

- a. Check to be sure the flywheel TDC timing mark is aligned with the center of the timing port (Figure 32). If necessary, turn the engine crankshaft while guiding the timing chain as required.
- b. Carefully remove the wire that was temporarily attached to keep the cam chain from falling and position the sprocket in the chain.

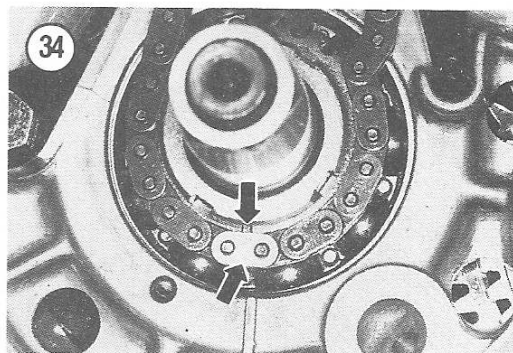
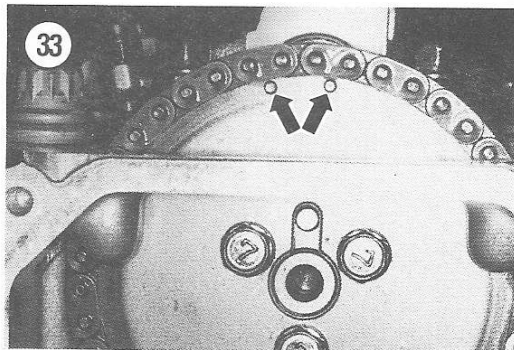
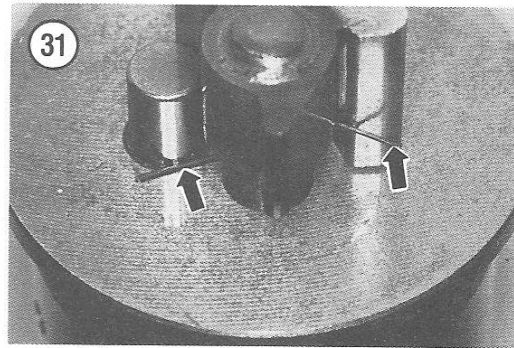
CAUTION

The camshaft must be correctly synchronized to open and close the valves at exactly the right time in relation to the position of the crankshaft. This exact timing is accomplished by installing the chain on the crankshaft and camshaft sprockets with the shafts in specific positions. Very expensive damage could result from improper installation.

- c. Attempt to attach the sprocket to the camshaft, without moving the crankshaft or the camshaft. If the cam sprocket cannot be attached to the cam without moving either the camshaft or crankshaft, relocate the sprocket inside the chain.
- d. When the cam chain is correctly installed, the flywheel TDC mark will be centered in the timing port hole (Figure 32) and the camshaft sprocket drive pin (Figure 23) will be straight up as shown. Camshaft sprocket marks (Figure 33) will be up as shown.
- e. When the camshaft timing is correct, remove each of the screws attaching the cam sprocket, one at a time, coat the threads with Loctite 242 (or equivalent) and tighten to the torque listed in Table 3. Remove the shop cloth from the cavity below the cam sprocket when installation is complete.

3B. If the alternator stator plate is removed, time the camshaft to the crankshaft as follows.

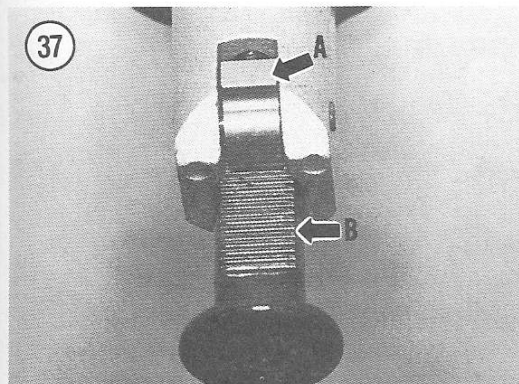
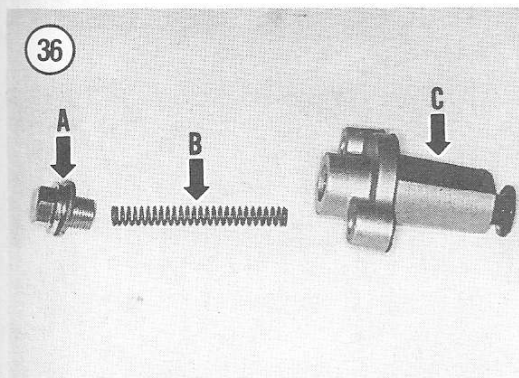
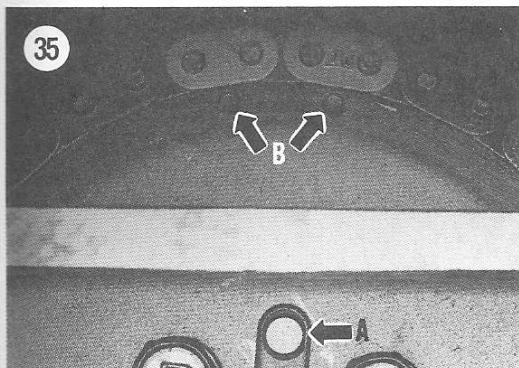
- a. Turn the engine crankshaft until the mark (Figure 34) on the crankshaft sprocket is facing down.
- b. Use a wire to pull the chain up through the cylinder head.
- c. Mesh the timing chain with the crankshaft sprocket so that the single plated link is aligned with the marked tooth as shown in Figure 34.



NOTE

Make sure the camshaft drive pin (A, Figure 35) is still facing straight up.

- d. Carefully remove the wire that was temporarily attached to the cam chain and position the sprocket in the chain with the 2 marks aligned, with the two plated links (B, Figure 35), of the chain.



- e. Attach the sprocket to the camshaft, without moving the crankshaft or the camshaft. It may be necessary to pry carefully on the bottom of the sprocket to attach the sprocket to the camshaft.
- f. When correctly assembled, the crankshaft TDC marks (Figure 34) will be aligned with the camshaft sprocket drive pin (A, Figure 35) will be facing straight up as shown.

NOTE

Because of the number of links in the cam chain, the plated links will not align with the marked sprocket teeth every revolution. The plated links are only useful when assembling.

- g. After the chain and sprockets are correctly installed, remove each of the screws attaching the cam sprocket, one at a time and coat the threads with Loctite 242 (or equivalent) and tighten to the torque listed in Table 3.
4. Apply Loctite 525, Loctite 518 Gasket Eliminator or equivalent to the camshaft end cap (Figure 30) and install a new O-ring, then install the end cap.
 5. Set and install the cam chain tensioner body as follows.

NOTE

Plug (A, Figure 36) is under spring pressure. Push against the plug while removing to keep it from flying off. The plug must be removed to set the tensioner.

- a. Remove the plug (A, Figure 36) and spring (B, Figure 36) from the tensioner body.
- b. Lift the ratchet (A, Figure 37), then push the plunger (B, Figure 37) into the body.

NOTE

Do not install the plug (A, Figure 36) or spring (B, Figure 36) until after the tensioner body is installed.

- c. Use a new gasket and install the tensioner body, plunger and ratchet in the cavity of the cylinder. Tighten the two retaining screws to the torque listed in Table 3.
- d. Install tensioner spring (B, Figure 36) and plug (A, Figure 36). Tighten the plug to the torque specified in Table 3.

NOTE

Timing marks on the crankshaft and camshaft sprockets will align every other revolution of the crankshaft. Also, because of the number of chain links, the plated links sometimes used for timing will probably not be aligned after turning the crankshaft.

- Rotate the engine crankshaft 2 or more revolutions and recheck alignment of the timing marks (Figure 33 and Figure 34). If installing the chain tensioner changed the timing, remove the tensioner and repeat Steps 3-5.
- Complete assembly by reversing the removal procedure. Refer to Table 3 for recommended torque values.

CYLINDER HEAD**Removal**

- Remove the cylinder head cover, rocker arms and the camshaft as described in this chapter.
- Detach the carburetor and exhaust pipe from the cylinder head. Refer to Chapter Six.
- Remove the 2 flange head screws (Figure 38).
- Loosen the 4 retaining screws (Figure 39) evenly in a crossing pattern, then remove the screws.

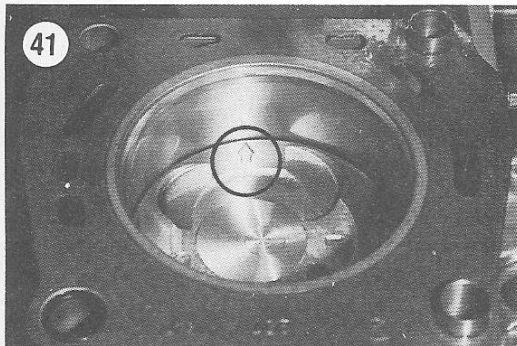
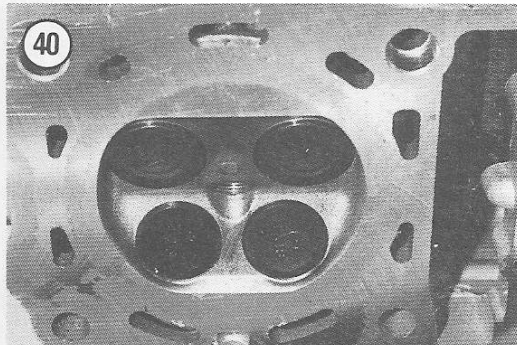
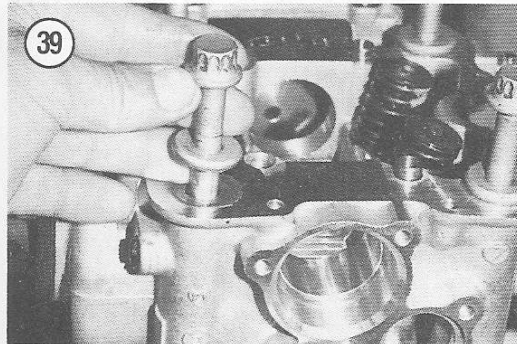
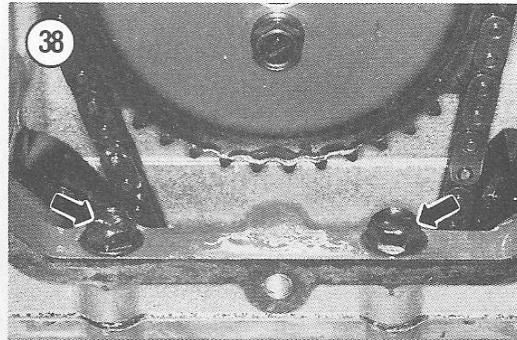
NOTE

The cylinder head may stick to the gasket and to the dowel pins in cylinder.

- Separate the cylinder head from the cylinder and move the cylinder head to a suitable work area.

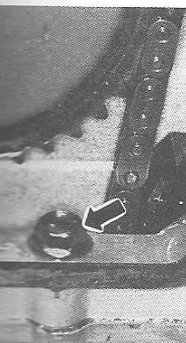
Disassembly/Inspection/Assembly

- Remove all traces of gasket material from the cylinder and head mating surfaces.
- Before removing the valves, remove all carbon deposits from the combustion chamber (Figure 40) and valve ports with a wire brush. A blunt screwdriver or similar scraper can be used, but care must be taken not to damage the cylinder head, valves or spark plug threads.
- After the carbon is removed from the combustion chamber and ports, clean the entire cylinder head with solvent. Blow dry with compressed air.
- Clean all carbon from the piston crown (Figure 41).



- Check the ... stripped threads.
- Place a ... gasket surface ... listed in Table ...
- Inspect the ... inner head for ... delivery port (F ... blind plug in fr ...

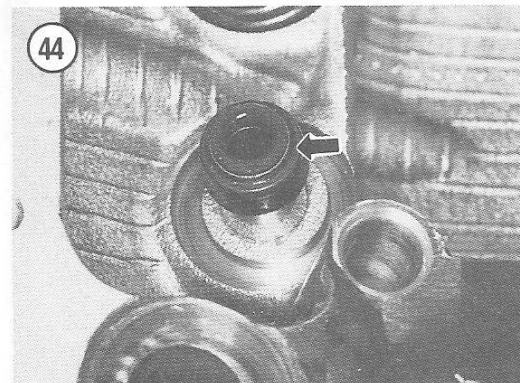
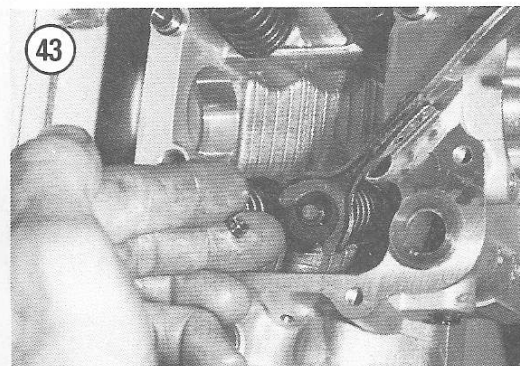
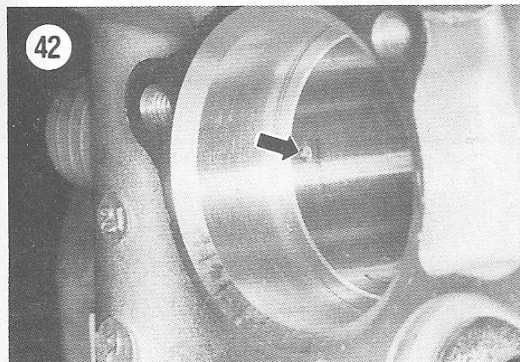




5. Check the cylinder head for cracks, erosion, stripped threads or other damage.

6. Place a straightedge across the cylinder head gasket surface and compare with the warpage limit listed in **Table 4**.

7. Inspect the camshaft bearing surfaces in the cylinder head for wear or scoring. Also check the oil delivery port (**Figure 42**) for blockage. Remove the blind plug in front of the oil delivery port to assist in



cleaning. Coat the threads of the blind plug (**Figure 3**) with sealer before installing. Refer to **Table 3** for recommended tightening torque for the oil pressure blind plug.

CAUTION

The general practice is to take the cylinder head to a machine shop or dealer for inspection and valve service. The following procedure should be done only by properly trained and equipped technicians. Lost or damaged parts may be difficult or impossible to obtain and precision machining may be necessary.

8. If the cylinder head is to be disassembled, use the following procedure.

NOTE

Do not compress the valve spring more than necessary to remove the keepers.

- a. Use a suitable tool to compress the spring on one valve, remove the keepers (**Figure 43**), then release the compressor tool slowly. Repeat the procedure for the other valves.

NOTE

Separate and mark the location of each valve and its related components. The front valve and components nearest the chain cavity can be identified as "X-R" (exhaust-right) and the similar components on the left side marked "X-L." The rear valves are inlet valves and can be similarly marked "I-R" for inlet-right and "I-L" for the inlet valves on the left side. Be sure to keep the parts separated and clearly identified, because components for all four valves are similar, but should not be interchanged.

- b. Remove the springs and keep the valve, springs, spring retainer and keepers together. Mark the components so they can be reinstalled in their original location.

NOTE

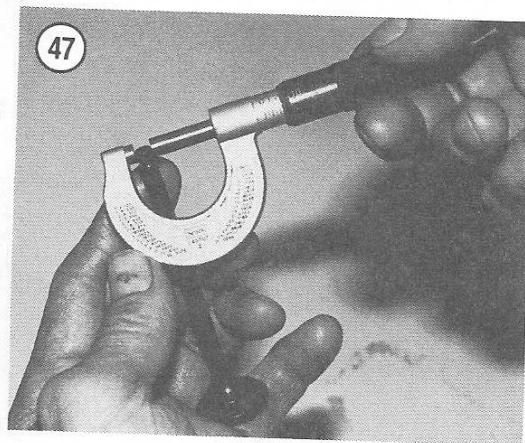
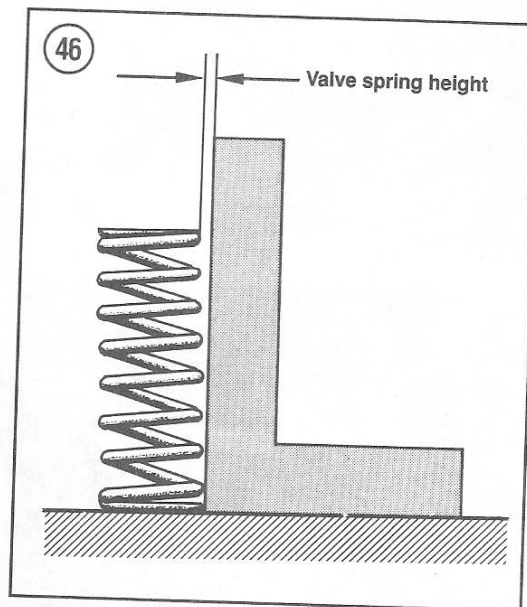
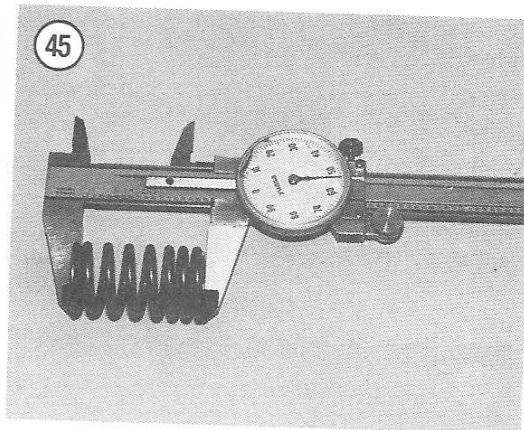
*Install new valve stem seals (**Figure 44**) whenever the cylinder head is disassembled. Hard, cracked or worn seals will result in excessive oil consumption, poor performance and carbon buildup.*

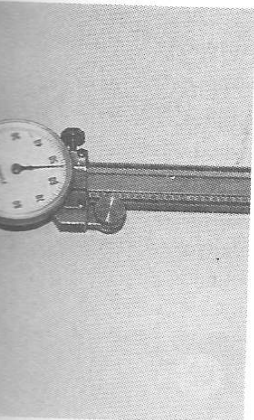
- c. Measure the free length of the valve springs (Figure 45) and compare with the specifications in Table 4. The springs should also be square with the ends as shown in Figure 46.

NOTE

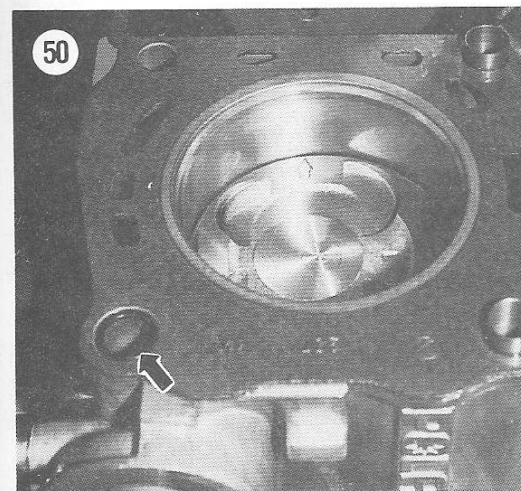
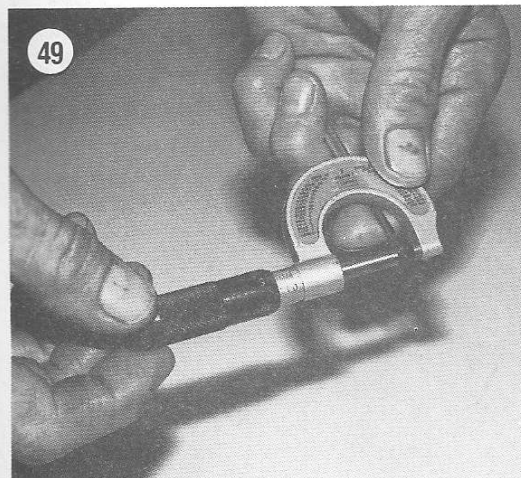
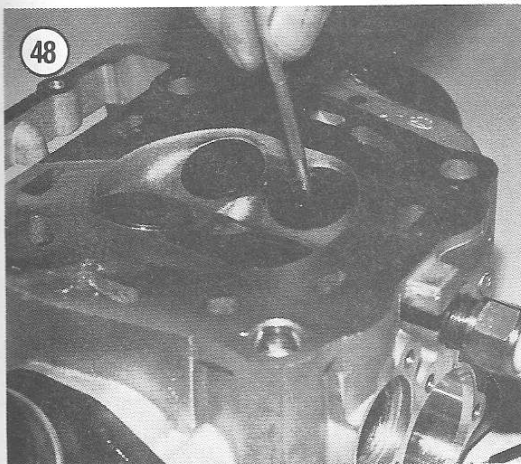
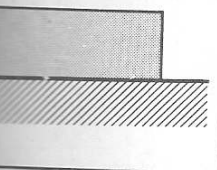
The valves cannot be refaced and the ends of the stems should not be ground. Install a new valve if it is defective in any way.

