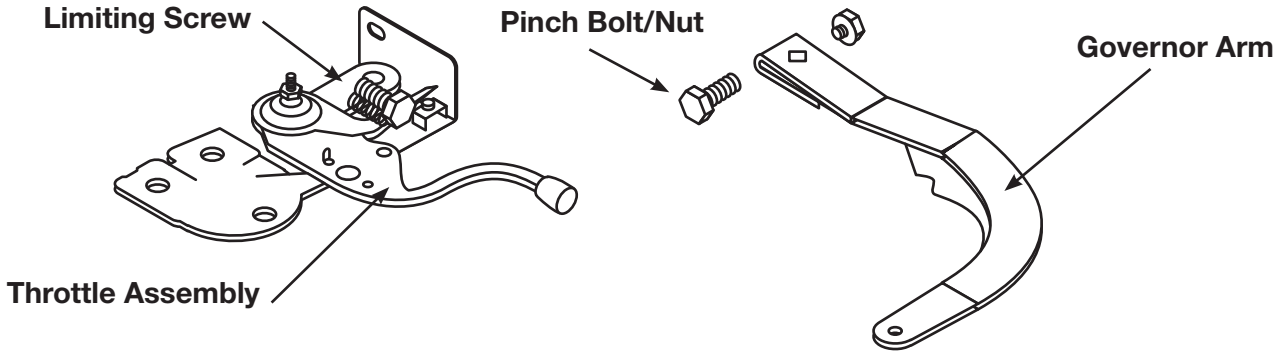
SAE 10W-30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area warrants.

The SAE oil viscosity and service classification are in the API label on the oil container. The manufacturer recommends you use API SERVICE category SJ engine oil, or better.



Governor Adjustment

1. Loosen the governor arm pinch bolt nut and move the arm to fully open the throttle.
2. Rotate the arm shaft in the same direction as far as it can go
3. Start the engine, all it to reach normal operating temperature. Run the engine at maximum speed by moving adjusting the throttle lever.
4. Adjust the throttle lever limiting screw so the throttle lever cannot move past that point.



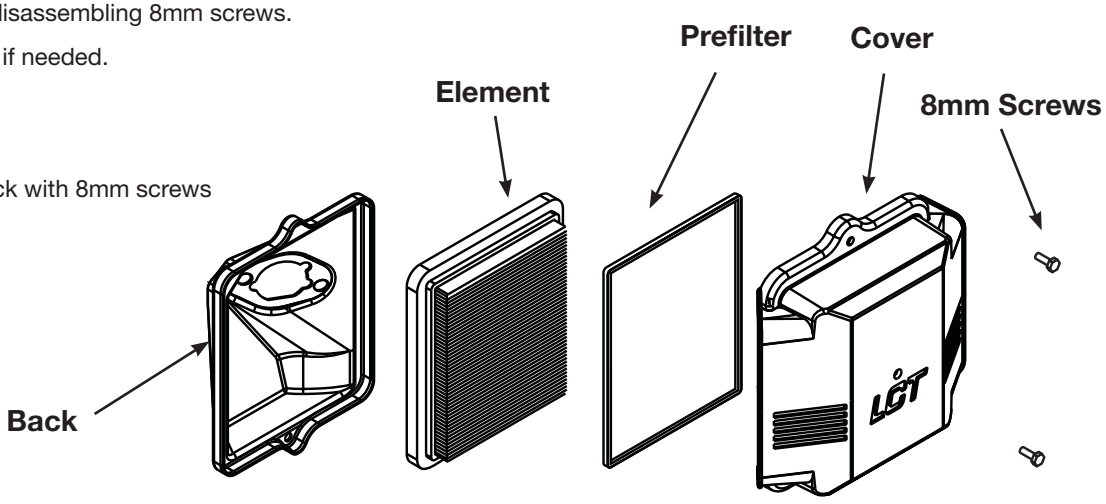
Valve Adjustment

Specs: Exhaust .007 -.009
Intake: .005 - .007

1. Remove spark plug and hold thumb over hole
2. Slowly rotate engine until air flow (pressure) is felt
3. Position piston at top dead center (TDC)

Air Filter Replacement

1. Remove air filter cover by disassembling 8mm screws.
2. Remove prefilter and clean if needed.
3. Replace air filter element
4. Reinstall pre filter
5. Attach air filter cover to back with 8mm screws



Maintenance Schedule

Normal Operating Conditions (less than 40 hrs. per year)

	EACH USE	FIRST MONTH	EVERY 6 MONTHS	ONCE A YEAR
Engine Oil Level	Check			
Engine Oil		Replace	Replace	
Air Filter	Check			Clean / Replace
Spark Plug*			Clean	Replace
Cylinder/Head Fins				Clean
Oil Leaks	Check			
Bolts	Check			
Fuel Hose Clamps	Check			

* Spark plug gap to be set to 0.027 - 0.030 inches.

