1. Carriage bolt
2. Washer
3. Cup washer
4. Spacer bushing
5. Rubber damper
6. Engine support
7. Nut
8. Spacer bushing
9. Washer
10. Nut
11. Exhaust gasket
12. Exhaust manifold
13. Lockwasher
14. Nut
15. Rubber shear mount
16. Washer
17. Nut
18. Washer
19. Aluminum ring
20. Muffler
21. Spring
22. Exhaust grommet
23. Loctite 242
24. Stud
25. Bolt
26. High tension cable clip
27. Clip nut
28. Noise damper
1. Carriage bolt
2. Washer
3. Cup washer
4. Spacer bushing
5. Rubber damper
6. Engine support
7. Nut
8. Spacer bushing
9. Washer
10. Nut
11. Exhaust gasket
12. Exhaust socket
13. Lockwasher
14. Bolt
15. Tuned pipe (P.T.O.)
16. Tuned pipe (mag.)
17. Spring
18. Support
19. Rubber shear mount
20. Washer
21. Washer
22. Nut
23. Loctite 242
24. Stud
25. Coupler
26. Tail pipe
27. Spring
28. Swirl chamber
29. Support
30. Spring
31. Bolt
32. Washer
33. Nut
34. Exhaust grommet
35. Bolt
36. High tension cable clip
37. Clip nut
38. Spring
39. Noise damper
ENGINE SUPPORT & MUFFLER

REMOVAL FROM VEHICLE

Disconnect or remove the following from vehicle:

- Pulley guard and drive belt.
- Air silencer.
- Throttle cable and housing at handlebar.
- Fuel lines, primer lines and impulse line.
- Electrical wires.
- Muffler.
- Rewind starter.

Disconnect oil line from bottom of oil reservoir then drain oil from reservoir and crankcase. Disconnect upper oil line from vent elbow.

Remove engine mount nuts then lift engine from vehicle.

DISASSEMBLY & ASSEMBLY

1. Torque to 3.6 kg-m (26 ft-lbs).
2. Torque to 2.1 kg-m (15 ft-lbs).
3. At assembly on crankcase apply Loctite Lock'n Seal 242 on threads.

INSTALLATION ON VEHICLE

To install engine on vehicle, inverse removal procedure. However, pay attention to the following:

- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.
1. Crankshaft
2. Woodruff key
3. Loctite 242
4. Needle cage bearing
5. "Sealing ring"
6. Distance ring 1 mm
7. Shim 0.5 mm
8. Bearing
9. Oil seal
10. Distance sleeve 9.7 mm
11. Distance ring 2 mm
12. Oil hose connector
13. Magneto ring nut
14. Crankcase upper half
15. Crankcase lower half
16. Crankcase sealant
17. Stud (support)
18. Lockwasher
19. Nut
20. Spring washer
21. Lockwasher
22. Bolt or stud with nut
23. Allen cap screw
24. Washer
25. Cylinder stud
26. Vent elbow
27. Plug
28. Circlip
29. End cap
30. Junction block bracket
31. Screw
32. Wire grommet
BOTTOM END

CLEANING
Discard all oil seals, gaskets, "O" rings and sealing rings.
Clean all metal components in a non-ferrous metal cleaner.
Remove old sealant from crankcase mating surfaces with Bombardier sealant stripper.

CAUTION: Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

DISASSEMBLY & ASSEMBLY

1. To remove magneto side bearing from crankshaft, use a protective cap and special puller as illustrated. (See Tools Section).

Prior to installation, place bearings into an oil container and heat the oil to 100° C (210° F) for 10 min. This will expand bearing and ease installation.
Install bearings with groove outward.

2. At assembly apply a light coat of lithium grease on seal lips. To insure adequate oil supply to the bearings it is imperative that the oil seals outer surface be flush with crankcase.

3. Apply Loctite Lock'n Seal 242 on threads prior to assembly.

4. To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support, as illustrated. (See Tool Section).

At assembly on crankcase, apply Loctite Lock'n Seal 242 on threads.

5. Torque to 3.6 kg-m (26 ft-lbs).

6. Torque to 2.2 kg-m (16 ft-lbs).

7. Torque to 1 kg-m (7 ft-lbs).

6. Apply Loctite Lock'n Seal on the threads of the two studs, screwed into the crankcase, above the intake ports.

8. At assembly, apply a light coat of crankcase sealant on end cap sealing surface.

9. Apply Loctite Lock'n Seal 242 on threads.

Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves.
1. Bolt (or nut with stud)
2. Lockwasher
3. Rotary valve cover
4. "O" ring
5. Allen cap screw
6. Washer
7. Rotary valve gear
8. Rotary valve disc
9. Locking ring
10. Oil seal
11. Bearing
12. Woodruff key
13. Rotary valve shaft
14. Distance sleeve
15. "O" ring
16. Pinion
17. Spring sleeve
18. Spring
19. Shim 1 mm
20. Locking ring
21. Bearing
22. Locking ring
23. End cap
24. Oil tank cap
25. Gasket
26. Clamp
27. Oil tank
28. Support
29. Bolt
30. Nut
31. Grommet
32. Male connector
33. Clam (hose)
34. Oil line
ROTARY VALVE MECHANISM

CLEANING
Discard all oil seals and "O" rings.
Remove crankcase sealant traces on rotary valve gear, adjacent bearing and on end cap sealing surface.
Clean all metal components in a non-ferrous metal cleaner.

DISASSEMBLY & ASSEMBLY

① At assembly, apply crankcase sealant on rotary valve gear and bearing mating surfaces.

② To correctly install the rotary valve disc proceed as follows:
   - Turning crankshaft counter-clockwise, (drive pulley side) bring magneto side piston to Top Dead Center using a T.D.C. gauge.
   - Position the rotary valve disc on gear to have edges as close as possible to the marks.

NOTE: The rotary valve disc is asymmetrical, therefore, at assembly try positioning each side of disc on gear to determine best installation position.

③ To remove rotary valve shaft assembly from crankcase a special puller is needed. (See Tools Section). First remove locking ring then position special puller over shaft bore and screw puller bolt into rotary valve shaft. While holding puller bolt, turn puller nut clockwise until shaft comes out.

④ At assembly, position square edge of locking ring against shaft shoulder as illustrated.

⑤ At assembly, apply a light coat of Loctite crankcase sealant on end cap sealing surface.
1. Piston
2. Gudgeon pin
3. Circlip
4. Ring
5. Gasket (cylinder / crankcase)
6. Cylinder
7. Gasket (Cylinder head)
8. Cylinder head
9. Expansion sleeve
12. Washer
13. Exhaust gasket
14. Lockwasher
15. Nut
16. Cap screw
17. Exhaust socket
18. Exhaust manifold
TOP END

Discard all gaskets.
Clean all metal components in a non-ferrous metal cleaner.
Scrape off carbon formation from cylinder exhaust port, cylinder head and piston dome using a wooden spatula.
NOTE: The letter "AUS" (over an arrow on the piston dome) must be visible after cleaning.
Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

DISASSEMBLY & ASSEMBLY

NOTE: Refer to Technical Data Section for component fitted tolerance and wear limit.
Place a clean cloth over crankcase to prevent circlips from falling into crankcase then use a pointed tool to remove circlips from piston.
Drive the gudgeon pins in or out using a suitable drive punch and hammer.
CAUTION: When tapping gudgeon pin in or out of piston, hold piston firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rod.
At assembly, place the pistons over the connecting rods with the letters AUS (over an arrow on the piston dome) facing direction of the exhaust port.