- d. Inspect the seating surface of the valve for evidence of leakage.
- e. Measure the diameter of the valve stem (Figure 47) and compare with the specification in Table 4.
- f. Measure the inside diameter of the valve guide using the proper size hole gauge as shown in Figure 48. Use a micrometer to measure the hole gauge as shown in Figure 49.
- g. Guides should only be replaced and replaced by your Polaris dealer or competent machine shop specializing in this type of work. The cylinder head must be heated to 100° C (212° F) before pressing the old guides out. Heat the cylinder head and freeze the new guides before pressing new guides into place. Refer to Table 4 for correct protrusion. The valve seat must be machined after installing a new guide.
- h. Subtract the stem outside diameter (sub-step 8e) from the inside diameter of the guide (sub-step 8f) to determine the stem to guide clearance. Refer to Table 4 for recommended limits.
- i. Inspect the valve seat in the cylinder head for pitting, roughness, uneven surface, or evidence of burning. If the need for machining is questioned, have the head and valves inspected by your Polaris dealer or competent machine shop specializing in this type of work. Machining the valve seat in the cylinder head requires special equipment and training. Do not remove any more material than is necessary and check seating carefully.
- j. Assemble new valve stem seals (Figure 44) onto the valve guides. The correct seal (part No. 3084857) for the inlet valves is black. The seal (part No. 3084859) for the exhaust valves is brown.
- k. Lubricate the valve guide and seal with clean engine oil. Coat the valve stem with molybde-





Valve spring height



num disulfide grease and insert the valve into the guide and seal using a twisting motion.

- l. Dip the valve spring in engine oil and position on the correct valve with the tightly wound coils toward the cylinder head.
- m. Place a retainer on the spring and compress the spring just enough to install the split keepers (**Figure 43**). After the keepers are installed, tap the end of the valve stem with a soft faced hammer to seat the keepers.

Installation

1. Position the gasket on the cylinder dowels. The O-ring (**Figure 50**) seals the oil passage leading to the camshaft and valves. The O-ring should be part of the gasket.
2. Position the cylinder head over the dowels in the cylinder and install the six retaining screws finger tight.

CAUTION

It is important to tighten the cylinder head retaining screws as described to provide a good seal and to prevent damage.

3. Tighten the 4 larger bolts (**Figure 39**) in a crossing pattern evenly in the following steps:
 - a. Tighten to 30 N·m (22 ft.-lb.).
 - b. Tighten to 69 N·m (51 ft.-lb.).
 - c. Loosen each of the 4 screws exactly 180° (1/2 turn).
 - d. Tighten to 15 N·m (11 ft.-lb.).
 - e. Tighten each of the 4 screws exactly 90° (1/4 turn).
 - f. Tighten each of the 4 screws exactly 90° (1/4 turn) more.
4. Tighten the 2 screws (**Figure 38**) to the torque listed in **Table 4**.
5. Install the cylinder head cover and the camshaft as described in this chapter.
6. Install the carburetor and attach the exhaust pipe to the cylinder head. Refer to Chapter Six.

CYLINDER

Removal

1. Remove the cylinder head cover, rocker arms and cylinder head as described in this chapter.

2. Lift the front cam chain guide strip (**Figure 51**) from the chain gallery.
3. Loosen the banjo bolts at the ends of both oil pipes (**Figure 52**). Remove the four banjo bolts, eight sealing washers and two oil pipes.
4. Loosen the clamp, then detach the coolant hose from the cylinder inlet fitting at the front of the cylinder.
5. Remove the 2 screws (**Figure 53**) from the right (cam chain) side of the cylinder.

NOTE

Remove the cylinder head gasket from the cylinder to locate the four cylinder base screws. The screws are located in the cooling passage surrounding the cylinder.

6. Loosen each of the four cylinder base screws 1/4 turn at a time in a crossing pattern. Remove the screws after all four are loose.

NOTE

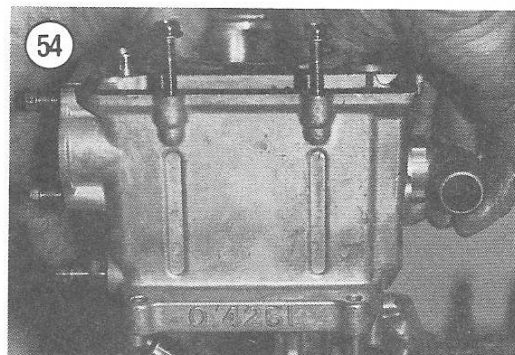
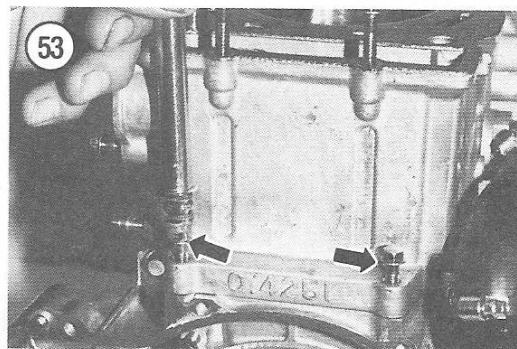
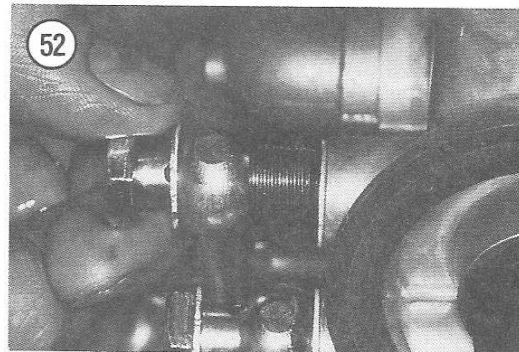
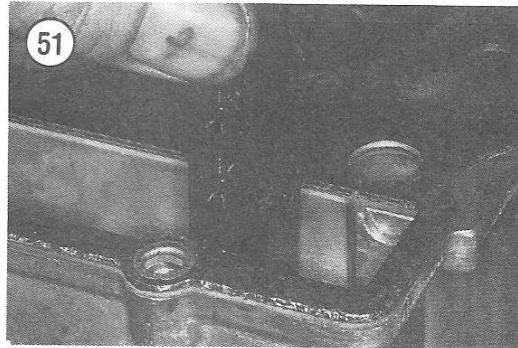
The piston should slide smoothly in the cylinder bore and only light taps should be required to release the cylinder.

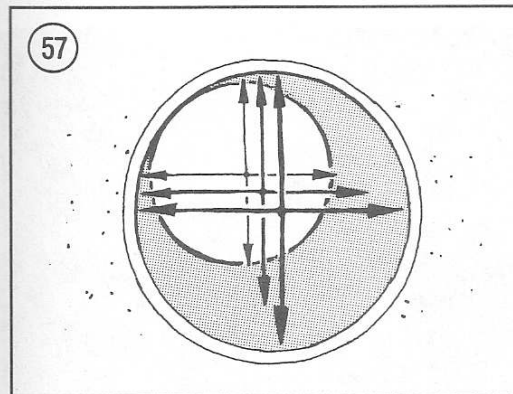
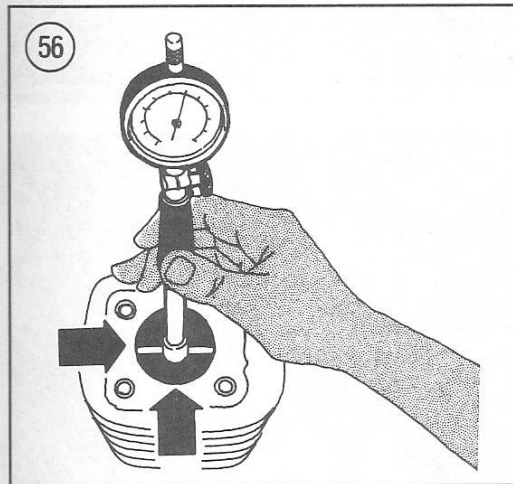
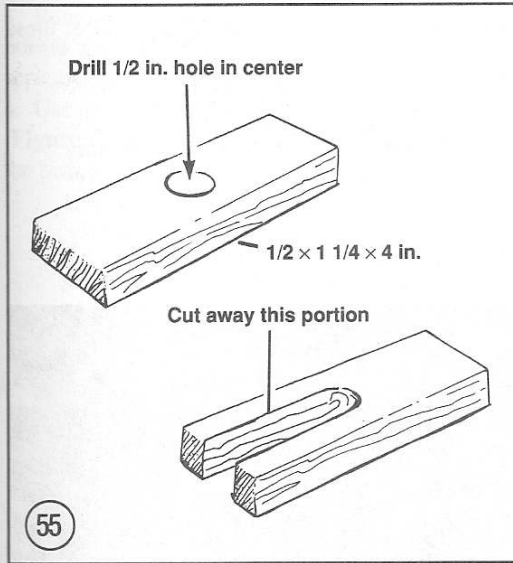
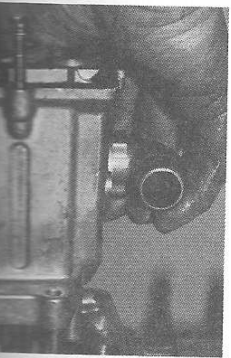
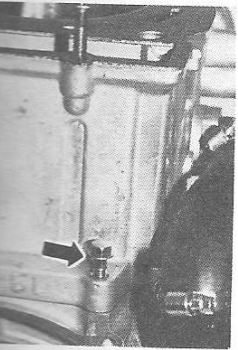
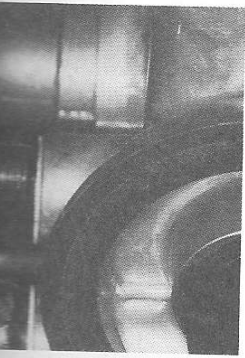
7. Tap the cylinder lightly with a soft hammer to separate the cylinder from the cylinder base gasket and the dowels in the crankcase.

CAUTION

Stuff a shop towel around the connecting rod under the cylinder before the cylinder is completely removed to prevent any loose parts from falling into the crankcase. The shop towel will also keep the connecting rod and piston from falling when the cylinder is removed.

8. Lift the cylinder from the piston and crankcase as shown in **Figure 54**. Notice that dowel pins are loose and may fall free when removing the cylinder.
9. Remove the cylinder base gasket and discard it.
10. Soak any remaining gasket material with solvent, then scrape it from the cylinder base and crankcase. Be careful not to gouge the sealing surfaces.
11. Install a piston holding fixture under the piston to protect the piston skirt from damage. This fixture may be purchased or fabricated from wood. See **Figure 55** for dimensions.





Inspection

The following procedure requires the use of highly specialized and expensive measuring instruments. If such equipment is not available, have the measurements performed by a dealer or qualified machine shop.

1. Measure the cylinder bore with a cylinder bore gauge (Figure 56), or inside micrometer at the points shown in Figure 57. Measure in line with the piston pin and at 90° to the pin. If the taper or out-of-round exceeds the limits in Table 4, the cylinder must be rebored to the next oversize and fitted with a new piston, or a new standard size cylinder should be installed.

NOTE

Purchase the new piston before the cylinder is rebored so the piston can be measured by the machinist before any changes are made. Slight manufacturing tolerances must be taken into account to determine the actual cylinder bore diameter and the final piston-to-bore clearance.

2. Check the cylinder bore for scratches or other obvious damage. It may be possible to repair a damaged cylinder by reboring, but if you have any question, have the part inspected by your Polaris dealer or machine shop specializing in this type of repair.

Installation

1. Check to be sure that all of the old gasket has been removed from the top surface of the crankcase and the bottom surface of the cylinder.
2. Make sure the cylinder, piston, crankcase and work area are clean and undamaged.
3. Be sure that all of the dowel pins are in place in the crankcase, then install a new cylinder base gasket over the dowel pins.
4. Lubricate the cylinder bore, piston and rings with engine oil.
5. Make sure the top rail of the oil ring is correctly positioned in the notch as shown in Figure 58. The gaps in the remaining rings should be spaced around the piston.

NOTE

The ring compressor must be the correct size and must be a type that is removable

from the bottom of the piston around the connecting rod.

- Compress the rings into the grooves of the piston using a suitable ring compressing tool. Refer to **Figure 59**.

NOTE

If the cam chain is still installed, carefully pull it up through the cylinder as the cylinder is lowered into position.

- Slide the cylinder over the piston and compressed rings, then remove the ring compressor and lower support tools. Then lower the cylinder against the gasket on the crankcase and over the dowel pins. Refer to **Figure 59**.

- Install the cylinder retaining screws and tighten to the torque specified in **Table 3**. Tighten the 4 larger screws, located in the coolant passage, in a crossing pattern, before tightening the 2 smaller screws (**Figure 53**).

- Install the front cam chain slipper (**Figure 60**). Make sure the lower end engages the notch (**Figure 61**) at the lower end correctly.

- Install the cylinder head, camshaft, rocker arms and cylinder cover as outlined in this chapter.

- Adjust the valve clearance as described in Chapter Three.

PISTON, PISTON PIN AND PISTON RINGS

The piston is made of an aluminum alloy. The piston pin is made of steel and is a precision fit in the piston. The piston pin is held in place by a clip at each end of the bore in the piston.

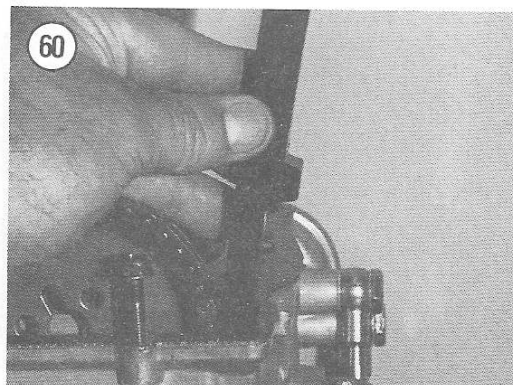
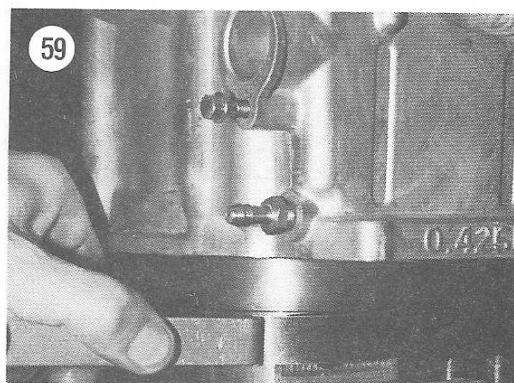
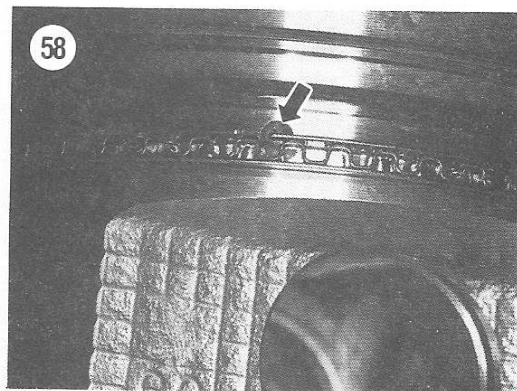
Piston Removal

- Remove the cylinder head cover, cylinder head and cylinder as described in this chapter.
- Before removing the piston, hold the rod tightly and rock the piston to detect excessive clearance between the piston, piston pin and connecting rod. Do not confuse the normal sliding motion of the piston on the pin with rocking motion. Any perceptible rocking motion indicates wear on the piston pin, piston, connecting rod small end bearing or the connecting rod small end. Any excessive wear is

probably a combination of the wear of all of these parts.

NOTE

Do not reuse the piston pin retaining clips. The clips are damaged during removal and severe engine damage will result if a clip becomes loose while the engine is running.



- Remove the clip from the piston pin (Figure 62) and springing out.
- Use a proper tool (Figure 63) to remove the piston.

Be careful not to damage the piston pin to avoid damage to the connecting rod. The piston pin is a precision fit.



f the wear of all of these

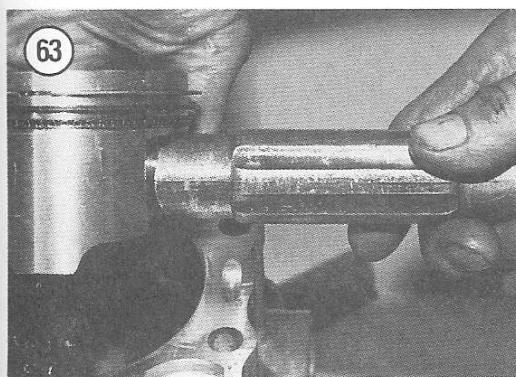
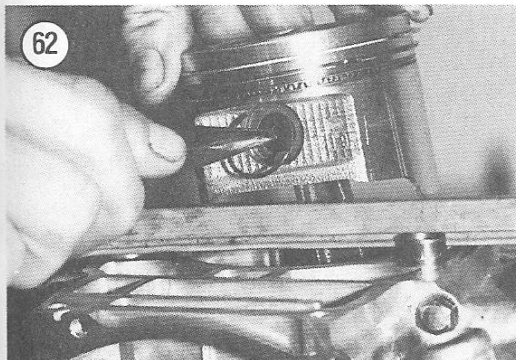
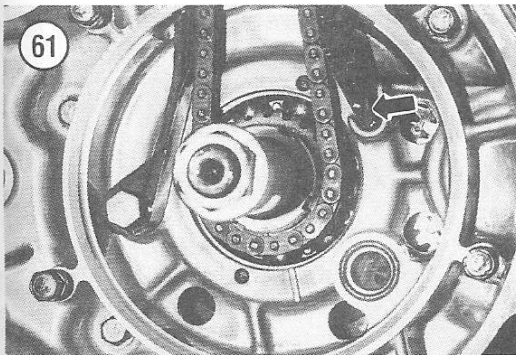
NOTE
Piston pin retaining clips damaged during re-assembly will cause engine damage will become loose while the



- Remove the clips from each side of the piston pin bore (Figure 62). Be careful to prevent the clip from springing out.
- Use a proper size wooden dowel or suitable tool (Figure 63) to push the piston pin from the bore in the piston.

CAUTION

Be careful when removing the piston pin to avoid damaging the connecting rod. The piston should be supported to



either push or pull the pin from the pin bore. Be sure that lateral loads are not transmitted to the lower connecting rod bearing.

- Lift the piston from the connecting rod.

NOTE

If the piston is to be left off for some time, protect the connecting rod by placing a piece of foam insulation tube over its end. Stuff a clean, lint-free shop towel around the connecting rod to keep dirt from entering the crankcase.

WARNING

The edges of all piston rings are very sharp. Be very careful when handling them to avoid cutting your fingers.

- Remove the top ring with a ring expander tool or by spreading the ends with your thumbs just enough to slide the ring up over the top of the piston. Repeat the procedure for the remaining rings.

Inspection

- Carefully clean the carbon from piston crown with a scraper. Do not damage the piston. Notice the arrow cast into the piston crown.

CAUTION

Do not use a wire brush to clean the piston skirt. Also, do not gouge the piston while attempting to clean it. The soft aluminum of the piston is easily damaged by improper cleaning techniques.

- Examine each ring groove in the piston for burrs, dented edges, carbon deposits or other conditions that reduce the width of the groove.

NOTE

The groove for the top compression ring usually wears more than the other grooves, but all should be carefully inspected.

- Examine each ring groove for gouges, bent lands or other conditions that increase the width of the groove.
- Measure the *Piston Clearance* as described in this chapter.

5. Measure the diameter of the pin bore in the piston (**Figure 64**) and the piston pin diameter (**Figure 65**).
6. Subtract the diameter of the piston pin from the diameter of the pin bore in the piston to find the pin-to-pin bore clearance.
7. Refer to the specifications listed in **Table 4** and replace parts as required.
8. If damage or wear indicates that the piston should be replaced, select a new piston as described in *Piston Clearance* in this chapter.
9. Inspect and install new piston rings as described in *Piston Ring Removal/Inspection/Installation* in this chapter.

Piston Clearance

1. Measure the piston outside diameter at a point 5 mm (0.20 in.) from the bottom of the piston skirt. Refer to **Figure 66**.
2. Measure the diameter of the cylinder bore with a cylinder bore gauge (**Figure 56**) or inside micrometer at the points shown in **Figure 57**. Measure in line with the piston pin and at 90° to the pin. If the taper or out-of-round exceeds the limits in **Table 4**, the cylinder must be rebored to the next oversize and fitted with a new piston, or a new standard size cylinder installed.
3. Subtract the diameter of the piston skirt from the maximum diameter of the cylinder bore to determine the piston skirt-to-cylinder clearance.
4. The piston skirt-to-cylinder clearance should not exceed the limits listed in **Table 4**. It may be possible to repair a damaged cylinder by reboring, but if you have any question, have the parts inspected by your Polaris dealer or machine shop specializing in this type of repair.

NOTE

Purchase the new piston before the cylinder is rebored so the piston can be measured, by the machinist, before any changes are made. Slight manufacturing tolerances must be taken into account to determine the actual cylinder bore diameter and piston-to-bore clearance.