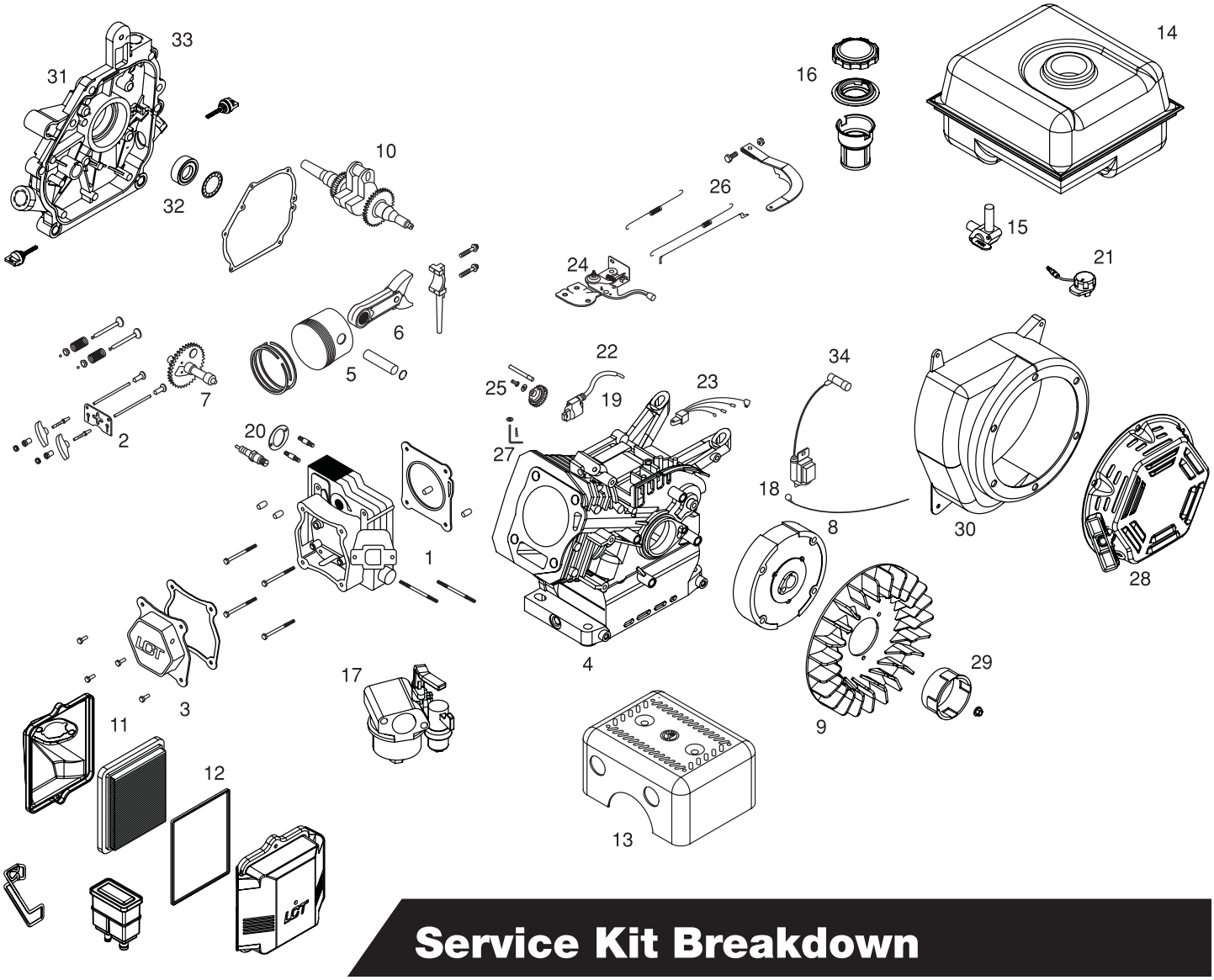
Extreme Operating Conditions (greater than 40 hrs. per year)

	EACH USE	EVERY 40 HOURS
Engine Oil Level	Check	
Engine Oil		Replace
Air Filter	Check	
Spark Plug*		
Cylinder/Head Fins		
Oil Leaks	Check	
Bolts	Check	
Fuel Hose Clamps	Check	

* Spark plug gap to be set to 0.027 - 0.030 inches.

⚠ NOTE

Following proper maintenance is critical under extreme operating conditions.