NOTE: To prevent leakage, install exhaust manifold prior to cylinder head tightening.
Torque cylinder head nuts to 1.6 kg-m (12 ft-lbs) following illustrated sequence.

Once the circlips are installed, turn each circlip so that the circlip break is not directly in line with piston notch. Using very fine emery cloth, remove any burrs on piston caused through circlip installation.
1. Armature plate
2. Magneto ring
3. Electronic box
4. Junction block
5. Screw
6. Lockwasher
7. Nut
8. Magneto housing
9. Starting pulley
10. Lockwasher
11. Screw (or nut with seal)
12. Wire grommet
13. Magneto nut
14. Protection cap
15. Loctite Lock'n Seal 242
16. H.T. wire
17. Spark plug protector
18. Spark plug
19. Flat washer
20. Lockwasher
21. Screw
22. Lighting coil 110 W
23. Screw
24. Charging coil
25. Lighting coil 30 W
26. Lockwasher
27. Screw
28. Wire function terminal
29. Protection hose
MAGNETO

CLEANING

Clean all metal components in a non-ferrous metal cleaner.

CAUTION: Clean armature and magneto using only a clean cloth.

DISASSEMBLY & ASSEMBLY

To facilitate timing procedure, perform primary adjustment by matching crankcase and armature plate marks.

Prior to assembly, clean crankshaft extension (taper) then apply Loctite Lock'n Seal 242 on taper. Install magneto retaining nut (with Loctite Lock'n Seal 242 on threads) and torque to 7.5 kg-m (54 ft-lbs).

2) Torque to 2.2 kg-m (16 ft-lbs).

Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted. To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012"-.018") between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.

Use a cable connector and rubber sleeve as illustrated, whenever a coil or cable is replaced.

1. Strip 5 mm of insulation from each end

2. Solder wires into connector with resin core type solder.

3. Slide rubber sleeve over connector then heat with a match to shrink sleeve.

Prior to assembly, clean crankshaft extension (taper) then apply Loctite Lock'n Seal 242 on taper. Install magneto retaining nut (with Loctite Lock'n Seal 242 on threads) and torque to 7.5 kg-m (54 ft-lbs).

2) Torque to 2.2 kg-m (16 ft-lbs).

Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted. To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012"-.018") between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.

Use a cable connector and rubber sleeve as illustrated, whenever a coil or cable is replaced.

1. Strip 5 mm of insulation from each end

2. Solder wires into connector with resin core type solder.

3. Slide rubber sleeve over connector then heat with a match to shrink sleeve.
1. Crankshaft
2. "O" ring (3)
3. Woodruff Key
4. Needle bearing
5. Ball bearing
6. "O" ring
7. Retaining disc
8. Oil seal
9. Shim (as required)
10. Washer
11. Spring
12. Breaker point cam
13. Tab washer
14. Magneto retaining nut
15. Distance sleeve
16. Starter gear
17. Washer (3 mm/0.118")
18. Lower crankcase half
19. Upper crankcase half
20. Crankcase stud (7)
21. Crankcase stud
22. Crankcase stud (2)
23. Dowel pin
24. Stud (4)
25. Lock washer (4)
27. Lock washer (13)
28. Cylinder head stud (8)
29. Crankcase/support stud (4)
30. Lock washer (4)
31. Nut (4)
32. Dowel tube
33. Crankcase/starter stud
34. Nut (2)
35. Starter bracket
36. Washer (2)
### SECTION 04
**SUB-SECTION 02 (TWO CYLINDER ENGINE)**

#### TOP END

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Piston (P.T.O. side)</td>
</tr>
<tr>
<td>2.</td>
<td>Piston (Mag. side)</td>
</tr>
<tr>
<td>3.</td>
<td>Gudgeon pin</td>
</tr>
<tr>
<td>4.</td>
<td>Circlip</td>
</tr>
<tr>
<td>5.</td>
<td>Rectangular ring</td>
</tr>
<tr>
<td>6.</td>
<td>&quot;L&quot; or rectangular ring</td>
</tr>
<tr>
<td>7.</td>
<td>Crankcase/cylinder gasket</td>
</tr>
<tr>
<td>8.</td>
<td>Cylinder (P.T.O. side)</td>
</tr>
<tr>
<td>9.</td>
<td>Cylinder (Mag side)</td>
</tr>
<tr>
<td>10.</td>
<td>Cylinder head gasket</td>
</tr>
<tr>
<td>11.</td>
<td>Cylinder head (P.T.O. side)</td>
</tr>
<tr>
<td>12.</td>
<td>Cylinder head (Mag. side)</td>
</tr>
<tr>
<td>15.</td>
<td>Distance nut (long)</td>
</tr>
<tr>
<td>16.</td>
<td>Distance nut (short)</td>
</tr>
<tr>
<td>17.</td>
<td>Support sleeve</td>
</tr>
<tr>
<td>18.</td>
<td>Exhaust socket (P.T.O. side-short)</td>
</tr>
<tr>
<td>19.</td>
<td>Exhaust socket (Mag. side-long)</td>
</tr>
<tr>
<td>20.</td>
<td>Aluminium ring</td>
</tr>
<tr>
<td>21.</td>
<td>Intake manifold stud</td>
</tr>
<tr>
<td>22.</td>
<td>Intake manifold gasket (P.T.O. side)</td>
</tr>
<tr>
<td>23.</td>
<td>Intake manifold gasket (Mag side)</td>
</tr>
<tr>
<td>24.</td>
<td>Intake manifold</td>
</tr>
<tr>
<td>25.</td>
<td>Ring gasket</td>
</tr>
<tr>
<td>26.</td>
<td>Intake cover</td>
</tr>
<tr>
<td>27.</td>
<td>Carburetor stud</td>
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<td>28.</td>
<td>Plain washer</td>
</tr>
<tr>
<td>29.</td>
<td>Lock washer</td>
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<tr>
<td>30.</td>
<td>Flange gasket</td>
</tr>
<tr>
<td>31.</td>
<td>Isolating flange</td>
</tr>
<tr>
<td>32.</td>
<td>Tab washer</td>
</tr>
<tr>
<td>33.</td>
<td>Exhaust manifold</td>
</tr>
</tbody>
</table>
REMOVAL
Remove or disconnect the following then lift engine out of vehicle.

Front-mounted engine
- Drive belt
- Muffler
- Rewind starter
- Air silencer
- Choke cable
- Throttle cable
- Fuel lines at carburetor

Note: Secure fuel line to steering support so that the opened ends are higher than the fuel tank.

Caution: On electric start model, disconnect negative cable (ground) from battery post before disconnecting other wires.
- Engine mount nuts.

Center mounted engine
- Drive belt
- Muffler
- Choke knob
- Throttle cable
- Fuel lines
- Electrical connector

Caution: On electric start model, disconnect negative cable (ground) from battery post before disconnecting other wires.
- Separate steering column support at upper column
- Engine mount nuts.

DISASSEMBLY & ASSEMBLY
If necessary, remove drive pulley as described in drive pulley section.