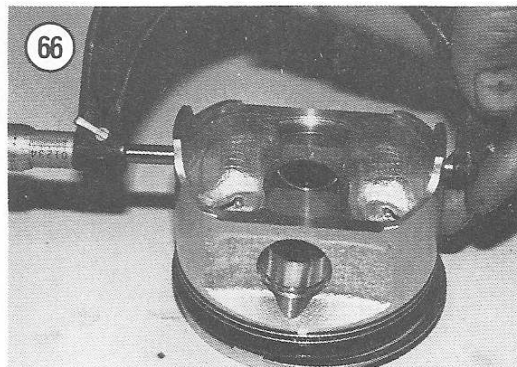
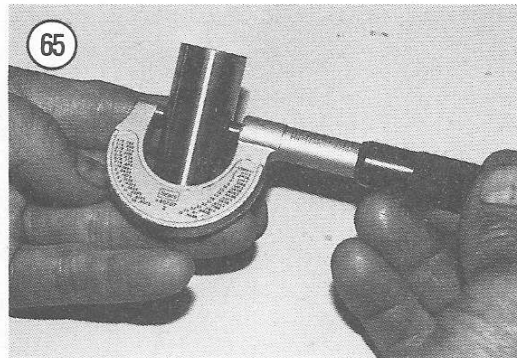
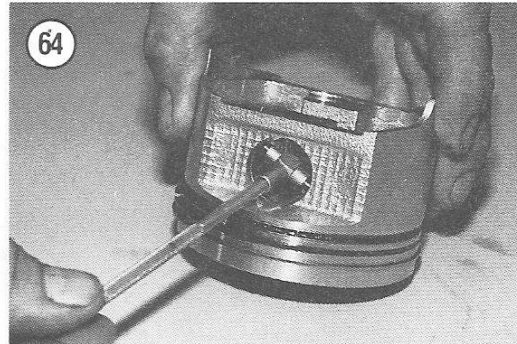
Piston Installation

1. Coat the piston pin, pin bore and connecting rod small end bore in with clean engine oil.

CAUTION

Do not reuse old clips to retain the piston pin in the piston. The clips are deformed during removal and severe engine damage can result if the clips become loose while the engine is running. Always install new clips if the piston is removed.

2. Install a new retaining clip in one end of the piston pin bore. Position the tang on the retaining



ring outward as
the top or bottom

3. Press the piston
which does not
tends slightly to



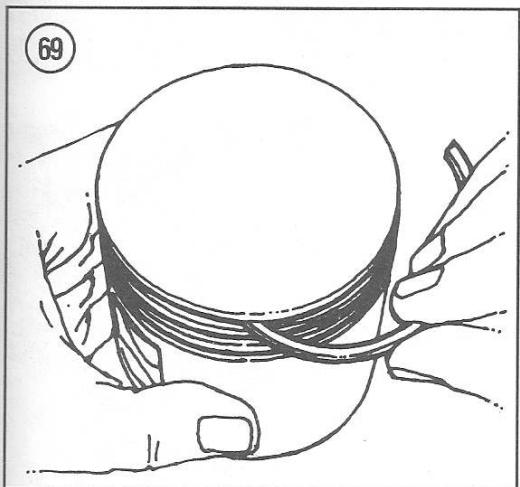
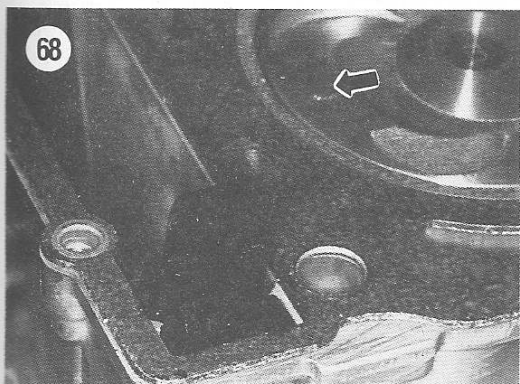
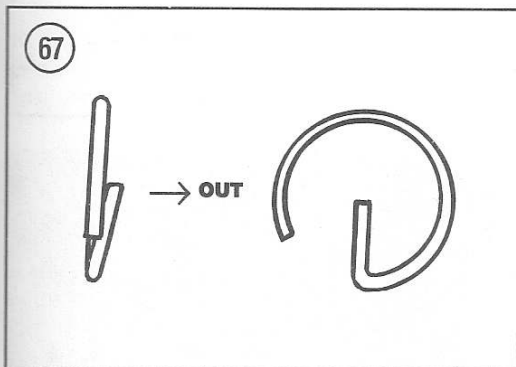
CAUTION
 Do not remove the clips to retain the piston. The clips are removed and severe damage will result if the clips are removed while the engine is running. Do not use new clips if the piston is damaged.

Insert the clip in one end of the piston pin bore. The tang on the retaining clip should project outward as shown in Figure 67.



ring outward as shown in **Figure 67**, either toward the top or bottom of the piston.

3. Press the piston pin through the bore in the piston, which does not have the retaining clip, until it extends slightly beyond the inside of the pin boss.



4. Place the piston over the connecting rod with the arrow (**Figure 68**) on the piston crown pointing toward the magneto (right) side of the engine.

5. Align the piston pin with the hole in the connecting rod, then push the pin through the connecting rod. Continue pushing the pin until it just contacts the previously installed retaining clip.

NOTE

The pin should be a smooth fit in the bore when the pin and the bores are lubricated and at 20° C (68° F). However, if the pin is too tight, cool the pin and warm the piston slightly. Be careful not to transmit lateral shock to the connecting rod or otherwise damage parts by carelessly pounding on the side of the piston.

6. Install a new retaining clip in the piston pin bore, with the tang projecting outward as shown in **Figure 67**. Position the tang either toward the top or bottom of the piston.

7. Check installation by rocking the piston back and forth around the pin axis, then sliding the piston from side to side. It should rotate freely without perceptible play.

8. Install the piston rings as described in this chapter.

9. Install the cylinder, cylinder head, camshaft, rocker arms and cylinder head cover as outlined in this chapter.

Piston Ring Removal/Inspection/Installation

WARNING

The edges of all piston rings are very sharp. Be very careful when handling them to avoid cutting your fingers.

1. Remove the top ring with a ring expander tool or by spreading the ends with your thumbs just enough to slide the ring up over the top of the piston. Repeat the procedure for the remaining rings.

2. Clean the carbon from the ring grooves in the piston with a broken ring or suitable tool. Refer to **Figure 69**. Be careful not to cut your hand on the ring used as a cleaning tool or damage the piston.

CAUTION

Do not use a wire brush to clean the piston skirt. Also, do not gouge the piston skirt.

ton while attempting to clean it. The soft aluminum of the piston is easily damaged by improper cleaning techniques.

3. Examine each ring groove in the piston for burrs, dented edges, carbon deposits or other conditions that reduce the width of the groove.

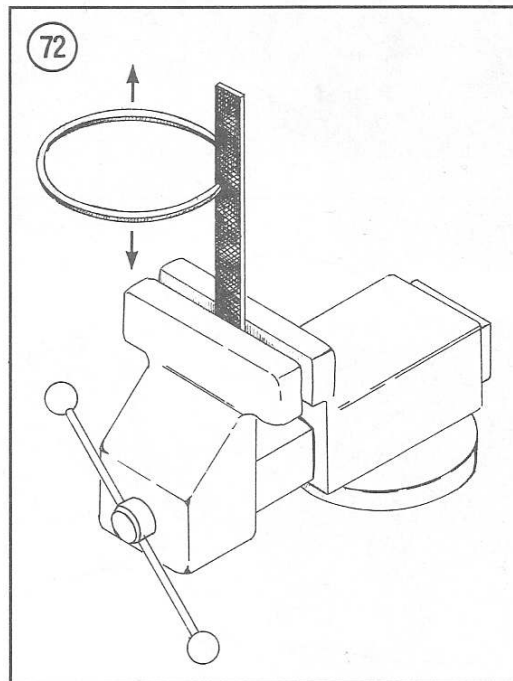
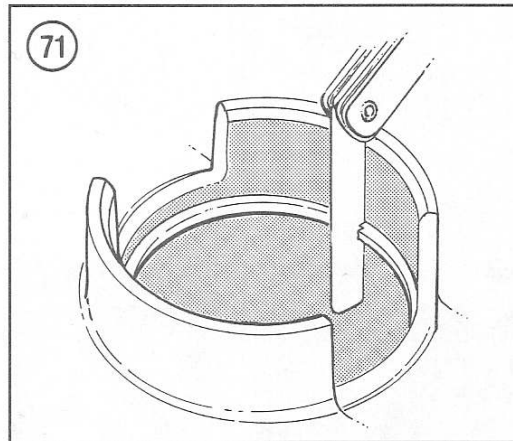
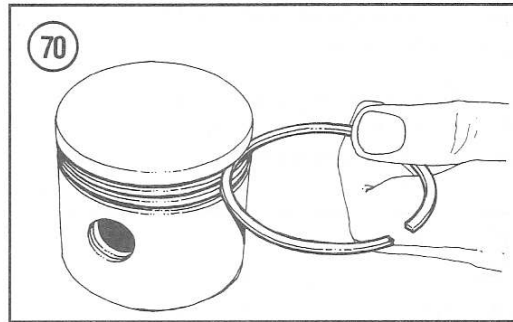
NOTE

The groove for the top compression ring usually wears more than the other grooves, but all should be carefully inspected.

4. Examine each ring groove for gouges, bent groove lands or other conditions that increase the width of the groove.
5. Roll each ring around its groove as shown in **Figure 70** to check for binding. Clean or replace the piston as necessary.
6. Measure the end gap of each ring in the cylinder bore, before installing the ring on the piston as follows.

- a. Insert one ring into the cylinder. Make sure the ring is square in the cylinder by using the top of the piston to slide the ring up or down in the cylinder.
- b. Use a feeler gauge to measure the gap between the ends of the ring as shown in **Figure 71**.
- c. Check the end gap at several locations in the cylinder and always make sure the ring is positioned squarely in the cylinder. If the gap is too wide, the rings will not seal properly. If the gap is too small, the rings may bind and break when the engine is run.
- d. If the gap is too wide, the cylinder bore is worn, the rings are worn or the ring is not correct for the application.
- e. If the gap is less than the minimum specified, first make sure the correct ring is being used. The end gap can be enlarged by carefully filing the ends of the ring as shown in **Figure 72**. Use a fine cut file and be extremely careful when filing the ends of a ring.

7. Measure the side clearance of the top and second piston rings in their grooves as shown in **Figure 73**. Always make sure the grooves are clean before measuring. Compare the measured side clearance with the specifications listed in **Table 4**. If the clearance of new rings in the piston grooves is greater than the wear limit, a new piston should be installed.



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installing the rings

The arrow
the right

9. Install the oil
with its ends toward
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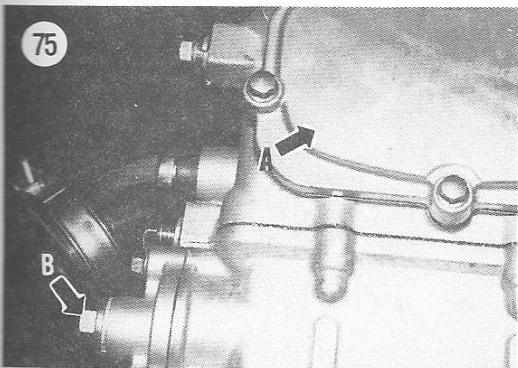
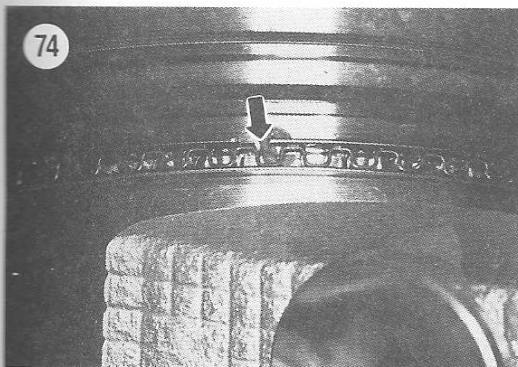


8. Make sure the piston is absolutely clean, then coat the rings and ring grooves with engine oil before installing the rings.

NOTE

The arrow on the piston faces toward the right (magneto) side of the engine.

9. Install the oil ring expander in the bottom groove with its ends toward the front of the piston. Make sure the ends do not overlap.



10. Install the top rail of the oil control ring over the expander installed in step 8. The tab of the top rail must engage the notch shown in **Figure 74**.

11. Install the bottom rail of the oil control ring over the expander with the gap at least 30° from the previously installed top rail.

12. Install the second ring with the "R" mark on its side toward the top (crown) of the piston. The second ring has a groove cut into the bottom outside diameter of the ring.

13. Install the top ring with the "R" mark on its side toward the top (crown) of the piston. The top ring is chrome plated and the inside diameter is chamfered at the top.

14. Position the second compression ring end gap toward the rear (inlet side) of the cylinder. Position the top ring with its end gap toward the front (exhaust) side of the engine.

CAUTION

Be extremely careful not to damage the assembled piston or rings. It is suggested that the piston and cylinder be installed as soon as possible after installing the rings in the piston grooves.

15. Follow the *Break-in Procedure* in this chapter if the cylinder was rebored, a new piston was installed or if new piston rings were fitted.

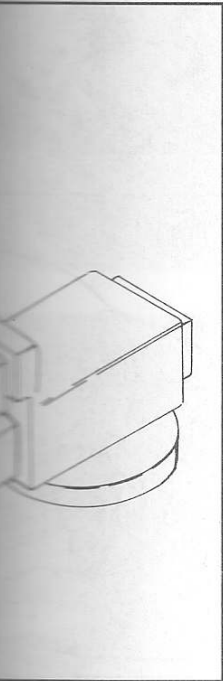
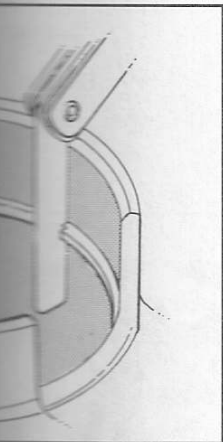
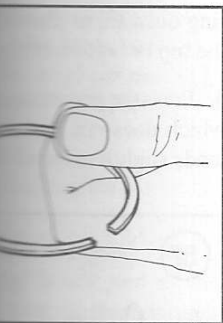
CAM CHAIN, SPROCKETS AND TENSIONER

The camshaft is driven by a chain located in a cavity in the right side of the engine. The chain is one piece, does not have a master link and should not be split. Removal of the cam chain and sprockets is usually part of a more complete disassembly and overhaul.

1. Refer to instructions in this chapter to remove the *Cylinder Head Cover and Rocker Arm Assembly*.
2. Clean the engine and frame thoroughly.
3. Unbolt and remove the sprocket cover (A, **Figure 75**) from the right side of the cylinder head.

CAUTION

*Plug (B, **Figure 75**) is under spring pressure. Push against the plug while removing to keep it from flying off. In Step 5, the plug only needs to be loosened, but it must be removed later to set the tensioner.*



4. Loosen the plug (B, **Figure 75**), then remove the two screws attaching the tensioner assembly to the cylinder. Remove the tensioner assembly.

5. Refer to this chapter and remove the recoil starter assembly.

6. Refer to Chapter Eleven and remove the flywheel and the alternator stator plate.

7. Turn the engine until the sprocket drive pin (**Figure 76**) is at the top. The engine will be at (or near) top dead center on the compression stroke.

8. Remove the three screws attaching the camshaft sprocket to the camshaft. Refer to **Figure 76**.

9. Slide the camshaft in (toward the left), then remove the sprocket from the dowel pin and camshaft. Hold the chain up and remove the sprocket from the chain and cylinder head.

10. Attach a wire to the cam chain, then lower the chain (A, **Figure 77**) while removing it from around the crankshaft.

11. Slide the cam drive sprocket from the crankshaft after removing the slotted nut (B, **Figure 77**). The nut has left-hand threads and is loosened by turning clockwise.

12. Inspect the chain and sprockets as follows:

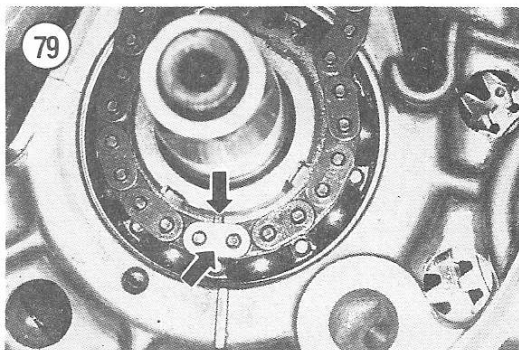
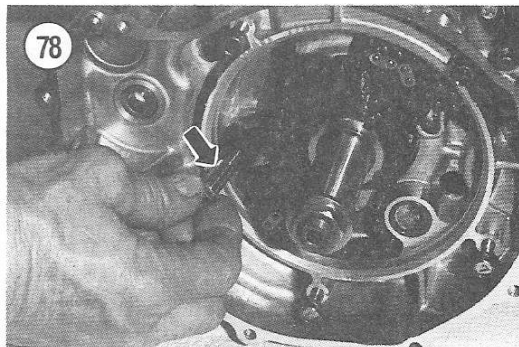
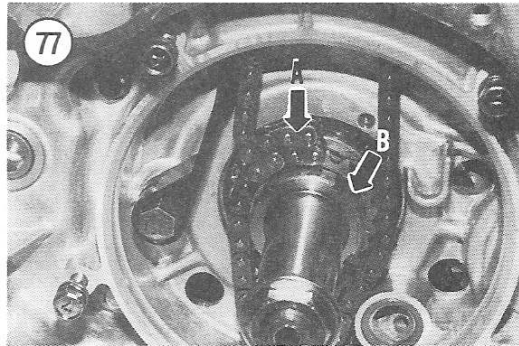
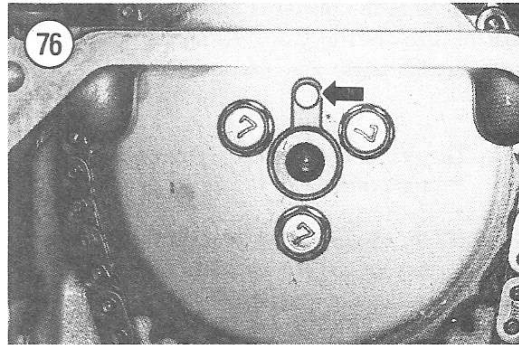
- Stretch the chain on a flat surface (like a table), exerting approximately 4.53 kg (10 lb) force.
- Measure the length of a 20 pitch section of the chain.
- If the length of 20 rollers is more than 13.7 cm (5.407 in.), install a new chain.
- Check the sprocket teeth for wear or other damage. A damaged sprocket can quickly damage a new chain.
- Check the Woodruff key and slot in the lower (drive) sprocket for wear or damage.

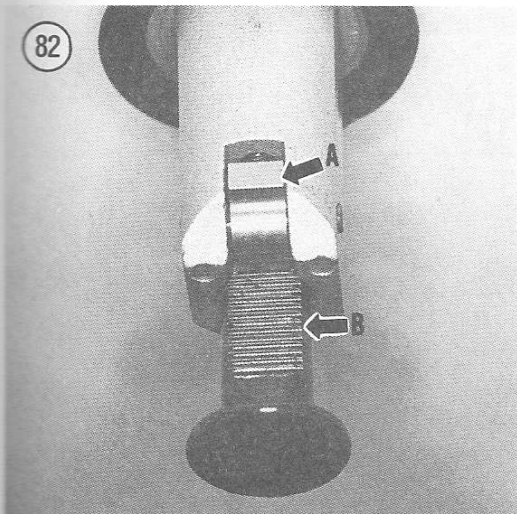
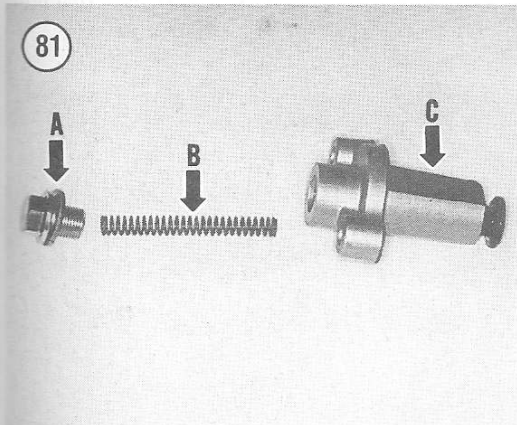
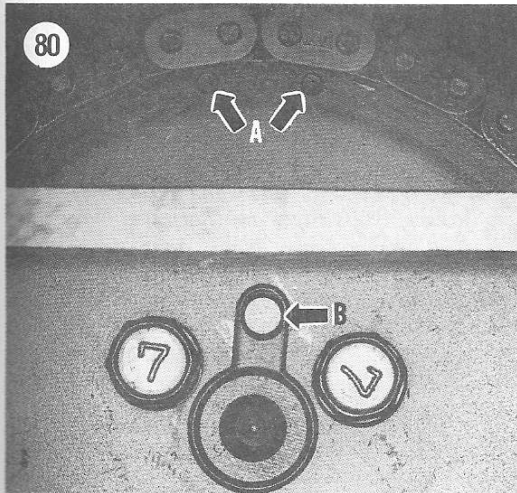
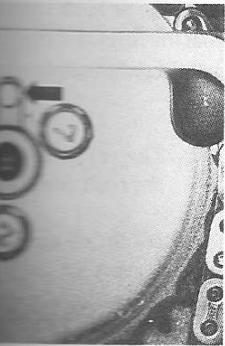
13. Remove the screw (**Figure 78**) and lift out the rear tensioner slider. Inspect the tensioner slider for wear or damage. If the condition of the front slider is questioned, remove the cylinder head and remove the rear slider.

14. Install the tensioner slider and tighten the lower retaining screw to the torque listed in **Table 3**.

15. Install the Woodruff key for the lower sprocket, then install the lower sprocket with the marked tooth towards the outside.

16. Install the slotted nut (B, **Figure 77**) that retains the cam drive sprocket and tighten it to the torque listed in **Table 3**.





17. Make sure the marked tooth of the drive sprocket is facing the bottom after the nut is tightened.

18. Install the camshaft drive chain around the lower sprocket and use a wire to pull the chain up inside the chain cavity. The plated links of the chain should be toward the outside and the longer chain section between the plated links should be toward the rear of the engine.

19. Align the single plated link with the marked tooth of the lower (drive) sprocket and align the marked tooth with the crankcase mark as shown in **Figure 79**.