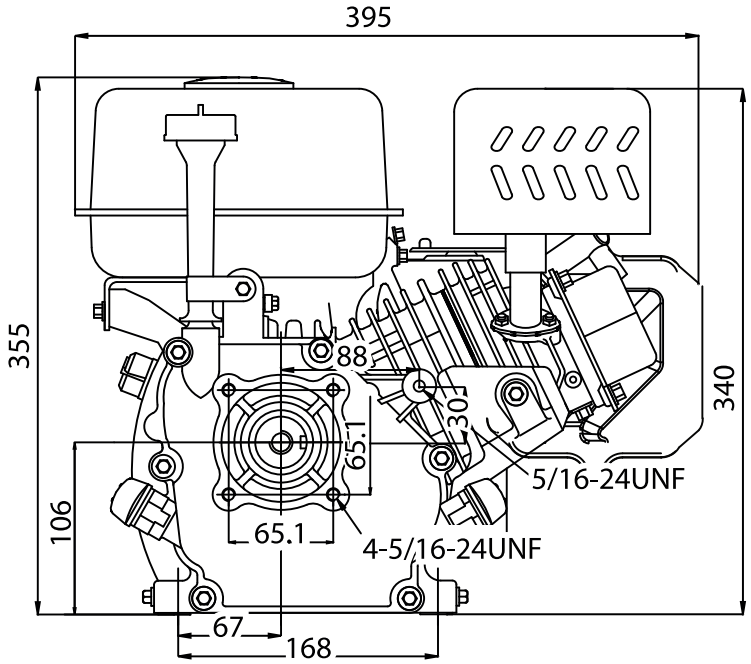
Service Kit Breakdown

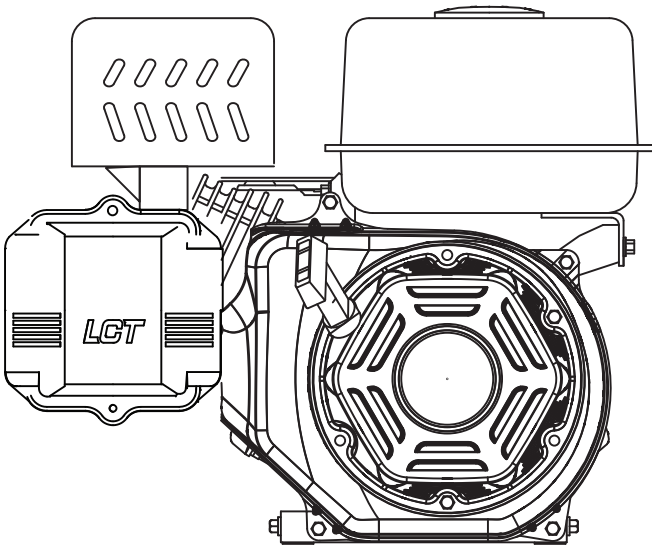
1	SK208-1000	CYLINDER HEAD SERVICE KIT
2	SK208-1001	PUSH ROD SERVICE KIT
3	SK4500	VALVE COVER SERVICE KIT
4	SK208-1300	CYLINDER SERVICE KIT
5	SK208-1400	PISTON SERVICE KIT
6	SK208-1500	CONNECTING ROD SERVICE KIT
7	SK208-1600	CAMSHAFT SERVICE KIT
8	SK208-1700	FLYWHEEL SERVICE KIT
9	SK208-4000	COOLING FAN SERVICE KIT
10	SK208-1800	CRANKSHAFT SERVICE KIT
11	SK208-2002	AIR FILTER ASSEMBLY SERVICE Kit
12	SK208-2120	PAPER FILTER SERVICE KIT
12A	SK208-9001	FOAM FILTER SERVICE KIT
13	SK208-2100	49 STATE MUFFLER SERVICE KIT
13A	SK208-9000	CALIFORNIA MUFFLER SERVICE Kit
14	SK208-2200	49 STATE FUEL TANK SERVICE KIT
14A	SK208-8200	CALIFORNIA TANK SERVICE KIT
15	SK208-2220	FUEL TANK PETCOCK SERVICE KIT
16	SK208-2300	49 STATE FUEL TANK CAP SERVICE