Note: Refer to Technical Data Section for component fitted tolerance and wear limit.

Bottom End
1. The center “O” ring/ball bearing combination may vary depending on production date of engine.

For correct assembly, refer to the following chart for identification.

<table>
<thead>
<tr>
<th>Ball bearing Groove Depth</th>
<th>&quot;O&quot; Ring Thickness</th>
<th>Outside Diameter</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>.059&quot; to .063&quot;</td>
<td>.078&quot;</td>
<td>2 5/16&quot;</td>
<td>420 830 350</td>
</tr>
<tr>
<td>.047&quot; to .051&quot;</td>
<td>.070&quot;</td>
<td>2 1/8&quot;</td>
<td>420 830 355</td>
</tr>
</tbody>
</table>

To remove bearing from crankshaft, use a protective cap and special puller, as illustrated. (See Tool Section).

Prior to installation, place bearings into an oil container and heat the oil to 200 °F. for 5 to 10 min. This will expand bearing and ease installation.

Install bearings with groove outward.

Crankshaft end-play is adjusted with shim(s) located between crankshaft and magneto side bearing. To determine correct amount of shim(s), proceed as follows.

Remove magneto side bearing and existing shim(s). Slide the appropriate crankshaft ring and the retaining disc on the crankshaft. (See Tool Section).

Position crankshaft assembly into crankcase lower half. Make sure that retaining washers are correctly seated in the grooves.

Gently tap crankshaft counterweight until P.T.O. side bearing bears against retaining disc.

Any free-play between the crankshaft ring and magneto side retaining disc minus recommended end-play is the distance to be covered by shim(s). Shims are available in thickness of .01 mm/.004", .02 mm/.008", .03 mm/.012", .05 mm/.020", .1 mm/.039".

Note: Crankshaft end-play requires adjustment only when crankshaft and/or crankcase is replaced.

To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tool Section).
At assembly torque retaining nut to 50-58 ft-lbs.

To remove starter gear from crankshaft it may be necessary to use a special puller as illustrated. (See Special Tool).

At assembly, apply a light coat of anti-seize compound on crankshaft extension nearest starter gear.

Prior to joining of crankcase halves, apply a light coat of "Loctite" crankcase sealant to the mating surfaces of the bottom half.

Position spring washers and nuts on crankcase studs then torque nuts to 14-16 ft-lbs., following illustrated sequence.

At assembly, torque to 14-16 ft-lbs.

At assembly, torque crankcase/support nut to 23-29 ft-lbs.

Top End

Place a clean cloth over crankcase to prevent circlip from falling into crankcase. Use a pointed tool to remove circlips from piston.

Caution: When tapping out gudgeon pins, hold piston firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rod.

At assembly, place the pistons over the connecting rods with the letters "AUS", over an arrow on the piston dome, facing in direction of the exhaust port.

Also make sure that the piston window is aligned with the crankcase transfer passage when the gudgeon pin orifice is in-line with the connecting rod bore.

Note: Once the circlips are installed turn each circlip so the circlip is not directly on piston notch. Remove any burrs on piston caused through circlip installation with very fine emery cloth.
When installing cylinder and or cylinder head, the cylinder aligning tool must be used to ensure sealing of intake manifold and cylinders. (See Tool Section).

Install exhaust manifold on exhaust socket then install aligning bar and torque distance nut to 14-16 ft-lbs.

Cross torque cylinder head nut to 14-16 ft-lbs. Remove aligning bar and exhaust manifold.

Note: Torque each cylinder head individually.

At assembly, torque to 14-16 ft-lbs.

At assembly, position magneto on crankshaft with the keyway and the cam notch position as illustrated.

At assembly, apply a small amount of low temperature grease into spring seating.

At assembly, apply Loctite "Lock'n Seal" on retaining screw threads.

Whenever a coil is replaced, the air gap (distance between magnet and armature end) must be adjusted.

To check air gap, insert a feeler gauge of correct thickness (0.31 mm/.012"-0.45 mm/.018") between magnet and armature ends.

If necessary to adjust, slacken retaining screw and relocate armature.

Magneto

With magneto retaining nut removed and hold-on support in place, install special puller onto hub.

Tighten puller nut and at same time, tap on nut head using a hammer to release magneto from its taper.
To replace a capacitor, it is first necessary to unsolder the two (2) black leads using a soldering iron. The capacitor can then be driven out of the armature plate using a suitable punch and hammer. To reinstall, inverse procedure.

When replacing breaker point set, apply a light coat of grease on pivot pin and rubbing block. Do not remove pivot pin unless replacement is needed. At assembly, apply Loctite “Lock’n Seal” on threads.

When replacing unit construction type breaker point, apply a small amount of grease on rubbing block.

Cooling System

At assembly, apply a light coat of Loctite “Lock’n Seal” on threads. It should be noted that to correctly remove a Loctite locked screw, it is first necessary to slightly tap on head of screw to break Loctite bond. The screw can then be removed. This will eliminate the possibility of screw breakage.

It is first necessary to heat bearing housing to 140° -160° F. To remove or install bearing.

Lock fan pulley with special holder wrench to remove or install pulley retaining nut. (See Tool Section).

Shim(s) located between pulley halves are used to adjust fan belt free-play. Correct free-play is 1/4”. If necessary to adjust, install or remove shim(s) between pulley halves. Install excess shim(s) between outer pulley half and washer.

CLEANING

Discard all oil seals, gaskets and “O” rings.

Clean all metal components in a non-ferrous metal cleaner.

Caution: Clean armature using only a clean cloth.

Scrape off carbon formation from cylinder exhaust ports, cylinder exhaust ports, cylinder heads and piston domes.

Note: The letter “AUS” over an arrow on the piston dome must be visible after cleaning.

Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

Remove old sealant from mating surfaces with Bombardier “Sealant stripper”.

Caution: Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

INSTALLATION

To install engine on vehicle, inverse removal procedure. However, pay attention to the following:

• Check ignition timing.
• Check tightness of engine mount nuts.
• After throttle cable installation, check carburetor maximum throttle opening.
• Check pulley alignment.
1. Carriage bolt
2. Flat washer
3. Spacer bushing
4. Lower rubber damper
5. Damper retainer
6. Engine support
7. Upper rubber damper
8. Nut
9. Reinforcement plate
10. Stud
11. Loctite Lock'n Seal 242
12. Lockwasher
13. Nut
14. Exhaust spring bracket
15. Flat washer
16. Lockwasher
17. Screw
18. Rivet
19. Spring
20. Felt strip
21. Sealing ring
22. Exhaust manifold
23. Sealing ring
24. Muffler
25. Spring
26. Spring
27. Spring
28. Washer
29. Bolt
30. Muffler bracket
31. Rubber spacer
32. Nut
ENGINE SUPPORT & MUFFLER (T'NT & EVEREST)

1. Rubber mount
2. Nut
3. Engine support
4. Flat washer
5. Reinforcement plate
6. Lockwasher
7. Felt strip
8. Exhaust spring bracket
9. Rivet
10. Stud
11. Lockwasher
12. Bolt
13. Nut
14. Flat washer
15. Nut
16. Washer
17. Sealing ring
18. Exhaust manifold
19. Exhaust spring
20. Sealing ring
21. Muffler
22. Spring
23. Rubber shear mount
24. Washer
25. Exhaust grommet
26. Loctite Lock'n Seal 242
ENGINE SUPPORT & MUFFLER

REMOVAL FROM VEHICLE

Remove or disconnect the following (if applicable) then lift engine out of vehicle.