20. Locate the camshaft (driven) sprocket inside the chain near the camshaft. Align the two marked teeth on the sprocket with the two plated links as shown at **A**, **Figure 80**.

NOTE

If the plated links are not at the top of the chain, make sure the chain is straight and that the longer section of chain (between the plated links) is toward the rear of the engine.

21. Align the pin (**B**, **Figure 80**) in the camshaft with the hole in the sprocket and install the 3 screws attaching the sprocket. Tighten the screws to the torque listed in **Table 3**.

22. Set and install the cam chain tensioner body as follows.

NOTE

*Plug (**A**, **Figure 81**) is under spring pressure. Push against the plug while removing to keep it from flying off. The plug must be removed to set the tensioner.*

- Remove the plug (**A**, **Figure 81**) and spring (**B**) from the tensioner body (**C**).
- Lift the ratchet (**A**, **Figure 81**), then push the plunger (**B**, **Figure 82**) into the body.

NOTE

*Do not reinstall the plug (**A**, **Figure 81**) or spring (**B**, **Figure 81**) until after the tensioner body is installed.*

- Install the tensioner body using a new gasket. Tighten the two retaining screws to the torque listed in **Table 3**.

- d. Install tensioner spring (B, **Figure 81**) and plug (A, **Figure 81**). Tighten the plug to the torque specified in **Table 3**.

NOTE

Timing marks on the crankshaft and camshaft sprockets will align every other revolution of the crankshaft, but because of the number of chain links, the plated links previously used for timing will probably not be aligned after turning the crankshaft.

23. Rotate the engine crankshaft 2 or more revolutions and recheck alignment of the timing marks. The marked tooth on the lower drive sprocket should be aligned with the mark on the crankcase as shown in **Figure 79**. In addition, the two marked teeth and the alignment dowel on the cam (driven) sprocket should be at the top as shown in **Figure 80**. If installing the chain tensioner changed the timing, remove the tensioner, then repeat Steps 20-23.
24. Complete assembly by reversing the disassembly procedure. Refer to **Table 3** for recommended torque values.

RECOIL STARTER

Removal/Installation

1. Place the ATV on a level surface and block the wheels to keep it from rolling.
2. Remove the screws attaching the recoil starter, then remove the starter and gasket.

NOTE

The electric starter reduction drive assembly should remain with the engine. One end of the reduction drive assembly pilots in the rewind starter housing.

3. Install the recoil starter assembly and tighten the retaining screws to the torque listed in **Table 3**.

Disassembly and Starter Rope Removal

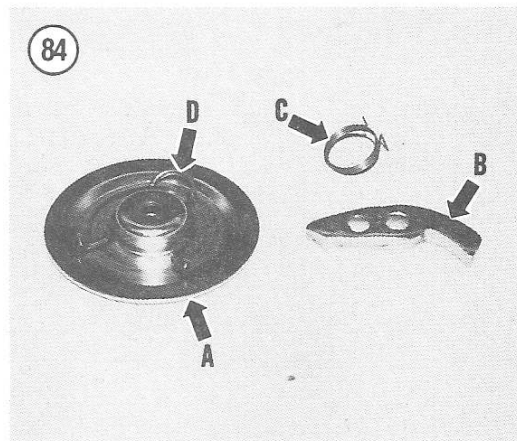
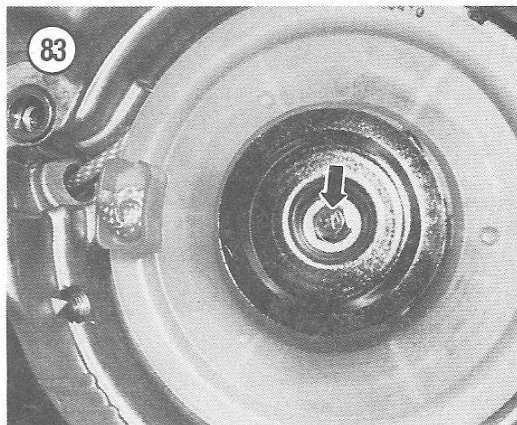
1. If the rope is not broken, pull it from the housing and tie a loose knot to keep the rope from rewinding.
2. Remove the anchor from the starter handle and remove the handle from the end of the rope.
3. Hold the rope, untie the previously tied knot, then allow the rope to wind slowly into the housing.

4. Remove the center screw (**Figure 83**).
5. Remove the friction plate (A, **Figure 84**), ratchet pawl (B) and spring (C).

CAUTION

The recoil spring is under pressure and may jump from the housing during disassembly. Its edges are sharp and may cut or cause eye injury. Wear safety glasses or a face shield and gloves when disassembling and assembling.

6. Carefully lift the starter pulley and rope from the housing. Make sure the recoil spring remains in the starter housing.
7. Unwind and remove the rope from the starter pulley if replacement is required.
8. To remove the recoil spring, invert the starter housing and tap it on a solid surface. The spring will fall free and unwind inside the starter housing.



1. Clean all parts.
2. Inspect the friction spring (D), ratchet pawl (B), and friction plate (A) for damage. Friction plate (A) should be replaced if damaged.
3. Check the rope for fraying. Usually a good rope will show slight damage, but



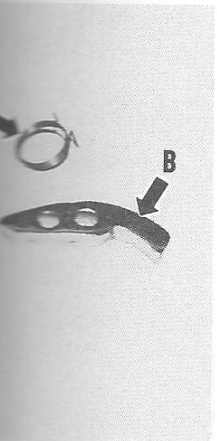
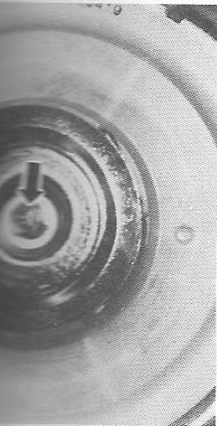
Figure 83).
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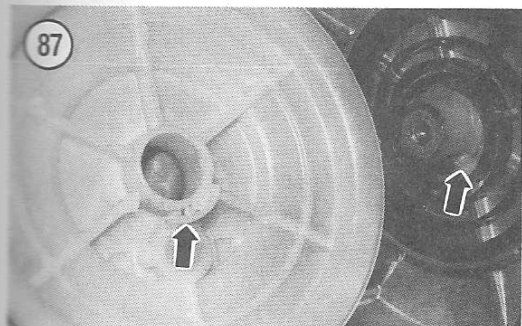
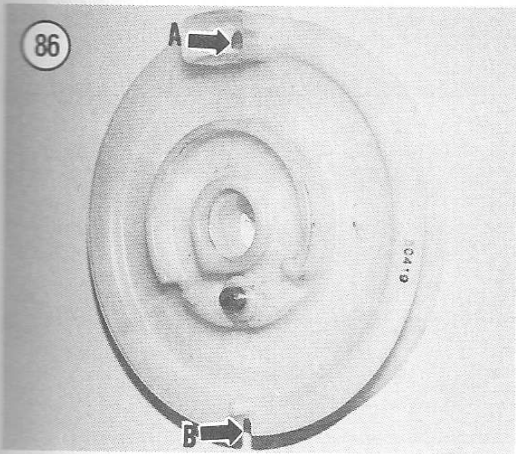
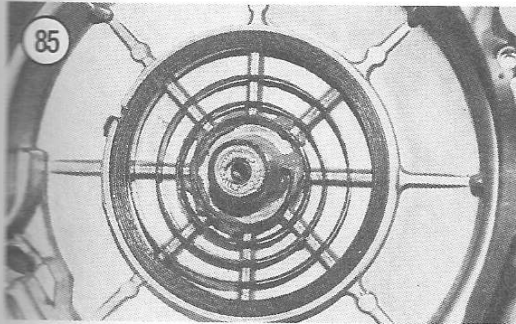
rope from the starter
 med.

ing, invert the starter
 surface. The spring will
 the starter housing.



Inspection and Assembly

1. Clean all parts and dry thoroughly.
2. Inspect the friction plate (A, Figure 84), friction spring (D), ratchet pawl (B) and pawl spring (C) for damage. Friction spring should grip the friction plate securely.
3. Check the rope for fraying or other damage. It is usually a good practice to replace a rope with even slight damage, before it breaks.



4. Inspect the tabs at the ends of the recoil spring.
- 5A. Reinstall the old recoil spring as follows:
 - a. Hook the outer end of the recoil spring in the housing.
 - b. Wind the spring into the housing in a counterclockwise direction until the spring is completely in the housing. Hold the coils in place while winding the spring into the housing.
 - c. The installed spring should be positioned as shown in Figure 85.
- 5B. New recoil springs are held compressed by a wire. Use the following instructions to install the new spring.
 - a. Position the new spring in the housing so that it spirals inward in a counterclockwise direction and attach the outer end of the spring to the housing.
 - b. Hold the spring in place and cut the retaining wire. The installed spring should be positioned as shown in Figure 85.
6. Lubricate the spring with a light, low-temperature lubricant such as Polaris Cable Lube (part No. 2870510).
7. If the rope is detached from the pulley, attach the rope as follows:
 - a. Tie a secure knot at one end of the rope and insert the other end through the hole (A, Figure 86).
 - b. Pull the rope through the pulley until the knot is firmly seated in the pocket of the pulley.
 - c. Wind the rope into the pulley groove counterclockwise (as viewed from the side shown in Figure 86). The rope should be wound fairly tightly into the groove.
 - d. When the rope is almost completely wound into the pulley, pull the end up through the notch (B, Figure 86). The end of the rope should lock into the notch.
8. Apply a small amount of Polaris low-temperature grease (or equivalent) to the center post in the starter housing and to the bushing in the center of the starter pulley.
9. Install the starter pulley over the center post making sure the inner end of the recoil spring engages the tab at the center of the pulley. Refer to Figure 87. Make sure the pulley is fully seated (down) in the housing.
10. Preload the recoil spring as follows:
 - a. Hold the pulley down in the housing.

- b. Grasp the end of the rope that extends from the notch (B, **Figure 86**) in the pulley and wind the pulley counterclockwise 4 turns.
 - c. Hold the pulley to prevent the spring from pulling the rope back into the housing.
 - d. Route the end of the rope out through the housing, while continuing to hold the pulley.
 - e. When the rope exits the housing, pull enough rope out to tie a large knot in the rope to keep it from winding into the housing.
11. Install the pawl spring (**Figure 88**).
 12. Install the pawl as shown in **Figure 89**. The pawl spring is located at arrow.
 13. Install the friction plate and spring (**Figure 90**) with each end of the spring located on the drive side of the ratchet.
 14. Install the spring washer and center screw (**Figure 83**). Tighten the screw to the torque listed in **Table 3**.
 15. Attach the handle to the starter rope and check operation of the recoil starter. If the rope is the correct length, but the recoil spring does not hold the handle against the housing, refer to Step 10 and preload the spring additional turn. If the rope is too long, the coils of the rope may extend outside the pulley groove and bind against the housing.

FLYWHEEL AND STATOR PLATE

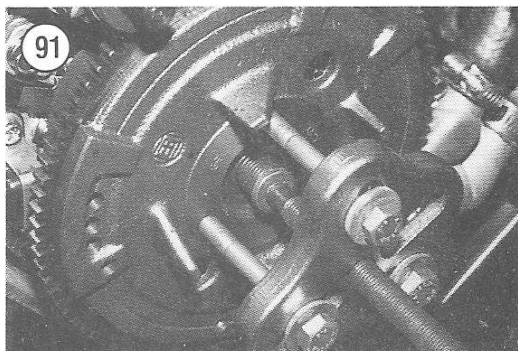
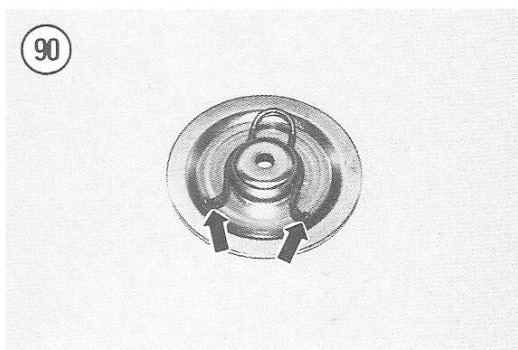
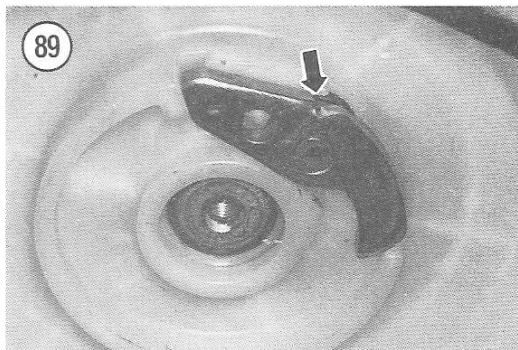
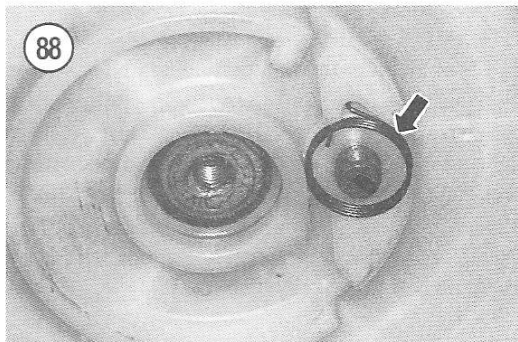
Removal/Installation

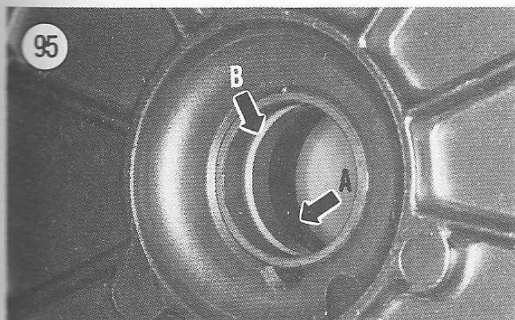
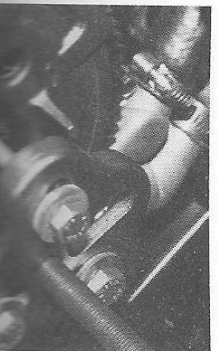
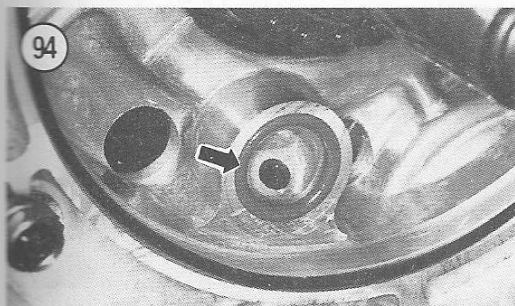
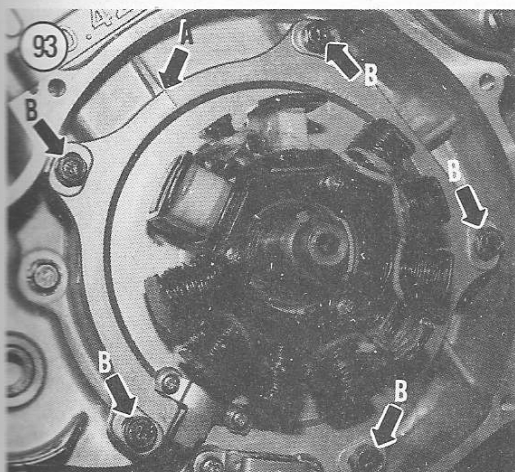
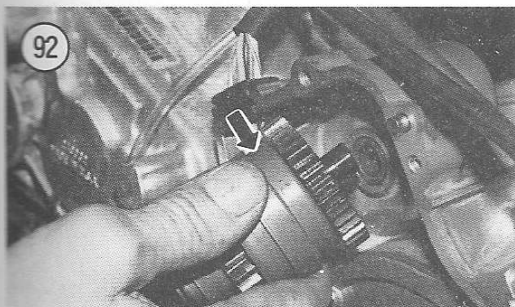
Before removing the flywheel and stator plate, clean the engine, frame and work area thoroughly. If water is used, be sure blow or wipe the engine dry before beginning removal.

1. Place the ATV on a level surface and block the wheels to keep it from rolling.
2. Disconnect the ground wire from the negative terminal of the battery.
3. Refer to Chapter Three to drain oil from the engine and the reservoir.
4. Detach the spark plug high tension lead from the spark plug.
5. Remove the recoil starter as described in this chapter.

CAUTION

Do not thread puller attaching bolts into the flywheel more than 6 mm (1/4 in.), or the stator coils may be damaged.





6. Remove the flywheel nut and washer then use a suitable puller (**Figure 91**) to remove the engine flywheel.

NOTE

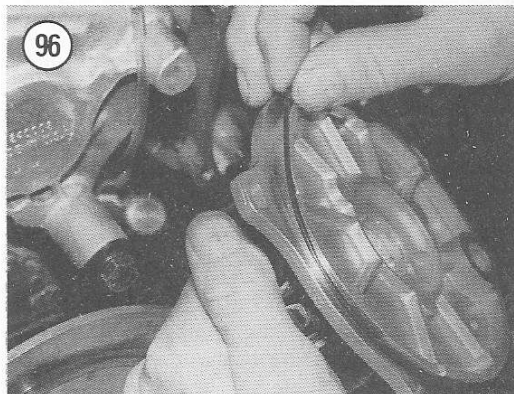
Do not lose the thrust washer located between the starter drive and the crankcase.

7. Remove the electric starter drive (**Figure 92**).
8. Mark the position of the stator plate on the crankcase (A, **Figure 93**), so the stator can be reinstalled at the same ignition timing position.

CAUTION

Use care to prevent damage to seals, crankshaft, stator plate, armature wires or other parts when removing the stator plate and stator assembly.

9. Remove the stator retaining screws (B, **Figure 93**), then remove the stator plate and stator assembly.
10. Remove the sealing ring (**Figure 94**).
11. Check the bearing and seal surfaces for scratches or burrs.
12. Apply a light coating of grease to the crankshaft and the seal (A, **Figure 95**) located in the stator plate.
13. Coat the bushing (B, **Figure 95**) in the stator plate with molybdenum disulfide grease or assembly lube.
14. Install a new O-ring (**Figure 94**) in the recess of the engine crankcase.
15. Apply Loctite 515, Loctite 518 or equivalent sealer to the outer diameter of the stator and position a new O-ring on the stator plate. Refer to **Figure 96**.
16. Install the stator plate, making sure the previously affixed timing marks are aligned. Be sure the



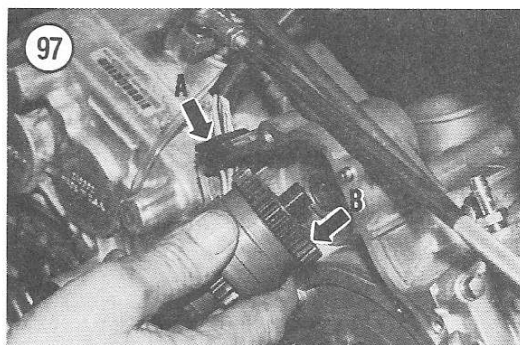
stator is fully seated and tighten the retaining screws to the torque listed in **Table 3**.

17. Seal the stator wire grommet (A, **Figure 97**) with an appropriate sealer.

18. Be sure the thrust washer is located on the back of the starter reduction gear (B, **Figure 97**). Apply a coating of grease to the bushing, then install the gear.

19. Make sure the Woodruff key is in place, then install the flywheel. Tighten the flywheel retaining nut to the torque recommended in **Table 3**.

20. Install the recoil starter and tighten the retaining screws.



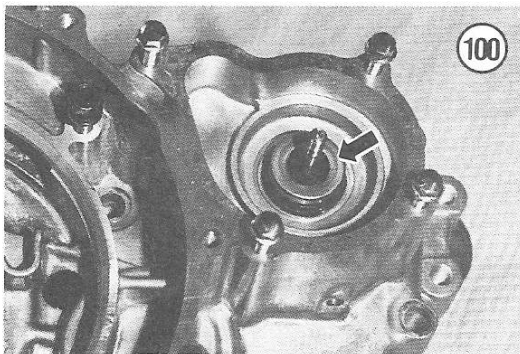
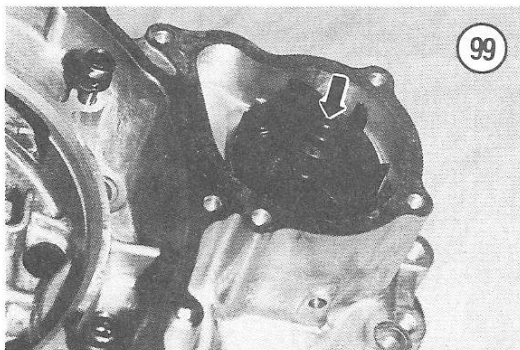
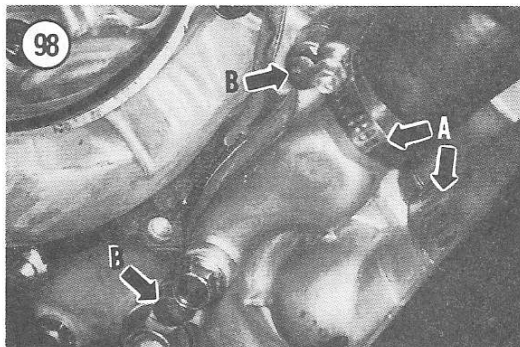
COOLANT PUMP

The engine must be removed from the frame and the crankcase must be separated before the coolant pump shaft and seals can be serviced. However, the outer cover and impeller can be removed for inspection without removing the engine.