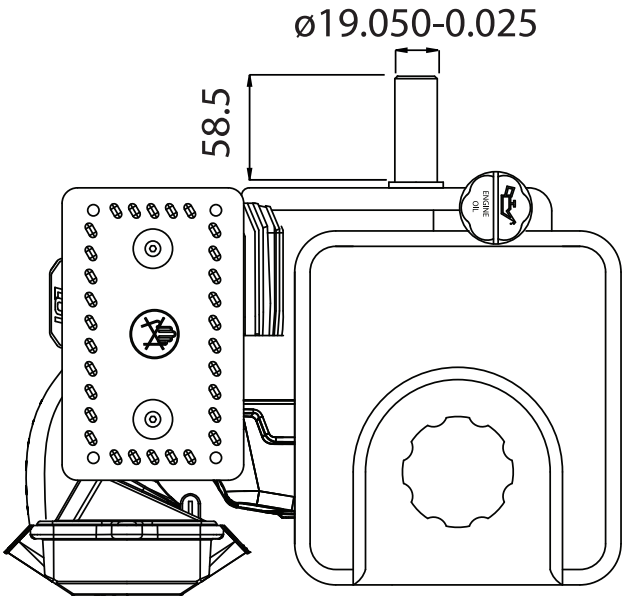
16A	SK208-8300	CALIFORNIA FUEL TANK CAP SERVI
17	SK208-2400	CARBURETOR SERVICE KIT
18	SK208-2500	IGNITION COIL SERVICE KIT
19	SK2750	IGNITION MODULE SERVICE KIT
20	SK1500	SPARK PLUG SERVICE KIT
21	SK208-2600	ENGINE ON/OFF SWITCH SERVICE I
22	SK208-2700	LOW OIL SENSOR SERVICE KIT
23	SK5930	LOW OIL SENSOR MODULE SERVIC
24	SK208-2800	THROTTLE CONTROL SERVICE KIT
25	SK208-2900	GOVERNOR GEAR SERVICE KIT
26	SK208-3000	GOVERNOR ARM SERVICE KIT
27	SK208-3100	GOVERNOR CRANK SERVICE KIT
28	SK208-3200	RECOIL STARTER SERVICE KIT
29	SK208-3300	STARTER CUP SERVICE KIT
30	SK208-3400	BLOWER HOUSING SERVICE KIT
31	SK208-3600	PTO COVER SERVICE KIT
32	SK208-3900	SEAL SERVICE KIT
33	SK208-3700	HIGH OIL FILL TUBE SERVICE KIT
34	SK208-3800	SPARK PLUG BOOT SERVICE KIT

Crankshaft Height Dimensions

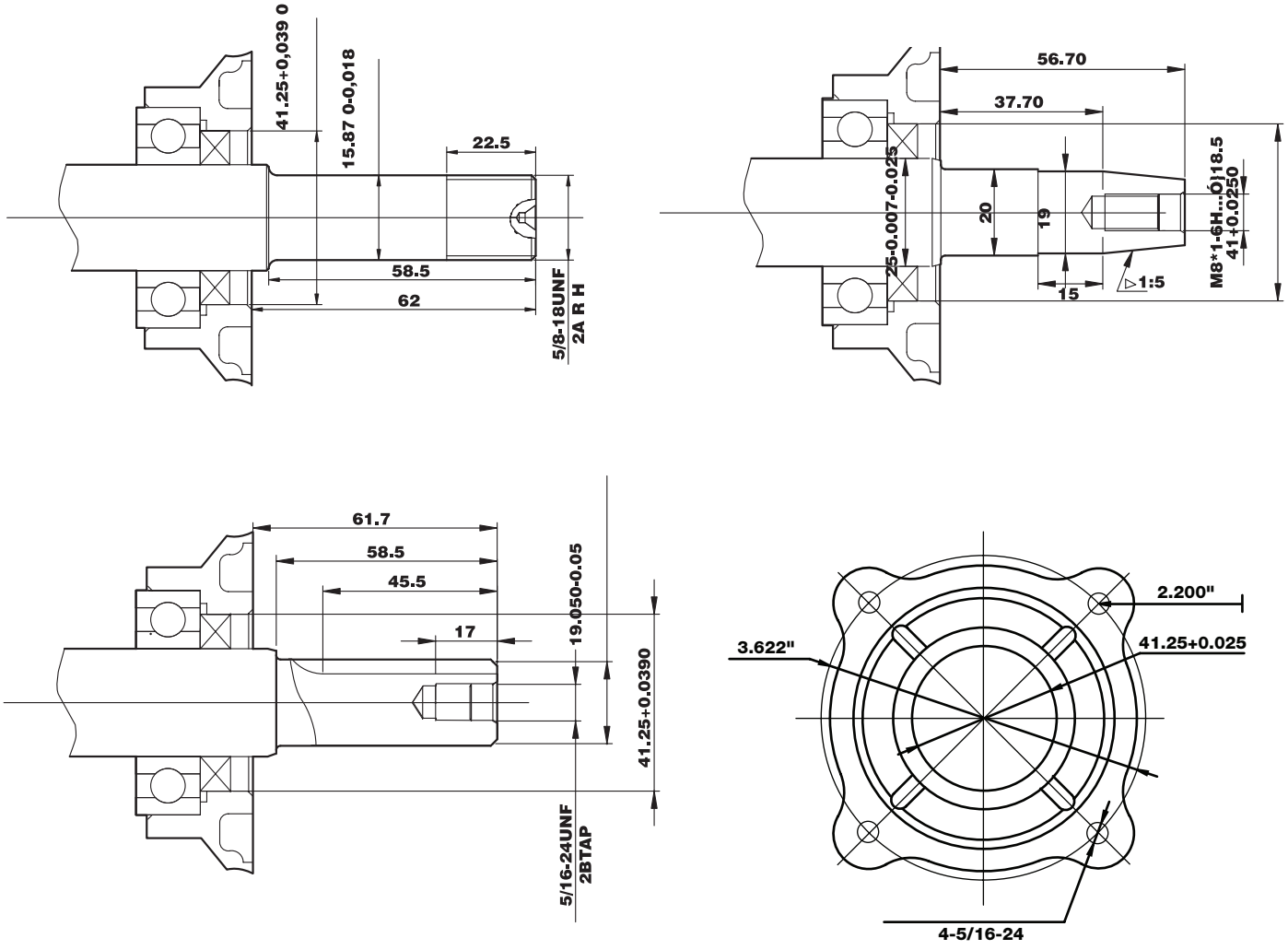
*Drawings do not accurately represent actual engine appearance.