- Pulley guard & drive belt
- Muffler & air duct
- Cab retaining cable
- Air intake silencer
- Fuel lines at carburetor, impulse line
- Throttle cable
- Electrical junction block.

⚠️ CAUTION: On electric start model, disconnect negative cable (ground) from battery before disconnecting other wires.

- Rewind starter
- Engine mount nuts

DISASSEMBLY & ASSEMBLY

- At assembly on crankcase, apply Loctite Lock'n Seal 242 on threads.
- Torque to 3.6 kg·m (26 ft-lbs).

INSTALLATION ON VEHICLE

To install engine on vehicle, inverse removal procedure. However, pay attention to the following:

- Check ignition timing
- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.
1. Crankshaft
2. Sealing ring
3. Distance ring 1 mm (1977)
4. Shim
5. Bearing (MAG)
6. “O” ring
7. Retainer washer
8. Oil seal (MAG)
9. Washer
10. Spring
11. Breaker point cam
12. Loctite Lock’n Seal 242
13. Magneto nut
14. Woodruff key
15. Distance ring 2 mm
16. Bearing (P.T.O.)
17. “O” ring
18. Distance ring 3 mm
19. Oil seal (P.T.O.)
20. Needle cage bearing
21. Crankcase upper half
22. Crankcase lower half
23. Crankcase sealant
24. Bolt or nut with stud
25. Lockwasher
26. Stud
27. Lockwasher
28. Nut
29. Stud
30. Washer
31. Nut
32. Loctite Lock’n Seal 242
BOTTOM END

CLEANING

Discard all oil seals, gaskets, "O" rings and sealing rings.

Clean all metal components in a non-ferrous metal cleaner.

Remove old sealant from crankcase mating surfaces with Bombardier sealant stripper.

\* CAUTION: Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

DISASSEMBLY & ASSEMBLY

General

Refer to Technical Data Section for component fitted tolerance and wear limit.

1. Crankshaft end-play is adjusted with shim(s) located between crankshaft and magneto side bearing. To determine correct amount of shim(s), proceed as follows.

2. NOTE: Crankshaft end-play requires adjustment only when crankshaft and/or crankcase is replaced.

Remove magneto side bearings and existing shim(s). Slide the appropriate bearing simulator and the retaining washers on the crankshaft. (See Tool Section).

Position crankshaft assembly into crankcase lower half. Make sure that retaining washers are correctly seated in the grooves.

Gently tap crankshaft counterweight until P.T.O. side inner bearing bears against retaining washer.

Any free-play between the bearing simulator and magneto side retaining washer, minus recommended end-play, is the distance to be covered by shim(s). Shims are available in the thickness of 0.10 mm (.004"), 0.15 mm (.006"), 0.20 mm (.008") and 0.30 mm (.012").

Prior to installation, place bearings into an oil container and heat the oil to 100° C (210° F) for 10 min. This will expand bearings and ease installation.

Install bearings with groove outward.

3. NOTE: Prior to magneto side bearing installation, determine crankshaft end-play and install required shim(s) on crankshaft extension.

4. At assembly apply a light coat of lithium grease on seal lip. Seal outer surface should be flush with crankcase.

5. To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tool Section).

At assembly apply Loctite Lock'n Seal 242 or equivalent on threads then torque to 8.3 kg-m (60 ft-lbs).

6. A 4 mm (0.160") distance ring is used on P.T.O. side with crankcase upper half having the oil passage between the two bearings. When the oil passage is between oil seal and outer bearing, a 3 mm (0.120") must be used.
Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves.

Prior to joining of crankcase halves, prepare mating surfaces with crankcase sealant primer then apply a light coat of crankcase sealant (See Tool Section) as per instructions printed on container.

Position the crankcase halves together and tighten nuts (or bolts) by hand then install armature plate (tighten) on magneto side to correctly align the crankcase halves.

Torque bolts or nuts to 2.1 kg-m (15 ft-lbs) following illustrated sequence.

1. Torque to 2.1 kg-m (15 ft-lbs).
2. At assembly on crankcase apply Loctite Lock'n Seal 242 on threads.
3. Torque to 3.6 kg-m (26 ft-lbs).
4. Torque to 2.1 kg-m (15 ft-lbs).
1. Gasket (cylinder / crankcase)
2. Cylinder (P.T.O.)
3. Cylinder (MAG)
4. Cylinder head gasket
5. Cylinder head (P.T.O.)
6. Cylinder head (MAG)
7. Flat washer
8. Support sleeve
9. Nut
10. Distance nut (short)
11. Distance nut (long)
12. Stud
13. Gasket (intake P.T.O.)
14. Gasket (intake MAG)
15. Intake manifold
16. Sealing ring
17. Intake cover
18. Intake cover (new type)
19. Flat washer
20. Lockwasher
21. Nut
22. Gasket
23. Isolating flange
24. Screw
25. Screw
26. Exhaust socket (P.T.O.)
27. Exhaust socket (MAG)
28. Sealing ring
29. Exhaust manifold
30. Piston
31. Gudgeon pin
32. Circllp
33. Ring
TOP END

CLEANING

Discard all gaskets.

Clean all metal components in a non-ferrous metal cleaner.

Scrape off carbon formation from cylinder exhaust port, cylinder head and piston dome using a wooden spatula.

NOTE: The letter "AUS" (over an arrow on the piston dome) must be visible after cleaning.

Clean the piston mag grooves with a groove cleaner tool, or with a piece of broken ring.

DISASSEMBLY & ASSEMBLY

NOTE: Refer to technical data for component fitted tolerance and wear limit.

When installing cylinder and/or cylinder head, the cylinder aligning tool must be used to ensure sealing of intake manifold and cylinders. (See Tool Section).

With exhaust manifold and aligning tool installed, you can then cross torque cylinder head nuts to 2.1 kg-m (15 ft-lbs).

Position nuts and distance nuts as per illustration then cross torque to 2.1 kg-m (15 ft-lbs).

NOTE: Torque each cylinder head individually (exhaust manifold & aligning tool installed).

Apply Loctite Lock’n Seal 242 on threads then torque to 2.1 kg-m (15 ft-lbs).

Place a clean cloth over crankcase to prevent circlip from falling into crankcase. Use a pointed tool to remove circlips from piston.

CAUTION: When tapping out gudgeon pins, hold piston firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rod.

At assembly, place the pistons over the connecting rods with the letters "AUS" (over an arrow on the piston dome) facing in direction of the exhaust port.

Also make sure that the piston window is aligned with the crankcase transfer passage when the gudgeon pin orifice is in line with the connecting rod bore.