Remove the oil pump as described in this chapter to service the shaft oil seal and the coolant pump mechanical seal. The coolant pump shaft is an extension of the oil pump drive shaft.

Removal/Installation

1. Drain the cooling system as described in Chapter Three.
2. Loosen the clamps (A, **Figure 98**) attaching the coolant hoses, then detach the hoses from the cover.
3. Remove the 4 screws (B, **Figure 98**) attaching the coolant pump cover.
4. Bump the cover to loosen the gasket, then remove the cover.
5. Remove the nut (**Figure 99**) and pull the impeller from the shaft.
6. If the seals (**Figure 100**) are leaking, remove the engine and separate the engine crankcase as described in this chapter.
7. Clean all old gasket material from the back of the coolant pump cover (**Figure 101**) and the mating surface of the crankcase.
8. Install the impeller and tighten the retaining nut to the torque listed in **Table 3**.
9. Install the pump cover using a new gasket. Tighten the retaining screws in a crossing pattern to the torque listed in **Table 3**.



11. Attach the cover with a minimum of in Chapter Three.

Disassembly

The crankcase once shaft and the shaft is made of a



10. Attach the coolant hoses. Fill the cooling system with a mixture of antifreeze and water as described in Chapter Three.

CRANKCASE

Disassembly

The crankcase contains the crankshaft, the balance shaft and the oil pump assembly. The crankshaft is made of several pieces pressed together and

includes the connecting rod. Service to these components is often better performed by properly trained technicians. Use extreme caution whenever you separate and rejoin the crankcase. The importance of absolute cleanliness during internal engine service cannot be over emphasized.

Crankcase Separation

1. Remove the engine as described in this chapter.
2. Remove the cylinder head and cylinder as described in this chapter.
3. Remove the camshaft drive (lower) sprocket from the engine crankshaft as outlined in this chapter.
4. Remove the coolant pump cover and impeller as described in this chapter.
5. Remove the ten screws attaching the crankcase halves together.
6. Remove the flywheel key from the crankshaft.

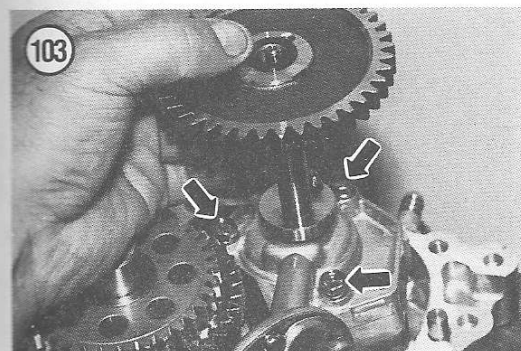
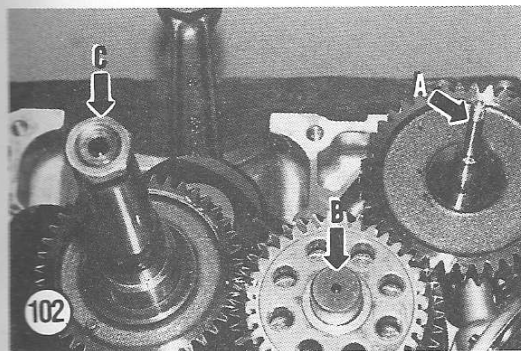
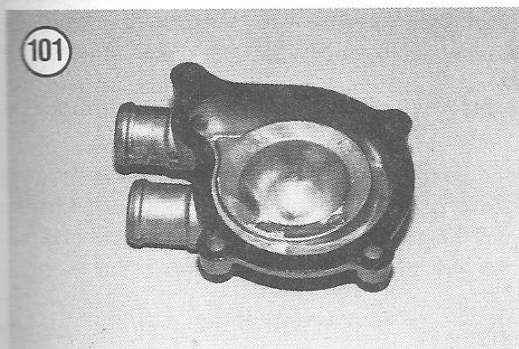
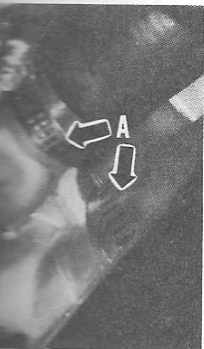
NOTE

The crankcase separation tool is much like a puller that is attached to one side of the crankcase with the puller screw placed at the center of the crankshaft. The tool pushes the crankshaft out of the right side main bearing without damaging the crankshaft. Pounding on the end of the crankshaft can knock the crankshaft out of alignment as well as damage the threaded end.

7. Attach a crankcase separation tool to the magneto side of the crankcase.
8. Bump the end of the coolant pump shaft while tightening the center screw of the crankcase separation tool. Be prepared to catch the crankcase halves when the bearings become free of the shafts. Refer to **Figure 102** for PTO side crankcase half and related components.
9. Remove the thrust washer from the pump shaft (A, **Figure 102**), then lift the drive gear from the shaft.
10. Remove the screws (**Figure 103**) attaching the oil pump to the crankcase, then remove the oil pump.

CAUTION

The balance shaft may be equipped with shim washers. Be careful not to loose or damage these washers.



5

11. Lift the balance shaft (B, **Figure 102**) from its bearing in the case.

CAUTION

*Be careful to support the case and press only on the center of the crankshaft (C, **Figure 102**). Do not drop the crankshaft when it releases from the bearing.*

12. Press the crankshaft from the left crankcase half using the crankcase separation tool.

13. Refer to the appropriate sections in this chapter for inspection and service to the crankshaft, oil pump and crankcase bearings.

Assembly

1. The crankshaft bearings are damaged while separating the case halves. New bearings must be installed during reassembly.

2. Always install new seals before assembling the crankcase.

3. Lubricate the bearings and seals located in the crankcase halves.

4. Select the correct thickness of shims for the crankshaft and balance shaft. Refer to *Crankshaft, Balance Shaft, Bearings and Seals* section in this chapter for determining the correct thickness of shims to install.

CAUTION

Always use the special crankshaft installation tool (part No. 2871283) when assembling the crankcase. The crankshaft may be damaged while assembling the crankcase halves, if the special crankshaft installation tool is not used. Thread the installation tool into the left (PTO) end of the crankshaft at least 25.4 mm (1 in.) to be sure the threads are not damaged during assembly.

5. Use crankshaft installation tool (part No. 2871283) to pull the crankshaft through the left (PTO) side main bearing.

6. Install the balance shaft with the marked tooth of the balance gear aligned with the marked valley as shown in **Figure 104**. Make sure the balance shaft is fully seated in the bearing.

7. Apply a light film of oil to the oil pump mounting surface and install the oil pump. Refer to **Table 3** for

the recommended torque for the pump mounting screws (**Figure 103**).

8. Align the drive pin with the hole in the drive gear and install the oil pump drive gear (**Figure 103**).

9. Position the correct thickness of shims on the pump shaft, crankshaft and balance shaft. Refer to *Crankshaft, Balance Shaft, Bearings and Seals* section in this chapter for determining the correct thickness of shims to install.

10. Apply Loctite 515, Loctite 518 (or equivalent) to the mating surface of the crankcase halves.

11. Make sure the alignment dowels are in place.

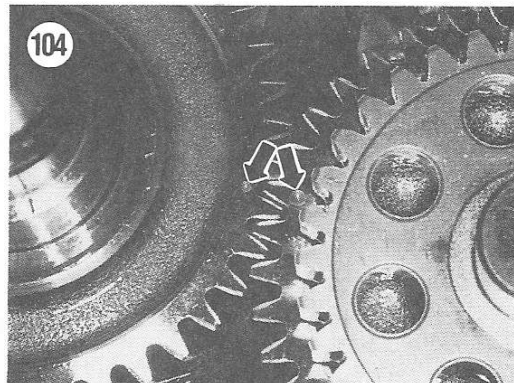
12. Set the right (magneto) side of the crankcase over the crankshaft and coolant pump shaft. Be careful not to damage the shaft seals.

13. Use the crankshaft installation tool (part No. 2871283) to pull the crankshaft through the right (magneto) side main bearing. Tap the case around the pump to make sure that the case is installed straight. Make sure the case is fully seated before installing the retaining screws. Do not attempt to pull the case halves together with the retaining screws.

14. Install the ten screws retaining the case halves together. Tighten the screws in several steps using a crossing pattern. Gradually increase the torque to the value listed in **Table 3**.

15. Install the oil/coolant pump shaft mechanical seal from the outside as follows:

- a. Make sure the seal bore is clean.
- b. Position the new seal in the seal drive collar and install them over the shaft.
- c. Screw the guide onto the end of the pump shaft.
- d. Install the washer and nut. Tighten the nut to push the seal into place until fully seated.
- e. Remove the guide adapter.



16. The remaining steps are to separate the pump and install the new seals.

CRANKSHAFT BEARINGS

Inspection/Installation

The crankshaft bearings are damaged while separating the case halves. New bearings must be installed during reassembly. If the old bearings are damaged, remove them.

1. Use suitable procedure to remove the old seals from the crankcase. Install new seals in the direction of the crankshaft mechanical seal out toward the PTO.



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ear (Figure 103).
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Bearings and Seals sec-
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fully seated before
not attempt to pull
retaining screws.
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shaft mechanical
clean.
e seal drive collar
shaft.
end of the pump

Tighten the nut to
fully seated.



16. The remainder of the assembly is the reverse of the separation procedure.

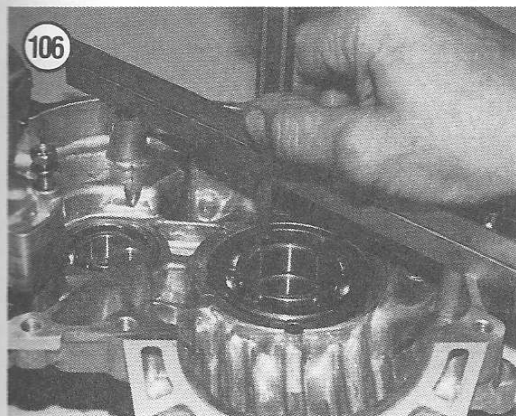
CRANKSHAFT, BALANCE SHAFT, BEARINGS AND SEALS

Inspection/Installation/Adjustment

CAUTION

The crankshaft bearings are damaged while separating the crankcase halves. Install new bearings when assembling. If the old bearings must be reused, inspect the bearings very carefully and do not remove them from their bores.

1. Use suitable pullers to remove the bearings and seals from the crankcase halves. Note the original direction of the shaft seals. The oil/coolant pump shaft mechanical seal should be removed by driving it out toward the outside.



NOTE

Install the new mechanical seal from the outside after the crankcase is assembled.

2. Clean the crankcase halves, both inside and out with a suitable solvent and dry thoroughly. Be sure to remove all traces of old gasket material and sealer from mating surfaces.

3. Inspect the crankcase halves carefully for cracks, fractures or other damage. Inspect the bearing bores for damage and be sure that all oil passages are absolutely clean.

4. Install new bearings in the crankcase with the manufacturer's numbers visible. Press bearings into their bores using drivers that are the correct size to press only on the outside race. The outer diameter of the various bearings are:

- a. Crankshaft main bearings, 70 mm (2.755 in.).
- b. Balance shaft, 46 mm (1.810 in.).
- c. Oil/cooling pump shaft, 28 mm (1.100 in.).

5. Check the condition of the connecting rod bearing. It is difficult to clean this bearing and its condition is usually determined by turning the connecting rod and noting any roughness or noise. Additional tests are as follows:

- a. Measure connecting rod side play with a feeler gauge as shown in **Figure 105**. Compare the side play with the specification listed in **Table 4**.
- b. Measure connecting rod radial play with a dial indicator and compare with the recommended limit listed in **Table 4**.
- c. Mount the crankshaft in a truing stand or in V-blocks and measure the runout at the shaft ends. Compare the runout with the recommended limit listed in **Table 4**.

6. If the crankshaft and connecting rod assembly is damaged, take it to a Polaris dealer for further evaluation.

7. Determine the correct shim thickness necessary to establish the correct crankshaft, balance shaft and oil pump end play inside the crankcase. The first step is to accurately measure the distance between the inner races of the bearings.

8. Make certain the crankshaft and balance shaft bearings are fully seated in both crankcase halves. Also, make certain the oil pump shaft bearing is fully seated in the magneto side crankcase half.

9. Position a straightedge across the PTO side crankcase half as shown in **Figure 106**.

10. Using a dial-type vernier caliper or depth gauge, *carefully* measure the distance from the top of the straightedge to the PTO side crankshaft bearing. See **Figure 106**.

11. Next, measure the thickness of the straightedge as shown in **Figure 107**. Subtract the thickness of the straightedge from the measurement taken in Step 10. The remainder is the distance from the mating surface of the PTO side crankcase half to the crankshaft bearing. Record this measurement.

12. Repeat Steps 9-11 to measure the magneto side crankcase half. Do not forget to subtract the thickness of the straightedge from the measurement.

13. Then, add the magneto side and the PTO side measurements together to obtain the total distance between the crankshaft bearings.

14. Measure the width of the crankshaft at the bearing seats as shown in **Figure 108**. Record the measurement.

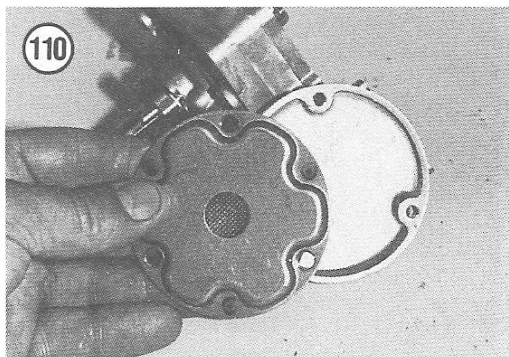
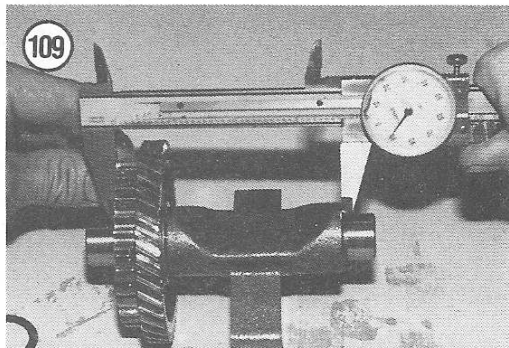
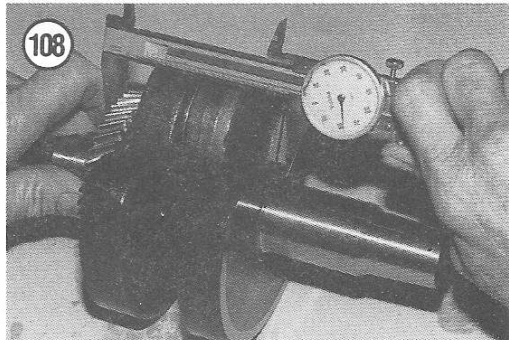
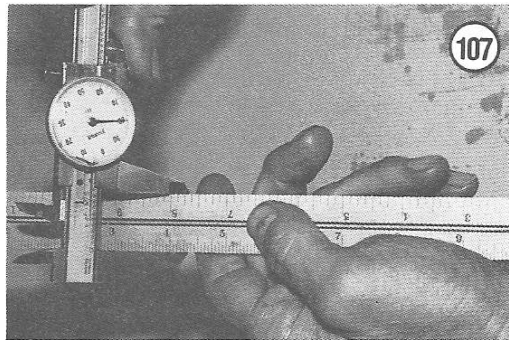
15. Subtract the width of the crankshaft (Step 14) from the total distance determined in Step 13. This value, minus the preferred crankshaft end play specification (**Table 4**), is the shim thickness necessary to establish the correct crankshaft end play. Replace the original crankshaft shim(s) if not the correct thickness.

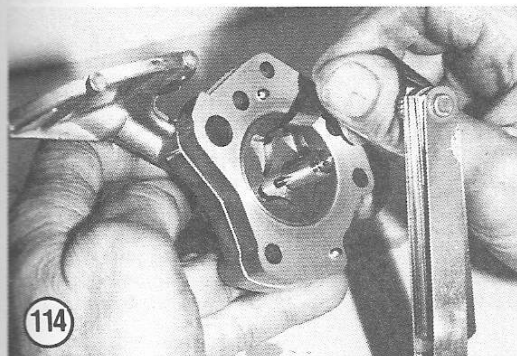
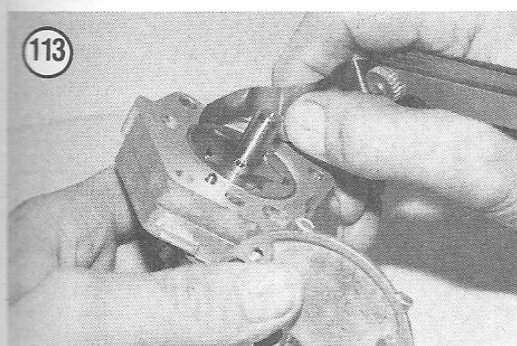
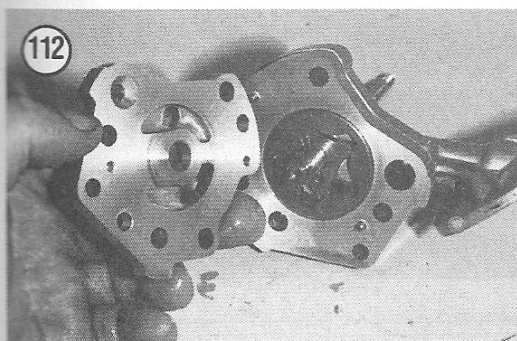
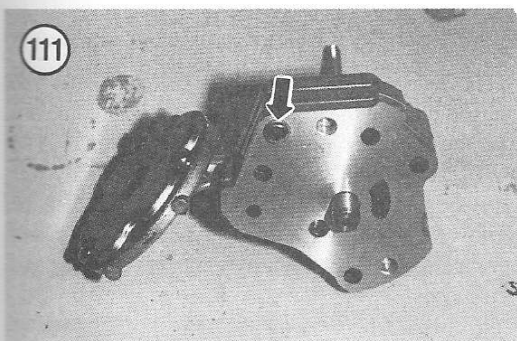
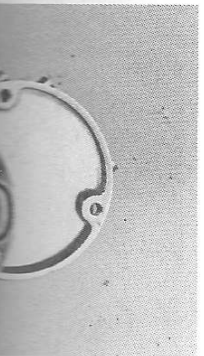
16. Again, place the straightedge across the PTO side crankcase half and measure the distance from the top of the straightedge to the balance shaft bearing. See **Figure 106**, typical. Subtract the thickness of the straightedge (**Figure 107**) from the measurement and record the remainder.

17. Repeat Step 16 on the magneto side crankcase half. Do not forget to subtract the thickness of the straightedge. Add this measurement to the distance obtained in Step 16 to determine the total distance between the balance shaft bearings.

18. Measure the width of the balance shaft between the bearing seats. See **Figure 109**. Subtract the balance shaft width from the total distance determined in Step 17. This value, minus the preferred balance shaft end play specification (**Table 4**), is the shim thickness necessary to establish the correct balance shaft end play. Replace the original balance shaft shim(s) if not the correct thickness.

19. Next, place the straightedge across the magneto side crankcase half. Measure the distance from the top of the straightedge to the oil pump shaft bearing. Subtract the thickness of the straightedge (**Figure**





107) from the measurement and record the remainder.

20. Install the oil pump drive gear on the pump shaft. Using a dial-type caliper or micrometer, measure the width of the oil pump and drive gear. Record this measurement.

21. Subtract the width of the pump and gear assembly from the measurement obtained in Step 19. This value, minus the preferred oil pump end play specification (Table 4), is the shim thickness necessary to establish the correct oil pump end play. Replace the original pump shim(s) if not the correct thickness.

22. Install the oil/coolant pump oil seal from the outside of the crankcase before assembling the crankcase as follows:

- a. Coat the lip of the seal with grease.
- b. Use a 25 mm (0.985 in.) seal driver to install the seal with the spring loaded lip toward the inside. Drive the seal into its bore until the outside is flush with the bottom of the mechanical (cooling) seal bore.
- c. Install the mechanical seal from the outside after the crankcase is assembled. Refer to the procedure described in crankcase assembly in this chapter.

OIL PUMP

Disassembly/Inspection/Assembly

The oil pump can be removed after separating the crankcase halves as described in this chapter.

1. Remove the three screws attaching the pump intake screen and remove the screen from the pump. Refer to Figure 110.
2. Clean and inspect the screen. Check for damage to the screen and for other damage indicated by metal particles in the screen.
3. Remove the screw (Figure 111) and separate the cover from the pump body as shown in Figure 112.
4. Use a feeler gauge and measure the clearance between the outer rotor and the pump body as shown in Figure 113. Recommended clearance is listed in Table 4.
5. Use a feeler gauge and measure the clearance between the tip of the inner rotor and the outer rotor as shown in Figure 114. Recommended clearance is listed in Table 4.

6. Use a straightedge and feeler gauge as shown in **Figure 115** to measure the end play of the pump rotors. Recommended end play is listed in **Table 4**.

7. Remove the inner rotor, outer rotor and pump body from the pressure pump to expose the scavenge pump rotors and body.

8. Measure the clearances for the scavenge pump following the description in Steps 4-6. Recommended clearances are the same as those for the pressure pump and are listed in **Table 4**.