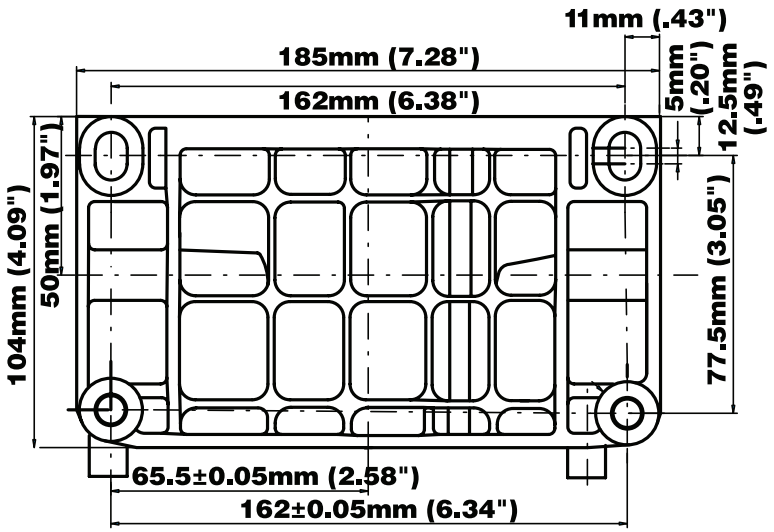




PTO & Mounting Configurations



Mounting Foot Specs



Torque Specs

Item	Torque(N.M)
Drain bolt	15~18
Oil sensor	5~8
The bolt fix wire of oil sensor	5~8
Oil level cap ass	6~8
Spark plug	20~25
Stud A of inlet air admission	9.8~12
Stud B of exhaust gas	12~15
Pivot bolt M8	22~25
Connecting rod bolt	12~14
Flange bolt	18~24
Distributor M6*27	9.8~12
Flange bolt of cylinder head M8*55	22~25
Pivot adjusting nut for inlet, exhaust valve	9.8~10
Flange bolt for head cover	9.8~12
The bolt for crankcase cover M6*14	9.8~12
Side plate M6*12	9.8~12
Support of governor	9.8~12
Nut for carburetor M6	9.8~12
Nut for muffler M8	13~15
Spark plug	20~25
Rocker bolt	20~25
Connecting rod bolt	15~20
Cover bolts	20~26
Cylinder head bolt	26~35
Flywheel nut	60~74
Spark plug electrode gap	0.7~0.8mm
Ignition gap	0.4~0.6mm
Inlet valve gap	0.15±0.02mm
Exhaust valve gap	0.20±0.02mm
High oil fill bracket bolts	8~10
Cylinder head	26~36
Flywheel Nut	60~75
Ignition Coil	10~12
Valve cover	6~7
Blower housing and recoil	10~12
Fuel tank	10~12
Carburetor nuts	10~12
Exhaust stud nuts	13~15
Fuel Petcock	5~8
Oil drain	15~18
Oil sensor module	5~8
Control bracket	8~10
Muffler Shield	8~10
Muffler Support Bracket Bolt	8~10