NOTE: Once the circlips are installed turn each circlip so it is not directly on piston notch. Remove any burrs on piston caused through circlip installation with very fine emery cloth.
MAGNETO

CLEANING

Clean all metal components in a non-ferrous metal cleaner.

\[ \text{CAUTION: Clean armature ass'y and magneto using only a clean cloth.} \]

DISASSEMBLY & ASSEMBLY

\( \text{To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See tool Section).} \)

\( \text{With magneto retaining nut removed and hold-on support in place, install special puller onto support.} \)

\( \text{Tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper.} \)

\( \text{At assembly, clean crankshaft extension (taper) then apply Loctite Lock'n Seal 242 or equivalent, position magneto on crankshaft with the keyway and the cam notch positioned as illustrated.} \)

\( \text{Install magneto retaining nut (with Loctite Lock'n Seal 242) on threads and torque to 8.3 kg-m (60 ft-lbs).} \)

\( \text{Torque to 2.2 kg-m (16 ft-lbs).} \)

\( \text{Apply Loctite Lock'n Seal 242 on threads.} \)

\( \text{At assembly apply a small amount of low temperature grease into spring seating.} \)

\( \text{To replace a capacitor, it is first necessary to unsolder the two (2) black leads using a soldering iron. The capacitor can then be driven out of the armature plate using a suitable drift. To reinstall, inverse procedure.} \)

\( \text{Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted.} \)

\( \text{To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012"-.018") between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.} \)

\( \text{Apply Loctite Lock'n Seal 242 on threads.} \)

\( \text{Do not remove pivot pin unless replacement is needed, if removed, reinstall with Loctite Lock'n Seal 242 on threads.} \)

\( \text{Old type breaker point set can be replaced by new type if pivot pin is removed. When installing new breaker point type it is advisable to fill the pivot pin cavity of the armature plate with Loctite 277 (thick red solution).} \)

\( \text{When replacing breaker point set, apply a light coat of grease on lubricating wick.} \)
1. Fan housing
2. Circlip
3. Shim(s)
4. Bearing
5. Fan shaft
6. Woodruff key
7. Pulley half
8. Shim
9. Shim
10. Fan
11. Washer
12. Nut
13. Belt
14. Fan cowl (intake)
15. Fan cowl (exhaust)
16. Spring washer
17. Screw
18. Screw
19. Nut
20. Fan cover
21. Junction block bracket
22. Lockwasher
23. Screw
24. Screw
25. Lockwasher
26. Rubber washer
COOLING SYSTEM

CLEANING

Clean all components in a non-ferrous metal cleaner.

DISASSEMBLY & ASSEMBLY

1. Heat bearing housing to 70° C (160° F) prior to bearing removal or installation.
2. Newer pulley half does not have a shoulder on its inner face so it is installed with a 6 mm (0.230") spacer.

Pulley half

NEW TYPE

OLD TYPE

1. Shim(s) located between pulley halves are used to adjust fan belt free-play. Correct free-play is 6 mm (¼"). If necessary to adjust install or remove shim(s) between pulley halves. Install excess shim(s) between outer pulley half (or fan) and washer of retaining nut.
2. There are three types of fan, the first is an internal type, the second and third are external and interchangeable. The second type utilises two pulley halves and the third type utilises one pulley half (the second half being part of the fan itself).
3. Lock fan (or pulley half) with special holder wrench to remove or install pulley retaining nut. (See Tool Section).

At assembly torque to 6.4 kg-m (46 ft-lbs).
4. Apply Loctite Lock'n Seal 242 on threads.

NOTE: It should be noted that to correctly remove a Loctite locked screw, it is first necessary to tap on head of screw to break Loctite bond. This will eliminate the possibility of screw breakage.

5. Apply Loctite Lock’n Seal 242 on threads then torque to 1 kg-m (7 ft-lbs).
SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

346, 396, 436 ENGINE TYPE

BOTTOM END

1. Crankshaft
2. "O" ring
3. Woodruff key
4. Needle bearing
5. Ball bearing
6. Lock washer
7. Magneto retaining ring nut
8. Oil seal
9. Shim (1 mm)
10. Stud (6)
11. Stud (8)
12. Dowel pin
13. Crankcase lower half
14. Stud (4)
15. Lock washer (4)
16. Nut (4, M-12)
17. Spring washer (12)
18. Lock washer (14)
19. Nut (14)
20. Stud (8)
21. Rubber plug
22. Crankcase upper half

TOP END

1. Piston
2. Gudgeon pin
3. Circlip
4. Piston ring
5. Cylinder/crankcase gasket
6. Cylinder (P.T.O. side)
7. Cylinder (Mag. side)
8. Cylinder head gasket
9. Cylinder head stud (4 or 8)
10. Cylinder head
11. Plain washer (12 or 16)
12. Cylinder head nut (12 or 16)
13. Exhaust manifold stud (4)
14. Exhaust manifold gasket
15. Lock washer (4)
16. Nut (8)
17. Exhaust manifold
18. Cross flange stud (4)
19. Cross flange gasket (2)
20. Cross flange (2)
21. Lock washer (4)
22. Nut (4)
23. Carburetor stud (4)
24. Flange gasket (4)
25. Isolating flange (2)
26. Lock tab (4)
SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

1. Nut (3)
2. Lock washer (3)
3. Starting pulley
4. Stud (3)
5. Magneto housing cover
6. Nut (4)
7. Lock washer
8. Magneto housing
9. Magneto ring
10. Allen screw (4)
11. Armature plate ass'y
12. Flat washer (2)
13. Lock washer (2)
14. Allen screw (2)
15. Rubber grommet

REMOVAL
Remove or disconnect the following, then lift engine out of vehicle.
- Drive belt
- Muffler
- Rewind starter
- Air silencer
- Choke cable
- Throttle cable
- Fuel lines at carburetor
- Engine mount nuts and washers

Note: Secure fuel line to steering support so that the open ends are located higher than the fuel tank.

DISASSEMBLY & ASSEMBLY
If necessary, removed drive pulley as described in drive pulley section.

Note: Refer to Technical Data section for component fitted tolerance and wear limit.

Bottom End
(2) The "O" ring/ball combination between early and later production engines vary. For correct assembly, refer to the following chart identification.

<table>
<thead>
<tr>
<th>Ball bearing Groove Depth</th>
<th>&quot;O&quot; Ring</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>.059&quot; to .063&quot;</td>
<td>2 5/16&quot;</td>
<td>420 830 350</td>
</tr>
<tr>
<td>.047&quot; to .051&quot;</td>
<td>2 1/8&quot;</td>
<td>420 830 355</td>
</tr>
</tbody>
</table>

(5) To remove bearing from crankshaft use a protective cap and special puller, as illustrated. (See Tool Section).
At assembly torque magneto retaining nut to 58-62 ft/lbs.

Prior to joining of crankcase halves, apply a light coat of "Loctite" crankcase sealant to the mating surfaces of the bottom half. Position spring washers, lock washers and nuts on crankcase studs then torque nut to 14-16 ft/lbs. following illustrated sequence.

Note: There is no spring washer on the last two (2) magneto side studs.

Prior to joining of crankcase halves, apply a light coat of "Loctite" crankcase sealant to the mating surfaces of the bottom half. Position spring washers, lock washers and nuts on crankcase studs then torque nut to 14-16 ft/lbs. following illustrated sequence.

Note: There is no spring washer on the last two (2) magneto side studs.

Note: Once the circlips are installed, turn each circlip so that the circlip break is not directly in line with piston notch. Using very fine emery cloth, remove any burrs on piston caused through circlip installation.

---

**Top End**

1. Place a clean cloth over crankcase to prevent circlip from falling into crankcase then use a pointed tool to remove circlips from piston.