9. Clean and dry all parts thoroughly.

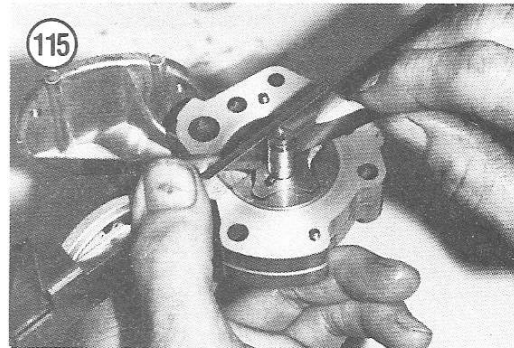
NOTE

Do not use any sealer when assembling the pump. Also, make sure the pump is absolutely clean when assembling.

10. Coat all parts of the pump with clean engine oil and assemble the pump without using sealer. Tighten the pump cover screws securely.

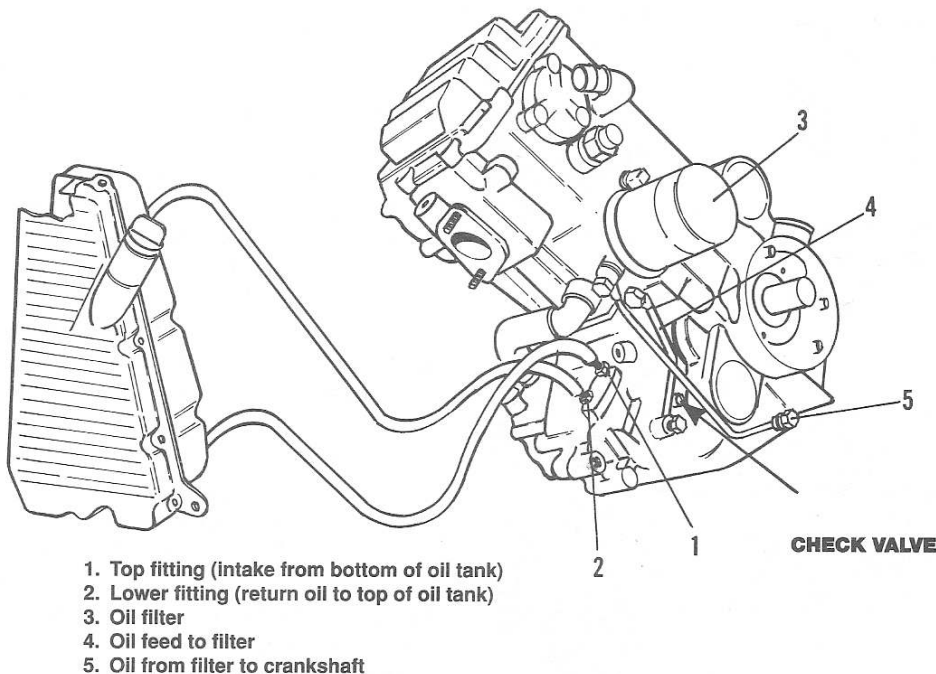
ONE WAY CHECK VALVE

The one way check valve is located under the flanged plug on the left side of the engine crankcase near the external oil pipes. Refer to **Figure 116**. The PVT (drive and driven pulleys) and the inner cover must be removed before the check valve can be removed. Usually, the one way check valve and spring (**Figure 117**) are only removed, cleaned and



116

OIL LINES AND CHECK VALVE



reassembled when overhauled. If engine is stopped, the check valve should be checked to **Table 3** for the one way check valve.

BREA

If the rings wear the cylinder rings work performed, it as though it were life of the engine sensible break-in.

For the first 5-10 than 1/3 throttle, possible within 1

Engine model

1995
Magnum 2 x 4
EH42PLE-01

Engine oil*
API type
Viscosity
Oil capacity
Oil pressure at 5
Normal
Minimum limit

* The manufacturer

Breather union
Cam drive sprocket
Cam driven sprocket
Cam chain tensioner
Cam chain tensioner
Carburetor flange
Coolant pump
Coolant pump in

VALVE

located under the engine crankcase in Figure 116. The inner cover and the inner cover check valve can be removed, cleaned and



reassembled when the engine is removed and being overhauled. If engine oil drains from the reservoir into the engine crankcase when the engine is stopped, the check valve is probably leaking. Refer to **Table 3** for torque recommended when installing the one way check valve plug.

BREAK-IN PROCEDURE

If the rings were replaced, a new piston installed, the cylinder rebored or honed or major lower end work performed, the engine should be broken-in just as though it were new. The performance and service life of the engine depends greatly on a careful and sensible break-in.

For the first 5-10 hours of operation, use no more than 1/3 throttle, and vary the speed as much as possible within the 1/3 throttle limit. avoid hard

acceleration in addition to prolonged steady running at one speed, no matter how moderate.

After the initial 5-10 hours of operation, use progressively more throttle (with short bursts of speed) until the ATV has run for 100-150 hours.

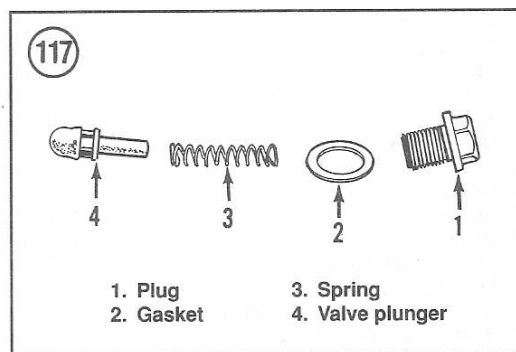


Table 1 4-STROKE ENGINE SPECIFICATIONS

Engine model	Bore mm (in.)	Stroke mm (in.)	Disp. cc (cid.)
1995 Magnum 2 × 4 and 4 × 4 EH42PLE-01	87.9 (3.4606)	70 (2.578)	425 25.9

Table 2 ENGINE LUBRICATION

Engine oil*		
API type	SE or SF	
Viscosity	10W-40	
Oil capacity	1.89 L	2 qt.
Oil pressure at 5,500 rpm		
Normal	138 kPa	20 psi
Minimum limit	83 kPa	12 psi

* The manufacturer recommends Polaris 40W/40 engine oil.

Table 3 TIGHTENING TORQUES MAGNUM 4-STROKE ENGINE

	N·m	ft.-lb.
Breather union	8.97-15.2	6.5-11
Cam drive sprocket nut	48.3-70.4	35-51
Cam driven sprocket screws	6.9-8.28	5-6
Cam chain tensioner slider	6.9-8.28	5-6
Cam chain tensioner plug	19.3-26.2	14-19
Carburetor flange	16.6-19.3	12-14
Coolant pump cover	6.9-8.97	5-6.5
Coolant pump impeller	6.9-8.97	5-6.5

(continued)

Table 3 TIGHTENING TORQUES MAGNUM 4-STROKE ENGINE (continued)

	N-m	ft.-lb.
Crankcase		
8mm	19.3-20.7	14-15
Crankcase drain bolt	19.3-23.5	14-17
Cylinder head bolts		
6mm	8.29	6
11mm	See text for procedure	
Cylinder head cover	8.28	6
Cylinder base bolts		
6mm	6.9-8.28	5-6
10mm	62.1-67.6	45-49
Flywheel	80.0-99.4	59-73
Oil delivery pipe bolts	24.8-34.5	18-25
Oil filter union	49.7-59.3	36-43
Oil hose union	8.97-15.2	6.5-11
Oil pressure blind plug	8.97-15.2	6.5-11
Oil pump mount bolts	6.9-8.97	5-6.5
One way valve plug	19.2-6.2	14-19
Recoil starter	6.9-8.97	5-6.5
Rocker arm support brackets	11.0-12.4	8-9
Rocker arm adjuster nut	8.28-9.66	6-7
Rocker shaft locating screw	8.28	6
Spark plug		
New	12.0-15.2	8.7-11
Old	23.5-27.6	17-20
Starter motor	6.9-8.97	5-6.5
Stator plate	6.9-8.97	5-6.5
Oil pump case screws	2.76	24 in.-lb.

Table 4 SERVICE SPECIFICATIONS

	mm	in.
Balance shaft end play	0.2-0.4	0.008-0.016
Cam chain tensioner spring		
Free length	58.9	2.320
Camshaft		
Exhaust cam lobe height	32.726-32.826	1.2884-1.2924
Wear limit	32.426	1.2766
Inlet cam lobe height	32.726-32.826	1.2884-1.2924
Wear limit	32.426	1.2766
Journal O.D.	38.005-38.025	1.4963-1.4970
Journal to bore clearance	0.055-0.090	0.0022-0.0035
Wear limit	0.10	0.0039
Connecting rod small end I.D.	23.007-23.020	0.9058-0.9063
Bearing radial clearance	0.007-0.026	0.0003-0.0010
Bearing wear limit	0.05	0.0020
Connecting rod big end		
Side clearance	0.1-0.65	0.0039-0.0256
Wear limit	0.80 mm	0.0315
Bearing radial clearance	0.011-0.038	0.0004-0.0015
Wear limit	0.05	0.0020
Crankshaft end play	0.2-0.4	0.008-0.016
Crankshaft runout limit	0.06	0.0024
Cylinder		
Bore diameter	87.900-87.920	3.4606-3.4614
Taper/out of round limit	0.050	0.002
Piston clearance	0.015-0.045	0.0006-0.0018
Wear limit	0.060	0.0024

(continued)

Cylinder head
Standard height
Warpage limit
Inlet valve
Margin limit
Overall length
Seat width
Stem diameter
Stem to guide
Exhaust valve
Margin limit
Overall length
Seat width
Stem diameter
Stem to guide
Oil pump
Inner rotor tip
Wear limit
Outer rotor to
Wear limit
Rotor end clear
Wear limit
Shaft end pla
Piston
Standard diam
Pin bore diam
Clearance in c
Desired
Wear limit
Piston pin O.D.
Clearance in
Piston rings
End gap
Top, desire
Wear limit
Second, de
Wear limit
Oil control
Wear limit
Side clearan
Top, desire
Wear limit
Second, de
Wear limit
Rocker arms
Bore clearanc
Wear limit
Shaft O.D.
Valve seat ar
Valve guide
Protrusion
Valve spring
Distortion l
Standard fi
Orange p
Yellow pa
Minimum fi
Orange p
Yellow pa

Table 4 SERVICE SPECIFICATIONS (continued)

	mm	in.
Cylinder head		
Standard height	98.3	3.870
Warpage limit	0.05	0.0020
Inlet valve		
Margin limit	0.8	0.031
Overall length	101.0	3.976
Seat width	0.7-1.4	0.028-0.055
Stem diameter	5.950-5.965	0.2343-0.2348
Stem to guide clearance	0.035-0.062	0.0014-0.0024
Exhaust valve		
Margin limit	0.8	0.031
Overall length	101.2	3.984
Seat width	1.0-1.8	0.039-0.071
Stem diameter	5.945-5.960	0.2341-0.2346
Stem to guide clearance	0.040-0.067	0.0016-0.0026
Oil pump		
Inner rotor tip clearance	0.127	0.005
Wear limit	0.2032	0.008
Outer rotor to pump body	0.0254-0.0762	0.001-0.003
Wear limit	0.1016	0.004
Rotor end clearance	0.0254-0.0762	0.001-0.003
Wear limit	0.1016	0.004
Shaft end play	0.2-0.4	0.008-0.016
Piston		
Standard diameter	87.875-87.885	3.4596-3.460
Pin bore diameter	23.0-23.006	0.9055-0.9057
Clearance in cylinder		
Desired	0.015-0.045	0.0006-0.0018
Wear limit	0.060	0.0024
Piston pin O.D.	22.994-23.0	0.9053-0.9055
Clearance in piston	0.004-0.008	0.0002-0.0003
Piston rings		
End gap		
Top, desired	0.20-0.36	0.0079-0.0138
Wear limit	1.0	0.039
Second, desired	0.20-0.36	0.0079-0.0138
Wear limit	1.0	0.039
Oil control, desired	0.20-0.70	0.0079-0.0236
Wear limit	1.5	0.059
Side clearance		
Top, desired	0.040-0.080	0.0016-0.0031
Wear limit	0.15	0.0059
Second, desired	0.030-0.070	0.0012-0.0028
Wear limit	0.15	0.0059
Rocker arms		
Bore clearance	0.020-0.054	0.0008-0.0021
Wear limit	0.10	0.0039
Shaft O.D.	21.987-22.0	0.8656-0.8661
Valve seat and face angle	45°	
Valve guide I.D.	6.0-6.012	0.2362-0.2367
Protrusion	17.5-18.0	0.689-0.709
Valve springs		
Distortion limit	1.9	0.075
Standard free length		
Orange paint	44.05	1.7342
Yellow paint	42.0	1.654
Minimum free length		
Orange paint	42.05	1.656
Yellow paint	40.0	1.575

CHAPTER SIX

FUEL AND EXHAUST SYSTEMS

The fuel system consists of the fuel tank, fuel shutoff valve, carburetor and air filter.

The exhaust system consists of an exhaust pipe and muffler assembly.

This chapter includes service procedures for all parts of the fuel system and exhaust system. Air filter service is covered in Chapter Three.

Carburetor specifications are covered in **Table 1**, located at the end of this chapter.

CARBURETOR OPERATION

An understanding of the function of each of the carburetor components and their relation to one another is a valuable aid for pinpointing a source of carburetor trouble.

The carburetor's purpose is to supply and atomize fuel in correct proportions with air drawn into the engine through the air intake. At the primary throttle opening (idle), a small amount of fuel is siphoned through the pilot jet by the incoming air. As the throttle is opened further, the air stream begins to

siphon fuel through the main jet and needle jet. A tapered needle is positioned in the needle jet and the effective flow capacity of the needle jet is increased as the needle is lifted.

At full throttle, the carburetor venturi is fully open and the needle is lifted far enough to permit the main jet to flow at full capacity.

The starting enrichment circuit is a starting jet system in which the choke lever opens a fuel enrichment valve rather than closing an air restricting butterfly. In the open position, the jet discharges a stream of fuel into the carburetor venturi to enrich the mixture when the engine is cold.

2-stroke models are equipped with a Mikuni VM carburetor. 4-stroke models are equipped with a Mikuni CV carburetor.

CARBURETOR (MODELS WITH 2-STROKE ENGINES)

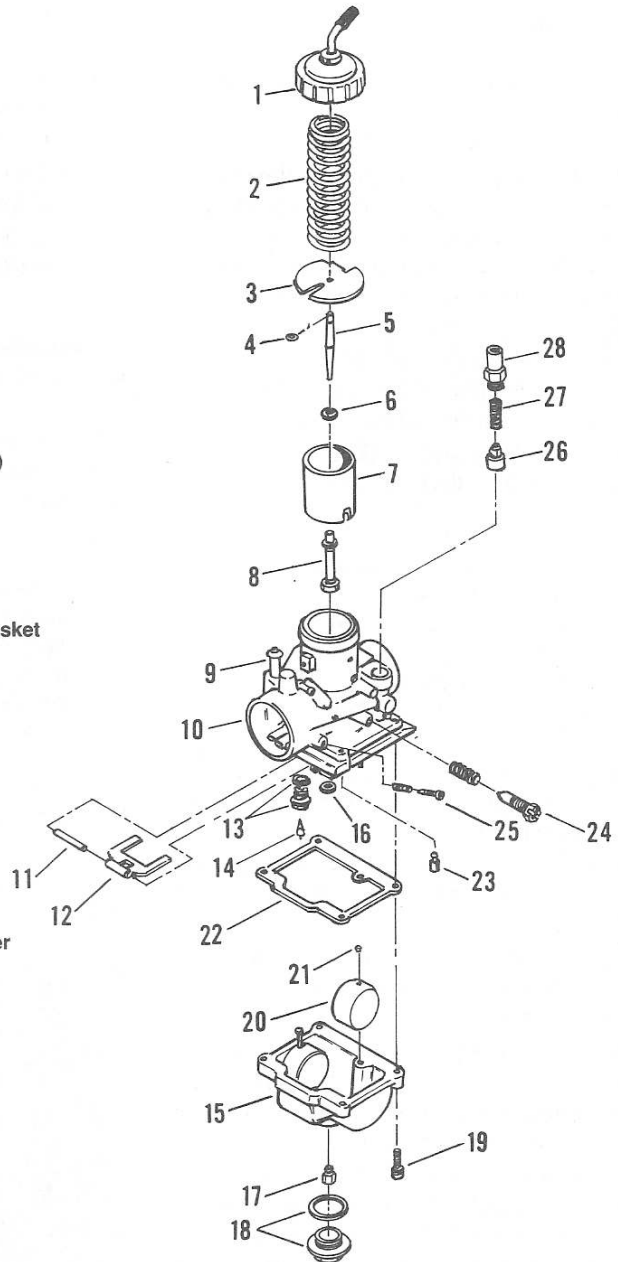
Refer to **Figure 1** and the following paragraphs when disassembling the carburetor.

1. Cap
2. Return
3. Needle
4. E-clip
5. Jet
6. Seal
7. Thro
8. Needle
9. Fuel
10. Body
11. Pin
12. Floa
13. Fuel
14. Fuel
15. Floa
16. Wash
17. Main
18. Plug
19. Scre
20. Floa
21. Retu
22. Bow
23. Pil
24. Idle
25. Idle
26. Star
27. Retu
28. Retu

1

**MIKUNI VM CARBURETOR
(MODELS WITH 2-STROKE ENGINES)**

- 1. Cap
- 2. Return spring
- 3. Needle retainer
- 4. E-clip
- 5. Jet needle
- 6. Seal washer (some models)
- 7. Throttle slide
- 8. Needle jet
- 9. Fuel inlet fitting
- 10. Body
- 11. Pin
- 12. Float arm
- 13. Fuel inlet valve seat and gasket
- 14. Fuel inlet valve needle
- 15. Float bowl
- 16. Washer
- 17. Main jet
- 18. Plug and O-ring
- 19. Screws
- 20. Floats
- 21. Retainer
- 22. Bowl gasket
- 23. Pilot jet
- 24. Idle stop screw
- 25. Idle mixture needle
- 26. Starting enrichment plunger
- 27. Return spring
- 28. Retainer



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wing paragraphs

Table 1 lists the carburetor originally installed and the original specifications. Some specifications may be different than listed to compensate for altitude, optional equipment or abnormal operating conditions.

Removal/Installation

1. Place the vehicle on level ground and set the parking brake.
2. Remove the seat and interfering panels.
3. Remove the fuel tank as described in this chapter.
4. Loosen the clamp at the rear of the carburetor and slide the air hose from the rear flange of the carburetor. It may be easier on some models to remove the air filter and inlet housing to provide more room.
5. Note the routing of the carburetor vent and overflow tubes prior to removing the carburetor. It is easier to attach the lines if they are marked before detaching them from the carburetor.
6. Unscrew the carburetor cap (**Figure 2**), then pull the throttle slide from the carburetor.

NOTE

As soon as it is removed, wrap the throttle slide in a shop towel to protect the slide and jet needle from damage.

7. Loosen the clamp (**Figure 3**), slide the carburetor back to free it from the intake adapter, then move it to the side.
8. Unscrew the starting plunger retainer (28, **Figure 1**) from the carburetor body and withdraw the starting enrichment plunger.
9. Refer to *Remove Throttle Slide* description in this chapter if the throttle slide is to be detached from the throttle cable.
10. Place a clean shop towel into the intake manifold and air box boot openings to prevent the entry of foreign material.
11. Install by reversing these removal steps, noting the following.
 - a. If separated, attach the throttle cable to the throttle slide as described in this chapter. Make sure that the valve needle is correctly seated, needle clip is in the correct groove and the retainer plate is in place between the throttle return spring and the throttle slide. Check throttle operation and be sure that the end of the cable is seated in recess of throttle slide.

- b. Insert the throttle slide into the carburetor, aligning the jet needle with the needle jet. The groove on the left side of the throttle slide must be aligned with the guide pin in the carburetor bore.
 - c. Install the cap (**Figure 2**) and tighten securely.
 - d. After installing, operate the throttle lever and the starting enrichment (choke) at the handlebar a few times. Make sure the throttle slide and starting enrichment valve operate properly without hanging up or binding.
 - e. Adjust the throttle cable free play as described in Chapter Three.
12. Insert the carburetor into the adapter and tighten the clamp (**Figure 3**).

Throttle Slide Removal/Installation

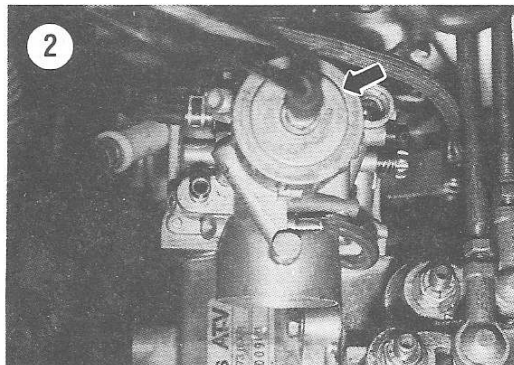
Refer to **Figure 1**.

1. Unscrew the cap (**Figure 2**) from the Mikuni VM carburetor.

CAUTION

If the throttle slide cannot be easily removed from the carburetor bore, have a Polaris dealer inspect the condition of the carburetor. Do not cause additional damage by attempting to force the slide from the bore.

2. Withdraw the throttle slide, cap and cable.
3. Compress the spring by pressing the throttle slide against the cap. Push the end of the cable to the side and disengage the throttle cable from the throttle slide.



4. Withdraw the cap. Separate the throttle slide from the throttle slide slowly.
5. Lift the retainer from the throttle slide washer located on the throttle slide.
6. Attach the throttle cable to the throttle slide as described in the procedure. Make sure the cable is seated in the throttle slide.

Engage the throttle slide with the left side of the throttle slide. The slide should not be binding.

7. Insert the throttle slide into the carburetor, making sure to align the throttle slide with the left side of the carburetor.
8. Tighten the carburetor cap.

Disassembly

1. Remove the throttle cable from the carburetor as described in this chapter.

*If possible, remove the throttle cable (see **Figure 1**) and disconnect the throttle cable while holding the throttle slide down, seat the throttle slide in the float bowl, and remove the small part of the throttle slide.*

2. Remove the plug from the bottom of float bowl.



4. Withdraw the cable from the throttle slide and cap. Separate the cap, throttle slide and spring slowly.
5. Lift the retainer plate, jet needle and needle clip from the throttle slide. Some models may have a seal washer located between the needle clip and the throttle slide.
6. Attach the throttle slide to the cable by reversing the procedure. Make sure the throttle cable end is seated in the throttle slide relief.

NOTE

Engage the groove in the side of the throttle slide with the alignment pin in the left side of the carburetor bore. The slide should move freely without binding.

7. Insert the throttle slide into the carburetor, making sure to align the jet needle with the needle jet.
8. Tighten the cap (**Figure 2**) securely.

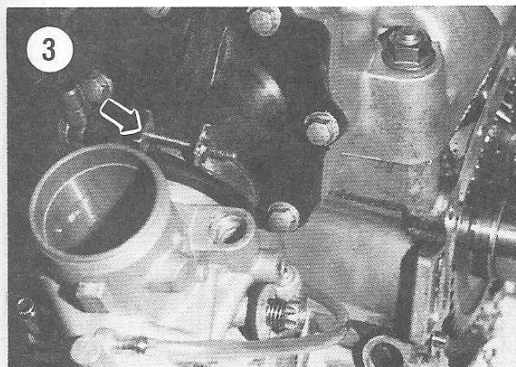
Disassembly

1. Remove the Mikuni VM carburetor as described in this chapter.

CAUTION

*If possible, remove the plug (18, **Figure 1**) and float bowl (15, **Figure 1**) while holding the carburetor upright. If the carburetor is turned upside down, sediment from the bottom of the float bowl may be dumped into the small passages located in the upper part of the carburetor.*

2. Remove plug (18, **Figure 1**) and O-ring from bottom of float bowl.



3. Remove screws (19, **Figure 1**) and separate the float bowl from the carburetor body. Be careful not to lose or damage the floats (20, **Figure 1**), or retainers (21, **Figure 1**), when removing the float bowl. Inspect the float bowl for sediment.
4. Remove pin (11, **Figure 1**), then remove the float arm (12, **Figure 1**), and the fuel inlet needle (14, **Figure 1**).

NOTE

*Before removing the idle mixture needle (25, **Figure 1**), check its current setting as follows. Observe the location of the slot in the idle mixture needle and turn it clockwise until lightly seated while noticing how far the needle has turned from its initial setting. Record the original setting as turns or parts of turns from the seated position. Compare the observed setting with the suggested setting in **Table 1**. Large differences may indicate improper setting or attempts to compensate for other problems.*

5. Remove the idle mixture needle and spring (25, **Figure 1**).
6. If not already removed, remove the carburetor throttle slide (7, **Figure 1**) as described in this chapter.
7. Remove the idle speed screw, O-ring and spring (24, **Figure 1**) from the carburetor body.
8. If not already removed, remove the retainer (28, **Figure 1**) and withdraw the starting enrichment plunger (26, **Figure 1**) and spring (27, **Figure 1**).
9. Remove the main jet (17, **Figure 1**) and washer (16, **Figure 1**).
10. Push the needle jet (8, **Figure 1**) up and out of the carburetor body.
11. Remove the fuel inlet seat (13, **Figure 1**).

CAUTION

*The pilot jet (23, **Figure 1**) can be easily damaged by attempting to remove it with a screwdriver that is the wrong size.*

12. Carefully remove the pilot jet (23, **Figure 1**).
13. Carefully remove the float retainers (21, **Figure 1**) and pull floats from the posts in the float bowl. The posts and the floats should be clean and smooth. The floats must move easily on the posts.
14. Clean and inspect all parts as described in this chapter.

Cleaning and Inspection

1. Initially clean all parts in a petroleum based solvent, then clean in hot soapy water. Rinse parts with cold water and blow dry with compressed air.

CAUTION

Do not dip the carburetor body or any of the O-rings in a carburetor cleaner or other solution that can damage the rubber parts and seals.

CAUTION

If compressed air is not available, allow the parts to air dry or use a clean lint-free cloth. Do not use a paper towel to dry carburetor parts, as small paper particles may plug openings in the carburetor body or jets.

CAUTION

Do not use wire or drill bits to clean jets as minor gouges in the jet can alter flow rate and upset the fuel/air mixture. Plugged jets can sometimes be cleared by using compressed air, but be careful that the obstruction is removed, not just more deeply seated.

2. Make sure the overflow and vent tubes are clear. Blow tubes, fittings and passages out with compressed air if necessary.

3. Inspect the float bowl gasket for damage or deterioration; replace if necessary.

4. Inspect the fuel inlet valve assembly (13 and 14, **Figure 1**) as follows:

- a. Be sure that all of the gasket is removed from the carburetor body and the valve seat. Always install a new gasket when assembling.
- b. Inspect the end of the fuel inlet valve needle (14, **Figure 1**) for wear or damage.
- c. Check the inside of the fuel inlet valve body (seat) (13, **Figure 1**) uneven wear or other damage.
- d. If the fuel inlet valve needle and/or body (seat) are damaged, replace the fuel valve assembly as a set. Damage to these parts will result in flooding and an excessively rich fuel mixture.

5. Inspect the idle mixture needle (25, **Figure 1**) and spring for damage. Replace the needle if the tip or threads are damaged.

6. Inspect the O-ring on the idle speed screw (24, **Figure 1**) for excessive wear, hardness, cracks or other damage. Replace if necessary.

7. Inspect the float for deterioration or damage. If the float is suspected of leakage, place it in a water filled container and push it down. If the float sinks or if bubbles appear (indicating a leak), the float must be replaced.

8. Move the throttle slide (7, **Figure 1**) up and down in the carburetor bore and check for free movement. If it does not move freely or if it sticks in any position, determine the cause and repair or install a new throttle slide and carburetor body.

9. Inspect the orifices in the pilot jet (23, **Figure 1**) and the needle jet (8, **Figure 1**). Check for damage caused by improper removal procedures and use care not to damage the openings while cleaning.

10. Make sure all passages and openings in the carburetor body are clear. Clean any that are plugged.

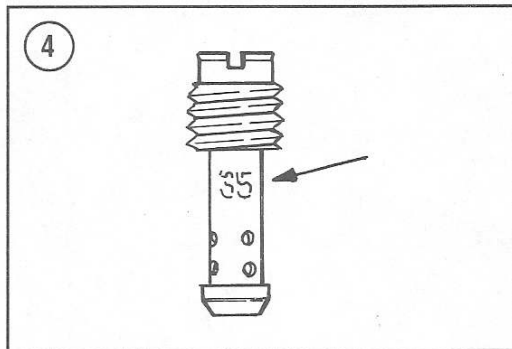
Assembly

1. Insert the needle jet (8, **Figure 1**) into the carburetor body. Align the notch in the jet with the pin in its bore.

2. Install washer (16, **Figure 1**) and main jet (17, **Figure 1**).

3. Install the fuel inlet valve seat (13, **Figure 1**) using a new gasket.

4. Install the idle mixture needle and spring (25, **Figure 1**). Turn the needle clockwise until lightly seated, then back it out the number of turns noted during disassembly. Refer to **Table 1** for standard setting.



Do not over-stall. The aged by ca

5. Install and the jet size is stamped. Refer to **Table 1**.
6. Insert the fuel seat assembly.
7. Position the float and between the pivot pin.

Do not bend their position the same by bending of the arm

8. Turn the carburetor to serve the position should be parallel of the body. If it contacts the fuel setting.

9. Install the float the float bowl. The floats should be in bowl.

10. Install the needle sure the floats move.

11. Install the float **Figure 1**. Tighten

12. Install the pilot the fuel bowl up

13. Compare the jet needle (5, **Fig** in **Table 1**. The standard position Number "2" is installed in the seat needle.

14. Position the slide (7, **Figure** sealing washer

15. Thread the throttle guide in the cap and retainer (3, **Fig** thread the throttle

speed screw (24, hardness, cracks or dry.

tion or damage. If place it in a water a. If the float sinks a leak), the float (Figure 1) up and down for free movement. If it sticks in any repair or install a pivot pin.

jet (23, Figure 1) Check for damage procedures and use while cleaning. openings in the can any that are

1) into the carburetor jet with the pin in

and main jet (17,

13, Figure 1)

le and spring (25, clockwise until lightly number of turns noted Table 1 for standard

CAUTION

Do not overtighten the pilot jet when installing. The pilot jet can be easily damaged by careless installation procedures.

5. Install and tighten the pilot jet (23, Figure 1). The jet size is stamped on the side as shown in Figure 4. Refer to Table 1 for standard size jet.
6. Insert the fuel inlet needle (14, Figure 1) into the seat assembly.
7. Position the float arm over the fuel inlet needle and between the attaching brackets, then install the pivot pin.

NOTE

Do not bend the float arms to change their position. Both arms should be at the same height and both are changed by bending the small tang in the center of the arms.

8. Turn the carburetor body upside down and observe the position of the float arm. The float arm should be parallel (Figure 5) with the gasket surface of the body. If necessary, bend the small tang that contacts the fuel inlet needle to adjust the float arm setting.
9. Install the floats (20, Figure 1) over the pins in the float bowl. The small pins on the sides of the floats should be facing toward the bottom of the float bowl.
10. Install the retainers (21, Figure 1) and make sure the floats move freely.
11. Install the float bowl using a new gasket (22, Figure 1). Tighten screws (19, Figure 1) securely.
12. Install the plug (18, Figure 1) on the bottom of the fuel bowl using a new O-ring.
13. Compare the number stamped on the side of the jet needle (5, Figure 1) with the standard size listed in Table 1. The number following the "-" indicates the standard position of the E-ring (4, Figure 1). Number "2" indicates that the E-ring should be installed in the second groove from the top of the jet needle.
14. Position the jet needle and E-clip in the throttle slide (7, Figure 1). Some carburetors may have a sealing washer (6, Figure 1) located between the E-ring and the throttle slide.
15. Thread the throttle cable down through the cable guide in the cap (1, Figure 1), spring (2, Figure 1) and retainer (3, Figure 1). Compress the spring and thread the throttle cable through the throttle slide (7,

Figure 1). Push the cable to the side and seat the end in the pocket.

16. Install the throttle (idle speed) stop screw, spring and O-ring (24, Figure 1). Adjust the initial position of the stop screw as follows.
 - a. Insert the throttle slide into the carburetor bore and thread the cap (1, Figure 1) onto the carburetor body.
 - b. Tighten the stop screw (24, Figure 1) just enough to begin lifting the throttle slide (7, Figure 1). The stop screw increases the idle speed by holding the slide open a small amount.
 - c. The carburetor cap (1, Figure 1) and throttle slide (7, Figure 1) can be removed after setting the initial adjustment of the throttle stop screw. Carburetor installation may be easier with throttle slide removed until after installation to the engine.
17. Thread the starting enrichment (choke) cable through the retainer (28, Figure 1) and return spring (27, Figure 1). Attach the end of the cable to the starter plunger (26, Figure 1).
18. Install the carburetor as described in this chapter, then install the throttle slide and the starting enrichment plunger. Check for proper operation of the starting enrichment (choke) and throttle controls.
19. Adjust the carburetor as described in this chapter after assembly and installation are complete.

Mixture Adjustments

The fuel inlet valve is controlled by the float to maintain a constant fuel level in the carburetor float bowl. The height of the fuel affects the fuel/air mixture throughout the engine's operating range, so the position of the float arm (Figure 5) should be adjusted as described in this chapter.

Adjustment of the idle mixture needle (25, Figure 1) is described in Chapter Three. The initial setting listed in Table 1 is recommended for operation at ambient temperatures of 5-26° C (40-80° F) at altitudes of 0-900 M (0-300 ft.). Adjustment will probably be required (to lean the mixture) for improved performance at higher altitudes and at warmer temperatures. Turning the mixture needle out (counterclockwise) will lean the mixture.

The size of the pilot jet (23, Figure 1) also affects the fuel/air mixture for low speed throttle settings, but the size will probably not require changing.

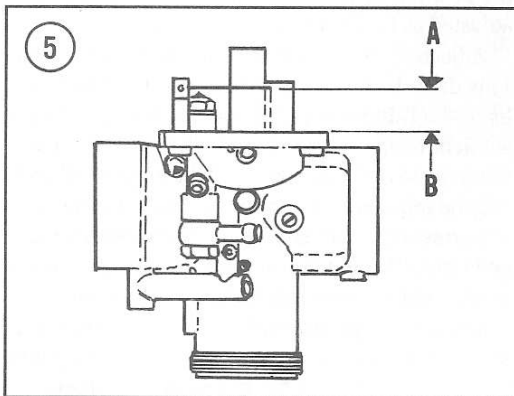
The position and size of the jet needle (5, **Figure 1**) affects the fuel/air mixture for intermediate (medium) throttle openings. The E-clip (4, **Figure 1**) is located in one of the grooves at the top of the jet needle. **Table 1** lists the standard size jet needle and the number following the “-” identifies the original position of the E-ring. The position number indicates the number of grooves from the top of the needle. Installing the E-clip in a groove closer to the top of the jet needle will lower the needle and lean the mixture during mid-throttle opening. Moving the E-clip to a groove further from the top of the jet needle will raise the needle and enrich the mid-range mixture.

The size of the main jet (17, **Figure 1**) affects the fuel/air mixture during wide-open throttle operation. Different size main jets are available and can be installed to change the wide-open throttle mixture. The size is stamped on the jet. The size listed in **Table 1** is recommended for operation at ambient temperatures of 5-26° C (40-80° F) at altitudes of 0-900 M (0-3000 ft.). A smaller size main jet may be required for optimum performance at higher altitudes and at warmer temperatures. A larger main jet may be used at colder temperatures.

CARBURETOR (MODELS WITH 4-STROKE ENGINES)

Refer to **Figure 6** and the following paragraphs when disassembling the carburetor. Mikuni CV carburetors are used on Magnum (4-stroke) models.

Table 1 lists the carburetor originally installed and the original specifications. Some specifications may be different than listed to compensate for altitude,

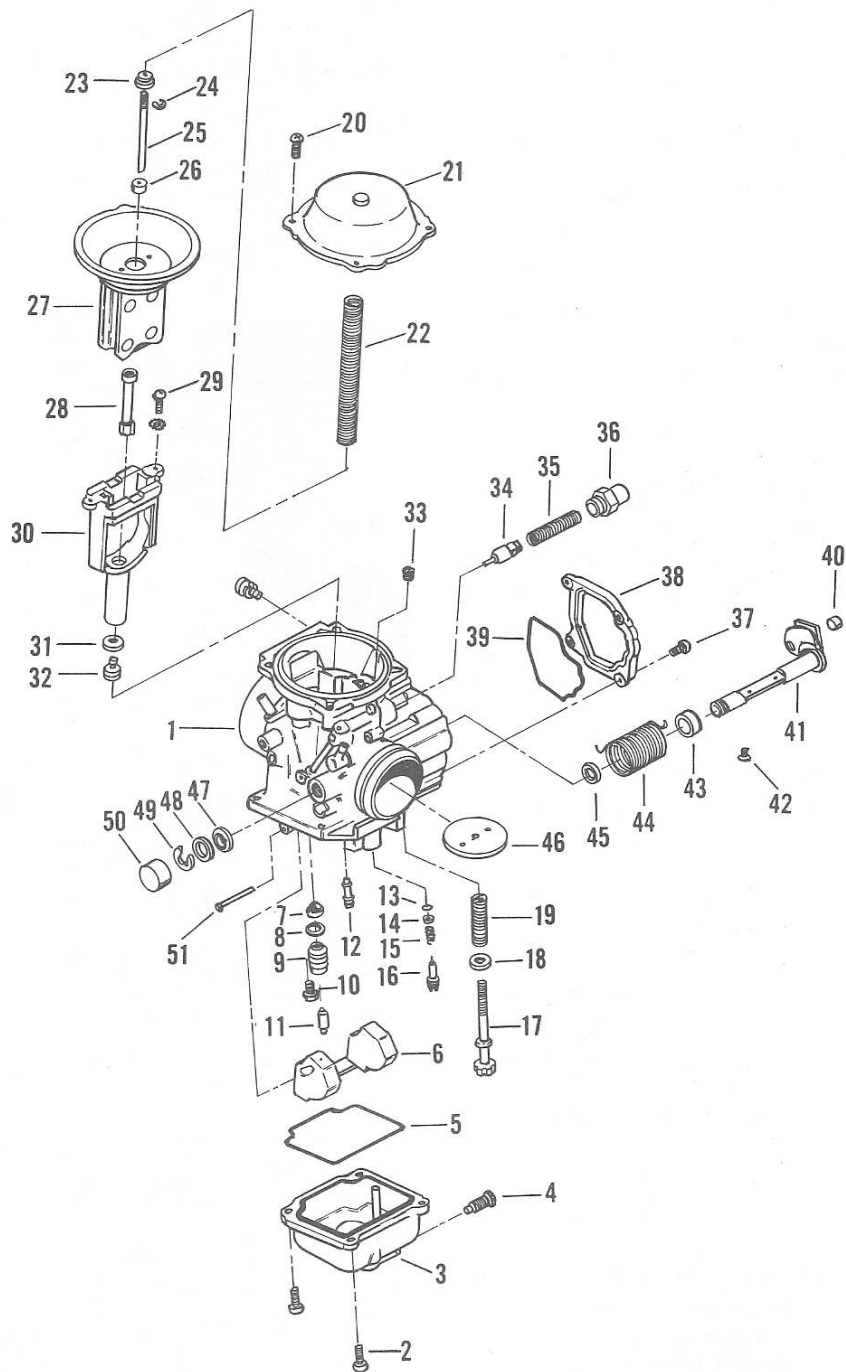


6

MIKUNI CV CARBURETOR (MODELS WITH 4-STROKE ENGINES)

1. Body
2. Screw
3. Float bowl
4. Plug
5. O-ring
6. Float
7. Filter screen
8. O-ring
9. Fuel inlet valve seat
10. Screw
11. Fuel inlet valve needle
12. Pilot (fuel) jet
13. O-ring
14. Washer
15. Spring
16. Idle mixture needle
17. Idle speed stop screw
18. Washer
19. Spring
20. Screw
21. Cover
22. Spring
23. Spring seat
24. E-ring
25. Jet needle
26. Spacer
27. Diaphragm and vacuum slide assembly
28. Needle jet
29. Screw
30. Jet block assembly
31. Washer
32. Main jet
33. Pilot (air) jet
34. Starting enrichment valve
35. Spring
36. Retainer
37. Screw
38. Cover
39. O-ring
40. Cable guide
41. Throttle shaft
42. Screws
43. Ring
44. Return spring
45. Seal
46. Throttle valve
47. Seal
48. Packing
49. E-ring
50. Cap
51. Pin

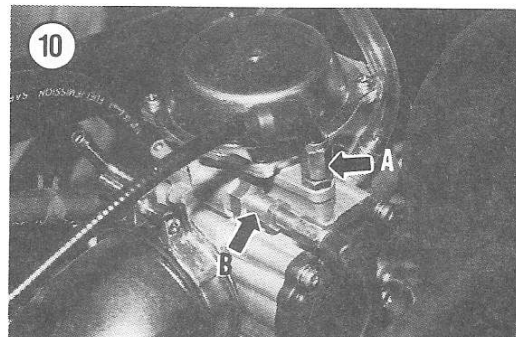
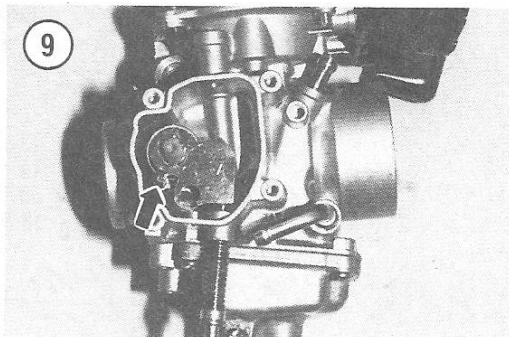
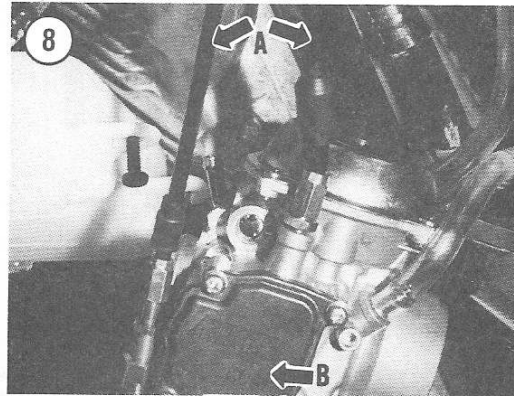
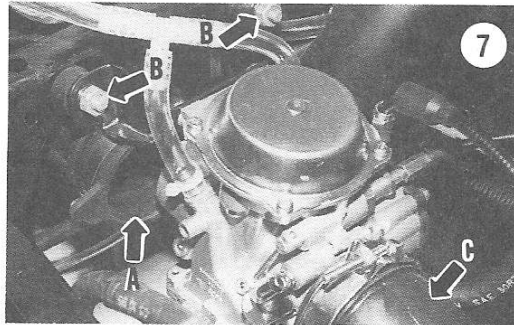
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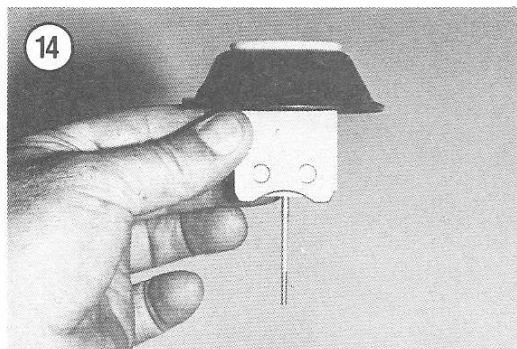
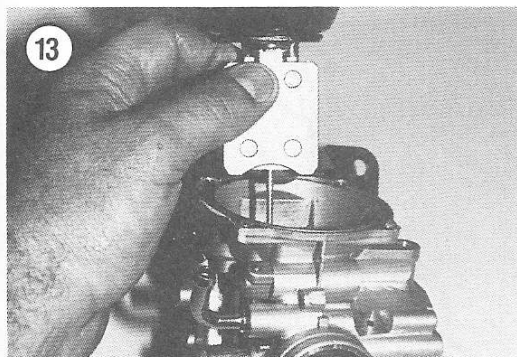
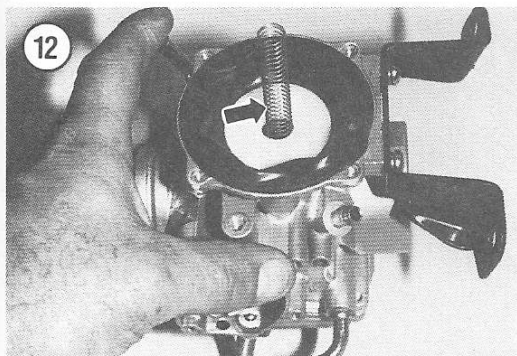
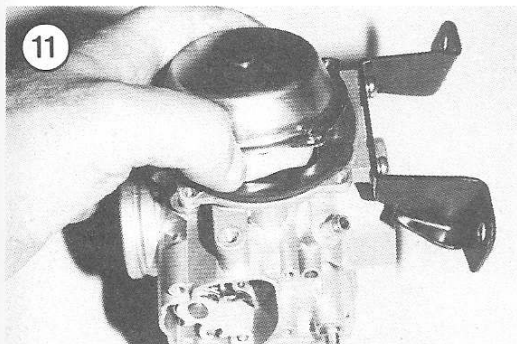


optional equipment or abnormal operating conditions.