Drive the gudgeon pins in or out using a suitable drive punch and hammer.

Caution: When tapping gudgeon pins in or out of pistons, hold firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rod.

At assembly, place the pistons over the connecting rods with the letters AUS, over an arrow on the piston dome, facing direction of the exhaust port.

---

**Exhaust**

Note: To prevent possible distortion, install exhaust manifold prior to cylinder head tightening.

---

**Magneto**

1. At assembly torque to 14-16 ft/lbs.

2. At assembly torque to 9 ft/lbs.

3. With magneto retaining nut removed and hold-on support in place, install special puller onto hub. Tighten puller nut and at same time, tap on nut head using a hammer to release magneto from its taper. (See Special Tool).
At assembly, make sure the three (3) bottom wires are positioned as illustrated to prevent squeezing. (A dab of silicon seal or a few drops of candle wax will hold them in place).

Clean the piston ring grooves with a groove cleaner tool, or using a piece of broken ring.

Remove old sealant from mating surfaces of crankcase with a scraper blade.

Caution: Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

**INSTALLATION**

To install engine on vehicle inverse removal procedure, however, special attention should be paid to the following:

- Torque engine mount nuts to 25 ft/lbs.
- After throttle cable installation, check maximum throttle opening adjustment.
- Check pulley alignment.
- Check ignition timing.

**CLEANING**

Discard all oil seals, gaskets and "O" rings.

Clean all metal components using a non-ferrous metal cleaner.

Caution: Clean armature using only a clean cloth.

Scrape off any carbon formation from cylinder exhaust ports, cylinder heads and piston domes.

*Note: The letter AUS over an arrow on the piston dome must be visible after cleaning.*
1. Rubber mount
2. Nut
3. Engine support
4. Flat washer
5. Reinforcement plate
6. Lockwasher
7. Nut
8. Exhaust
9. Exhaust manifold
10. Lockwasher
11. Bolt
12. Aluminum ring
13. Muffler
14. Spring
15. Rubber shear mount
16. Washer
17. Washer
18. Nut
19. Exhaust grommet
20. Stud
SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

REMOVAL FROM VEHICLE

Remove or disconnect the following (if applicable) then lift engine out of vehicle.
- Pulley guard & drive belt.
- Muffler.
- Cab retaining cable.
- Air intake silencer.
- Fuel lines at carburetor, impulse line.
- Throttle cable.
- Electrical junction block.
- Rewind starter.
- Engine mount nuts.

DISASSEMBLY & ASSEMBLY

© Torque to 4.4 kg-m (32 ft-lbs).
© Torque to 2.1 kg-m (15 ft-lbs).
© At assembly on crankcase, apply Loctite Lock'n Seal 242 or equivalent on threads.

INSTALLATION ON VEHICLE

To install engine on vehicle, inverse removal procedure. However, pay attention to the following:
- Check ignition timing prior to installation in vehicle.
- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.

BOTTOM END

1. Crankcase upper half
2. Crankcase lower half
3. Crankcase sealant
4. Bolt or stud with nut
5. Lockwasher
6. Spring washer
7. Stud (engine support)
8. Loctite Lock’n Seal 242
9. Nut
10. Stud
11. Impulse cap
12. Clamp
13. Plug
14. Junction block bracket
15. Lockwasher
16. Screw
17. Nut
18. Breaker point cam
19. Spring
20. Washer
21. Oil
22. Bearing
23. “O” ring
24. Distance ring 2 mm (mag. side)
25. Distance ring 1 mm (P. T. O. side)
26. Shim (2) 1 mm
27. Crankshaft
28. Needle cage bearing
29. Woodruff key
30. “O” ring
BOTTOM END

CLEANING
Discard all oil seals, gaskets, "O" rings and sealing rings.
Clean all metal components in a non-ferrous metal cleaner.
Remove old sealant from crankcase mating surfaces with Bombardier sealant stripper.

CAUTION: Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

DISASSEMBLY & ASSEMBLY
1. Crankcase halves are factory matched and therefore, are not interchangeable as single halves.
Prior to joining of crankcase halves, prepare mating surfaces with crankcase sealant primer then apply a light coat of crankcase sealant (See tool Section) as per instructions printed on container.
Position the crankcase halves together and tighten nuts (or bolts) by hand then install armature plate (tighten) on magneto side to correctly align the crankcase halves.
Position spring washers, lock washers and nuts or bolts then torque to 2.1 kg-m (15 ft-lbs) following illustrated sequence.

NOTE: There is no spring washer on the last two (2) magneto side studs (no. 1344).

4. Torque to 2.1 kg-m (15 ft-lbs).
7. At assembly on crankcase apply Loctite Lock'n Seal 242 or equivalent on threads.
9. Torque to 4.4 kg-m (32 ft-lbs).
10. Apply Loctite Lock'n Seal 242 or equivalent on threads.
15. Torque to 8.3 kg-m (60 ft-lbs).
11. At assembly apply a light coat of lithium grease on seal lips then position oil seal with outer surface flush with crankcase.

2. To remove bearing from crankshaft use a protective cap and special puller, as illustrated. (See Tool Section).

Prior to installation, place bearings into an oil container and heat the oil to 100° C (210° F) for 10 min. This will expand bearings and ease installation.
Before installation of bearing, slide the appropriate distance ring on crankshaft then install bearings with groove outward.
On P.T.O. side position two (2) 1 mm (.040") thick shims between the two bearings.
TOP END

CLEANING

Discard all gaskets.
Clean all metal components in a non-ferrous metal cleaner.
Scrape off carbon formation from cylinder exhaust port, cylinder head and piston dome using a wooden spatula.

NOTE: The letter "AUS" (over an arrow on the piston dome) must be visible after cleaning.
Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

DISASSEMBLY; ASSEMBLY

NOTE: Refer to Technical Data for component fitted tolerance and wear limit.

@ Torque to 2.1 kg-m (15 ft-lbs) following illustrated sequence for cylinder head nuts.

Drive the gudgeon pins in or out using a suitable drive punch and hammer.

CAUTION: When tapping gudgeon pin in or out of piston, hold piston firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rod.

At assembly, place the pistons over the connecting rods with the letters AUS (over an arrow on the piston dome) facing direction of the exhaust port.

EXHAUST

NOTE: Refer to Technical Data for component fitted tolerance and wear limit.

@ Torque to 2.1 kg-m (15 ft-lbs).
@ Torque to 0.5 kg-m (4 ft-lbs).
@ Place a clean cloth over crankcase to prevent circlips from falling into crankcase then use a pointed tool to remove circlips from piston.

NOTE: To prevent leakage, install exhaust manifold prior to cylinder head tightening.

@ Torque to 1.4 kg-m (10 ft-lbs).
@ Torque to 2.1 kg-m (15 ft-lbs).
@ Place a clean cloth over crankcase to prevent circlips from falling into crankcase then use a pointed tool to remove circlips from piston.
**SECTION 04**
**SUB-SECTION 02 (TWO CYLINDER ENGINE)**

**MAGNETO**

1. Armature ass'y
2. Armature plate
3. Magneto ring
4. Capacitor
5. Magneto retaining nut
6. Lock washer
7. Screw
8. Magneto housing
9. Spring
10. Centrifugal weight
11. Screw
12. Starting pulley
13. Lock washer
14. Screw
15. Wire grommet
16. Coils bracket
17. Lock washer
18. Screw
19. Coil
20. Lock washer
21. Screw
22. Protection cap
23. H.T. cable
24. Spark plug protector
25. Spark plug
26. Lighting coil
27. Ignition generator coil
28. Flat washer
29. Lock washer
30. Screw
31. Breaker point set
32. Lubricating wick
33. Loctite Lock'n Seal 242
34. Screw
35. Vibration damper (436 only)
36. Vibration damper (436 only)

**CLEANING**

Clean all metal components in a non-ferrous metal cleaner.

**CAUTION:** Clean armature and magneto using only a clean cloth.

**DISASSEMBLY & ASSEMBLY**

1. To replace a capacitor, it is first necessary to unsolder the two (2) black leads. The capacitor can then be driven out of the armature plate using a suitable drift and hammer. To reinstall, inverse procedure.

2. To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support, as illustrated. (See Tool Section).
With magneto retaining nut removed and hold-on support in place, install special puller onto hub. Tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper.

At assembly, clean crankshaft extension (taper) then apply Loctite Lock'n Seal 242 or equivalent, position magneto on crankshaft with the keyway and the cam notch positioned as illustrated.

Install magneto retaining nut (with Loctite Lock'n Seal 242 on threads) and torque to 8.3 kg-m (60 ft-lbs).

Apply Loctite Lock'n Seal 242 or equivalent on threads.

At assembly, apply a small amount of low temperature grease into spring seating.

Whenever a coil is replaced, the air gap (distance between coil end and magnet) must be adjusted.

To check air gap, insert a feeler gauge of 0.30-0.45 mm (.012"-.018") between magnet and coil ends. If necessary to adjust, slacken coil retaining screws and relocate coil.
1. Crankshaft
2. "O" ring (5)
3. Woodruff key
4. Needle bearing
5. Ball bearing
6. Retaining ring
7. Distance ring
8. Spacer
9. Oil seal
10. Distance sleeve
11. Distance sleeve
12. Starter ring gear
13. Washer
14. Spring
15. Breaker point cam
16. Tab washer
17. Magneute retaining nut
18. Lower crankcase half
19. Upper crankcase half
20. Crankcase stud (6)
21. Crankcase stud
22. Crankcase stud
23. Crankcase stud
24. Dowel pin
25. Fan housing stud (4)
26. Lock washer (4)
27. Nut
28. Lock washer
29. Cylinder stud (8)
30. Distance sleeve (4)
31. Engine bracket stud (4)
32. Lock washer (4)
33. Nut (4)
34. Sealing ring
35. Crankcase drain plug
36. Dowel tube
37. Starter stud (2)
38. Starter bracket
39. Washer (2)
40. Nut (2)

*Not installed on engine equipped with a C.D. ignition system.
### Top End

<table>
<thead>
<tr>
<th>Number</th>
<th>Part Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Piston (P.T.O. side)</td>
</tr>
<tr>
<td>2</td>
<td>Piston (Mag. Side)</td>
</tr>
<tr>
<td>3</td>
<td>Gudgeon pin</td>
</tr>
<tr>
<td>4</td>
<td>Circlip</td>
</tr>
<tr>
<td>5</td>
<td>Rectangular ring</td>
</tr>
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<td>6</td>
<td>&quot;L&quot;-Trapez or rectangular ring</td>
</tr>
<tr>
<td>7</td>
<td>Cylinder gasket</td>
</tr>
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<td>8</td>
<td>Cylinder (P.T.O. side)</td>
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<td>9</td>
<td>Cylinder (Mag. side)</td>
</tr>
<tr>
<td>10</td>
<td>Cylinder head gasket</td>
</tr>
<tr>
<td>11</td>
<td>Cylinder head (P.T.O. side)</td>
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<tr>
<td>12</td>
<td>Cylinder head (Mag. side)</td>
</tr>
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<td>13</td>
<td>Flat washer (10)</td>
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<td>Nut (14)</td>
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<td>Distance nut</td>
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<td>Exhaust socket (P.T.O. side-short)</td>
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<td>17</td>
<td>Exhaust socket (Mag. side -long)</td>
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<td>18</td>
<td>Asbestos string</td>
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<td>Intake manifold cover ring gasket</td>
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<td>24</td>
<td>Carburetor stud</td>
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<td>25</td>
<td>Flange gasket</td>
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<td>26</td>
<td>Intake deflector</td>
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<td>27</td>
<td>Isolating flange</td>
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<td>28</td>
<td>Tab washer</td>
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<td>Exhaust manifold stud (4)</td>
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<td>30</td>
<td>Exhaust manifold gasket</td>
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<td>31</td>
<td>Exhaust manifold gasket</td>
</tr>
<tr>
<td>32</td>
<td>Lock washer</td>
</tr>
</tbody>
</table>

*Applicable on 440 type only.*
Sub-section (two cylinder engine)

Cooling System

1. Cowl (Exhaust side)
2. Cowl (Intake side)
3. Cowl (434 type only)
4. Nut
5. Lock washer
6. Flat washer (3)
7. Cable clamp
8. Spacer (2)
9. Flat washer (3)
10. Lock washer (2)
11. Front cowl retaining bolt (2)
12. Rear cowl retaining bolt
13. Rear cowl retaining bolt (short)
14. Rear cowl retaining bolt (long)
15. Rubber washer
16. Flat washer
17. Spring washer
18. Cover retaining screw
19. Cowl cover
20. Fan
21. Woodruff key
22. Ball bearing
23. Spacer
24. Locking ring
25. Shim (5)
26. Pulley half
27. Lock washer
28. Fan retaining nut
29. Fan belt
30. Protector retaining screw (3)
31. Fan protector
32. Screw
33. Flat head screw
34. Fan housing
35. Junction block bracket
36. Lock washer
37. Screw
**REMOVAL**

Remove or disconnect the following (if applicable) then lift engine out of vehicle.

- Drive belt.
- Muffler.

**Note:** On rear-mounted engine vehicle, the muffler and associated components are accessible through an access panel located under the seat rest.

- Cab retaining cable.
- Air silencer.
- Choke cable or primer line at carburetor.
- Throttle cable.
- Fuel lines at carburetor.

**Warning:** Secure fuel lines so that the opened ends are higher than the fuel tank.

- Electrical connections.

**Caution:** On electric start model, disconnect negative cable (ground) from battery before disconnecting other wires.

- Engine mount nuts.

**DISASSEMBLY & ASSEMBLY**

**General**

Refer to Technical data Section for component fitted tolerance and wear limit. If necessary, refer to Drive Pulley Section for pulley removal.

**Bottom End**

1. The outside diameter of the "O" rings installed on engine type 440, vary.

The two magneto side bearings and the center bearing are fitted with small "O" rings (2 1/8" O.D.) while the two labyrinth seals are fitted with large "O" rings (2 5/16" O.D.).

On 434 engine type, only large "O" rings (2 5/16" O.D.) are installed.

To remove bearing from crankshaft, use a protective cap and special puller, as illustrated. (See Tool Section).

Prior to installation, place bearings into an oil container and heat the oil to 200° F. for 5 to 10 min. This will expand bearing and ease installation. Install bearings with groove outward.

2. A distance ring replaces the crankshaft shoulder on type 440 engine, starting from vehicle serial no. 2,749,845.

3. To remove starter gear from crankshaft it may be necessary to use a special puller as illustrated (See Tool Section).

4. To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tool Section).

At assembly, torque retaining nut to 50-58 ft-lbs on 434 type, and to 58-63 ft-lbs on 440 type.

**Note:** The tab washer located between magneto and retaining nut on late production 440 engine type has been cancelled. Therefore, at assembly apply a light coat of Loctite "Lock'n Seal" on magneto retaining nut threads.

5. Prior to joining of crankcase halves, apply a light coat of "Loctite" crankcase sealant to the mating surfaces of the bottom half. Position spring washers and nuts on crankcase studs then torque nuts to 14-16 ft-lbs., following illustrated sequence.
At assembly, torque to 14-16 ft-lbs.
At assembly, torque to 29-35 ft-lbs.

Top End
Place a clean cloth over crankcase to prevent circlip from falling into crankcase. Use a pointed tool to remove circlips from piston.

Caution: When tapping out gudgeon pins, hold piston firmly in place to eliminate the possibilities of transmitting shock and pressure to the connecting rod.

At assembly, place the pistons over the connecting rods with the letters "AUS", over an arrow on the piston dome, facing in direction of the exhaust port.

Also make sure that the piston window is aligned with the crankcase transfer passage when the gudgeon pin orifice is in-line with the connecting rod bore.

Note: Once the circlips are installed, turn each circlip so it is not directly on piston notch. Remove any burrs on piston caused through circlip installation using very fine emery cloth.

When installing cylinder and/or cylinder head, the cylinder aligning tool must be used to ensure sealing of intake manifold and cylinders. (See Tool Section).

Install exhaust manifold on cylinder then install aligning bar and torque distance nut to 14-16 ft-lbs.
Cross torque cylinder head nuts to 14-16 ft-lbs.

Note: Torque each head individually.

At assembly, torque to 14-16 ft-lbs.
At assembly, position deflector with tap toward inside on magneto side.
Tab washer should be replaced if bent more than three (3) times. If in doubt, replace.

Magneto
At assembly, torque to 14-16 ft-lbs.
With magneto retaining nut removed and hold-on support in place, install special puller onto support.
Tighten puller nut and at same time, tap on nut head using a hammer to release magneto from its taper.
At assembly, install magneto on crankshaft with the keyway, centrifugal lever and breaker point cam position as illustrated.

To replace a capacitor, it is first necessary to unsolder the two (2) black leads using a soldering iron. The capacitor can then be driven out of the armature plate using a suitable drift. To reinstall, inverse procedure.

When replacing breaker point set, apply a light coat of grease on pivot pin and rubbing block.

Do not remove pivot pin unless replacement is needed. At assembly, apply Loctite "Lock'n Seal" on threads.

When replacing unit construction type breaker point, apply a small amount of grease on rubbing block.

At assembly, align armature plate crankcase marks.

At assembly, apply a small amount of low temperature grease into spring seating.

At assembly, apply Loctite "Lock'n Seal" on retaining screw threads.

Whenever a coil is replaced, the air gap (distance between magnet and armature end) must be adjusted.

To check air gap, insert a feeler gauge of correct thickness (0.31 mm / .012" 0.46 mm / .018") between magnet and armature ends. To adjust, slacken retaining screw and relocate armature.
Cooling System

Heat bearing housing to 140° - 160° F. prior to bearing removal or installation.

Lock fan pulley with special holder wrench or install pulley retaining nut. (See Tool Section).

Shim(s) located between pulley halves are used to adjust fan belt free-play. Correct free-play is 1⁄8". If necessary to adjust install or remove shim(s) between pulley halves, install excess shim(s) between outer pulley half and washer.

At assembly, torque fan shaft nut to 42-50 ft-lbs.

At assembly, apply a light coat of Loctite "Lock'n Seal" on threads.

It should be noted that to correctly remove a Loctite locked screw, it is first necessary to tap on head of screw to break Loctite bond. This will eliminate the possibility of screw breakage.

Cleaning

Discard all oil seals, gaskets and "O" rings. Clean all metal components in a non-ferrous metal cleaner.

Caution: Clean armature using only a clean cloth.
Scrape off carbon formation from cylinder exhaust ports, cylinder heads and piston domes.

Note: The letter "AUS" over an arrow on the piston dome must be visible after cleaning.

Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.
Remove old sealant from mating surfaces with Bombardier "Sealant Stripper".

Installation

To install engine on vehicle, inverse removal procedure. However, pay attention to the following:

- Check ignition timing prior to installation in vehicle.
- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.
1. Rubber mount
2. Nut
3. Engine bracket
4. Washer
5. Reinforcement plate
6. Lockwasher
7. Nut
8. Exhaust manifold
9. Washer
10. Nut
11. Exhaust collar
12. Bolt
13. Nut
14. Spring
15. Asbestos tape
16. Aluminum ring
17. Nut
18. Washer
19. Muffler
20. Exhaust grommet
21. Washer
22. Rubber shear mount
23. Washer
24. Nut
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1. Carriage bolt
2. Flat washer
3. Spacer
4. Vibration absorber (lower)
5. Retainer
6. Lockwasher
7. Nut
8. Vibration absorber (upper)
9. Washer
10. Nut
11. Nut
12. Engine bracket
13. Reinforcement plate
14. Exhaust manifold
15. Spring
16. Sealing ring
17. Muffler
18. Spring
19. Washer
20. Spring
21. Muffler support
22. Bolt
23. Washer
24. Rubber spacer
25. Stud
26. Nut
ENGINE SUPPORT & MUFFLER

REMOVAL FROM VEHICLE
Remove or disconnect the following (if applicable) then lift engine out of vehicle.
- Pulley guard & drive belt.
- Muffler & air duct.
- Cab retaining cable.
- Air intake silencer.
- Fuel lines at carburetor, impulse line.
- Throttle cable.
- Electrical junction block.

CAUTION: On electric start model, disconnect negative cable (ground) from battery before disconnecting other wires.
- Rewind starter.
- Engine mount nuts.

DISASSEMBLY & ASSEMBLY
- Torque to 4.4 kg-m (32 ft-lbs).
- Torque to 2.1 kg-m (15 ft-lbs).
- At assembly on crankcase, apply Loctite Lock'n Seal 242 or equivalent on threads.

INSTALLATION ON VEHICLE
To install engine on vehicle, inverse removal procedure. However, pay attention to the following:
- Check ignition timing prior to installation in vehicle.
- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.
1. Crankshaft
2. "O" ring (sealing ring)
3. Shim
4. Bearing
5. "O" ring
6. Distance ring (4 mm)
7. Retaining washer
8. Oil seal
9. Washer
10. Cam spring
11. Breaker point cam
12. Loctite 242
13. Magneto ring nut
14. Woodruff key
15. Distance ring 1 mm
16. Distance sleeve
17. Upper crankcase half
18. Lower crankcase half
19. Crankcase sealant
20. Needle cage bearing
21. Drain plug
22. Sealing ring
23. Lockwasher
24. Bolt or stud with nut
25. Stud
26. Lockwasher
27. Nut
28. Stud (fan housing)
29. Washer (fan housing)
30. Nut (fan housing)
31. Stud (cylinder)