Removal/Installation

1. Place the vehicle on level ground and set the parking brake.
2. Remove the seat and interfering panels.
3. Remove the fuel tank as described in this chapter.
4. Loosen the clamp at the rear of the carburetor and slide the air hose (A, **Figure 7**) from the rear flange of the carburetor. It may be easier to remove the air filter and inlet housing to provide more room.
5. Remove the carburetor attaching nuts (B, **Figure 7**).
6. Note the routing of the carburetor vent and overflow tubes prior to removing the carburetor. It is easier to attach the lines if they are marked before detaching them from the carburetor.
7. Loosen the clamp (C, **Figure 7**), slide the carburetor back to free it from the intake adapter, then move it to the side.
8. Move the carburetor to the side so the control cables (A, **Figure 8**) can be detached more easily. Remove the carburetor side cover screws and remove the side cover (B, **Figure 8**).
9. Detach the throttle cable from the throttle lever (**Figure 9**). Loosen the locknut on the throttle cable adjuster, unscrew cable adjuster, then withdraw the throttle cable.
10. Place a clean shop towel into the intake manifold and air box boot openings to prevent the entry of foreign material.
11. Install by reversing these removal steps, noting the following.
 - a. Insert the throttle cable into the body and attach the cable end to the lever (**Figure 9**).
 - b. Tighten the cable adjuster (A, **Figure 10**) into the carburetor and tighten the locknut.
 - c. Insert the starting enrichment valve into the carburetor bore and tighten the retainer (B, **Figure 9**).
 - d. Operate the throttle lever and the starting enrichment (choke) controls a few times. Make sure the throttle lever moves smoothly at the carburetor with no binding and that the cable end does not pop out.
 - e. Adjust the throttle cable free play as described in Chapter Three.





- f. Adjust the starting enrichment cable as described in this chapter.
 - g. Install the cover (B, **Figure 8**) and tighten the screws securely.
12. Insert the carburetor into the front adapter and tighten the clamp (C, **Figure 7**).
 13. Reverse removal procedure to complete installation.

Diaphragm/Vacuum Slide/Jet Needle Removal/Installation

1. Remove the top cover screws and the cover (**Figure 11**).
2. Remove the spring (**Figure 12**).
3. Remove the diaphragm and vacuum slide assembly (**Figure 13**).
4. Push the jet needle up to dislodge the spring seat (23, **Figure 6**). Remove the jet needle (25, **Figure 6**), E-ring (24, **Figure 6**) and spacer (26, **Figure 6**).
5. Refer to **Table 1** for standard size jet needle. E-ring (24, **Figure 6**) is originally installed in the third groove from the top of the jet needle as indicated by the "3" at the end of the jet needle size in **Table 1**.
6. Reinstall the diaphragm, vacuum slide and jet needle (**Figure 14**).
7. Install spring (**Figure 12**) in the center of the diaphragm.
8. Make sure that the diaphragm is correctly positioned, then install the cover (**Figure 11**). Tighten the retaining screws securely.

Idle Speed Adjustment

Adjustment of the idle speed stop screw (17, **Figure 6**) is covered in Chapter Three.

Fuel Inlet Valve

The fuel inlet needle (11, **Figure 6**) is moved by the float to allow fuel to enter the float bowl or to stop the flow of fuel into the float bowl. If the fuel inlet valve sticks shut and does not open, the engine will starve for fuel. If the valve does not close completely, the engine will flood with fuel.

The carburetor has to be removed and partially disassembled to remove and install the fuel inlet valve.

1. Remove the carburetor as described in this chapter.
2. Remove the screws (2, **Figure 6**) securing the float bowl and remove float bowl.
3. Use a small punch to push the pin (51, **Figure 6**) from the bracket for the float.
4. Remove the float (6, **Figure 6**) and the fuel inlet needle (11, **Figure 6**). Inspect the tip of the inlet needle (**Figure 15**).
5. Remove screw (10, **Figure 6**) and pull valve seat (**Figure 16**) from the carburetor body bore. Filter screen (B, **Figure 17**) should be over the end of the valve seat.
6. Reassemble using a new O-ring (A, **Figure 17**), seat (C, **Figure 17**) and needle (**Figure 15**). Hook the wire clip on the inlet needle to the tang of the float as shown in **Figure 18**.
7. Refer to *Float Adjustment* in this chapter for setting the fuel level.
8. Reassemble by reversing the disassembly procedure.
9. The float valve can be checked using a small pressure checker connected to the fuel inlet as shown in **Figure 19**. The valve should hold 34.5 kPa (5 psi) indefinitely.

Float Adjustment

The fuel inlet valve is controlled by the float to maintain a constant fuel level in the carburetor float bowl. Because the height of the fuel affects the fuel/air mixture throughout the engine's operating range, make sure the float position is correctly adjusted.

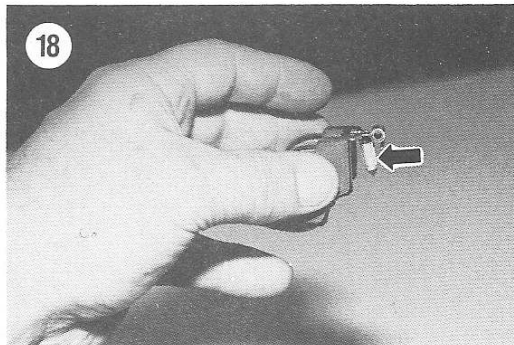
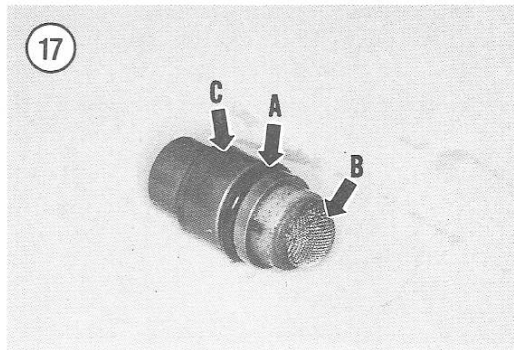
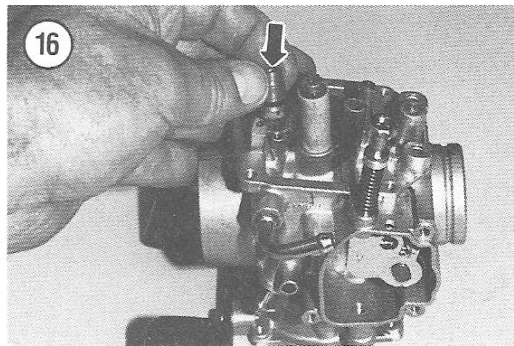
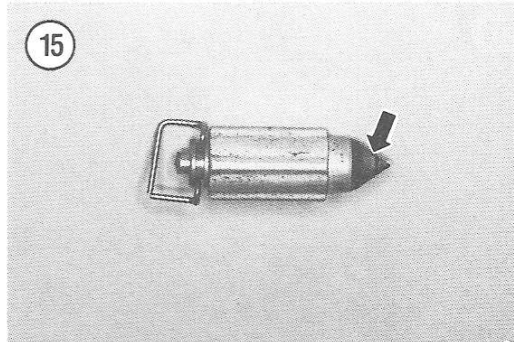
The carburetor assembly has to be removed and partially disassembled for this adjustment.

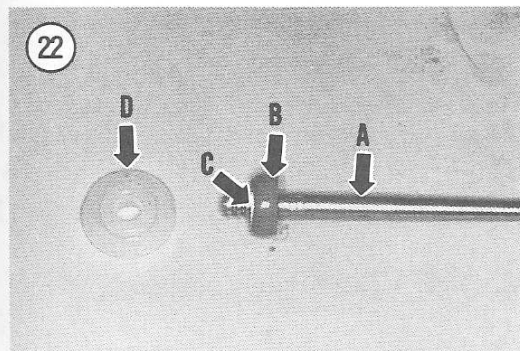
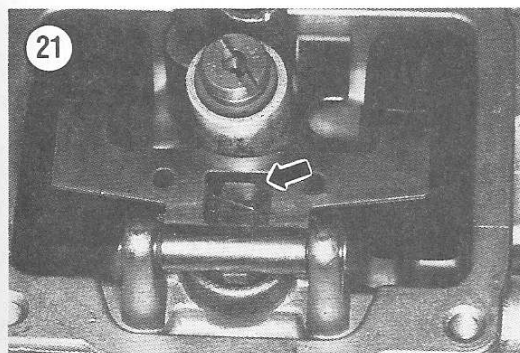
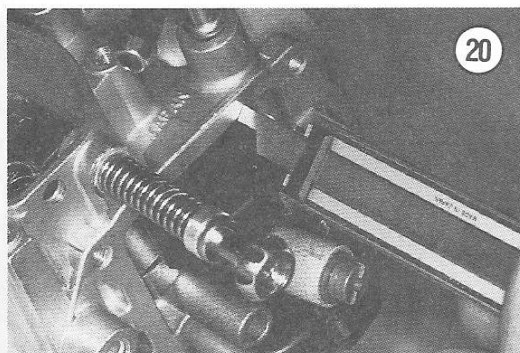
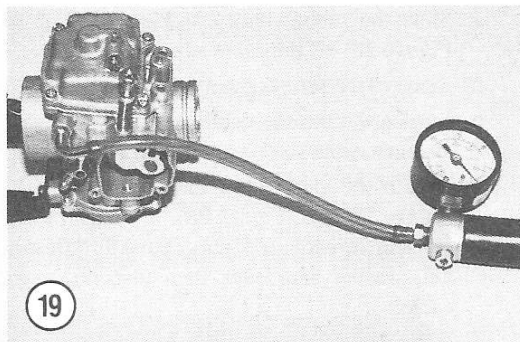
1. Remove the carburetor as described in this chapter.
2. Remove the screws (2, **Figure 6**) securing the float bowl and remove float bowl.

NOTE

Be sure that the weight of the float is not pushing the fuel inlet valve needle down when checking the float setting.

3. Hold the carburetor on its side so the tang in the middle of the float arm is just touching the fuel valve. Use a float level gauge, vernier caliper or small ruler as shown in **Figure 20** to measure the distance from the carburetor body gasket surface (gasket removed)





to the float. The correct distance is 14.5-14.7 mm (0.53-0.61 in.).

4. If the float setting is incorrect, adjust as follows:
 - a. Carefully bend the tang in the center of the float arm (Figure 21) with a small screwdriver to adjust the float level.
 - b. Recheck the float level as described in Step 3. Repeat until the float level adjustment is correct.
5. Reassemble and install the carburetor.

Jet Needle Adjustment

The position of the jet needle can be adjusted to affect the fuel/air mixture for medium throttle openings.

1. Remove the *Diaphragm/Vacuum Slide/Jet Needle* (Figure 14) as described in this chapter.
2. Push the jet needle up to dislodge the spring seat (23, Figure 6). Remove the jet needle (A, Figure 22), spacer (B), E-ring (C) and spring seat (D).
3. Refer to Table 1 for standard size jet needle. The E-ring (C, Figure 22) is originally installed in the third groove from the top of the jet needle as indicated by the "3" at the end of the jet needle in Table 1.

NOTE

Record the clip position prior to removal.

4. Raising the needle (lowering the E-ring) will enrich the mixture during mid-throttle opening, while lowering the needle (raising the E-ring) will lean the mixture.
5. Install the jet needle, vacuum slide and diaphragm as described in this chapter.

Main Jet

The size of the main jet (32, Figure 6) affects the fuel/air mixture during wide-open throttle operation. Different size main jets are available and can be installed to change the mixture for operation at high engine speeds.

The carburetor assembly has to be removed and partially disassembled to remove the main jet.

1. Remove the carburetor as described in this chapter.
2. Remove the screws (2, Figure 6), securing the float bowl and remove float bowl.

3. Remove the main jet and washer (**Figure 23**).
4. The size is stamped on the jet. The main jet size listed in **Table 1** is recommended for operation at ambient temperatures of 5-26° C (40-80° F) at altitudes of 0-900 m (0-3000 ft.). A smaller size main jet may be required for optimum performance at higher altitudes and at warmer temperatures. A larger main jet may be used at colder temperatures.
5. Install the main jet and reassemble the carburetor by reversing the disassembly procedure.

Idle Mixture Adjustment

Adjustment of the idle mixture needle (16, **Figure 6**) is described in Chapter Three. The initial setting is listed in **Table 1**.

The size of the pilot (fuel) jet (12, **Figure 6**) and the air jet (33, **Figure 6**) also affects the fuel/air mixture for low speed throttle settings. The pilot fuel jet (A, **Figure 24**) can be removed after removing the carburetor and float bowl as described in the preceding *Main Jet* paragraphs. The pilot air jet (**Figure 25**) can be removed after removing the *Diaphragm/Vacuum Slide/Jet Needle* as described in this chapter.

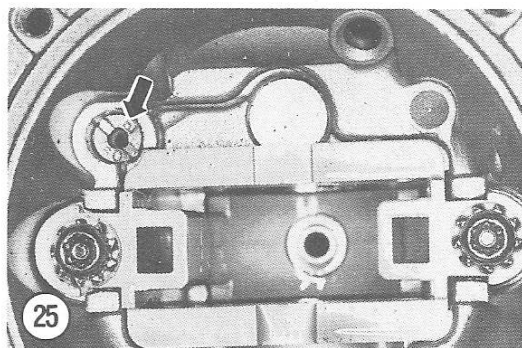
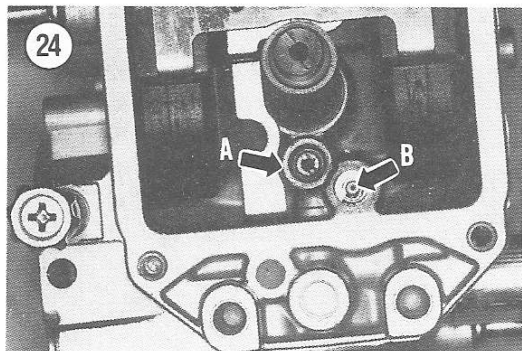
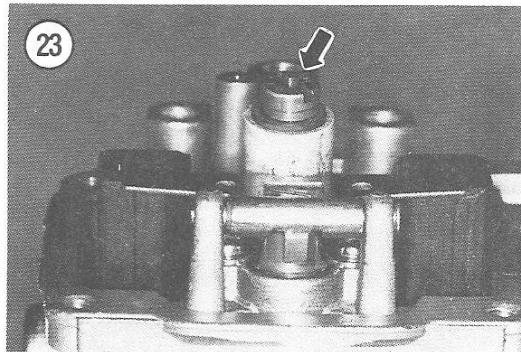
THROTTLE CABLE REPLACEMENT

The throttle cable on models with 2-stroke engines branches into 2 cables. 1 branch of the cable controls the carburetor and the other controls the oil injection (lubrication) pump. If the cable is damaged at any location, the cables must be replaced as an assembly.

A single throttle cable connects the speed control at the handlebar with the carburetor on models with 4-stroke engines.

1. Place the vehicle on level ground and set the parking brake.
2. Remove the seat.
3. Remove the fuel tank cover and front fender as described in Chapter Fifteen.
4. Remove the fuel tank as described in this chapter.
5. Disconnect the throttle cable from the carburetor as described under *Carburetor Removal/Installation* in this chapter.
6. On 2-stroke models, disconnect the throttle cable from the oil injection pump. Refer to **Figure 26**.
7. Disconnect the throttle cable from the handlebar mounted throttle lever as follows:

- a. Slide the rubber boot (A, **Figure 27** or A, **Figure 28**) off the cable adjuster.
- b. Remove the screws from the cover.
- c. Loosen the throttle cable adjuster to provide as much cable slack as possible.
- d. Detach the cable from the throttle arm (B, **Figure 27** or B, **Figure 28**). If you can't disconnect the cable end, remove the throttle arm nut, washer and lever, then disconnect the cable.
- e. Withdraw the cable from the throttle housing.



8. Disconnect the cable from the handlebar mounted throttle lever as follows:

A string can be used to pull the cable out of the handlebar before withdrawing the cable from the original cable housing.



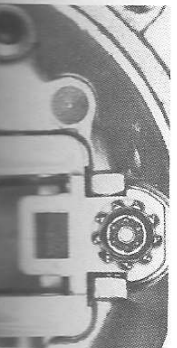
Figure 27 or A,
adjuster.

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throttle arm (B,
A. If you can't dis-
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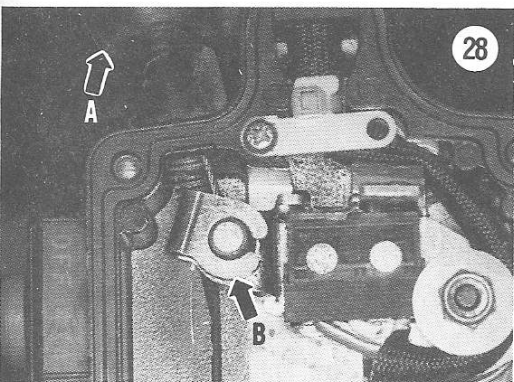
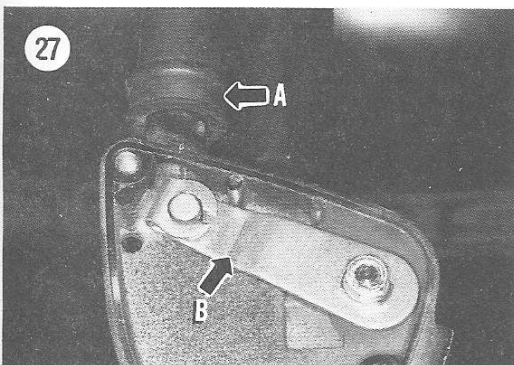
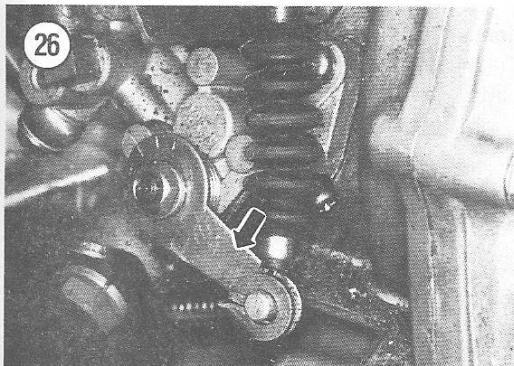
throttle housing.



- Disconnect the throttle cable from any clips holding the cable to the frame.

NOTE

A string can be attached to the cable before withdrawing it, so the original path of the cable is occupied with the string. The new cable can be attached to the string and pulled into the path of the original cable.



- Make a note of the cables routing path through the frame, then remove it.
- Lubricate the new cable(s) as described in Chapter Three.
- Reverse Steps 1-8 to install the new cable assembly.
- The junction block of the throttle and oil injection pump cables should be attached securely to the frame with a cable tie.
- Reattach the throttle cable to the carburetor as described under *Carburetor Removal/Installation* in this chapter.
- Apply grease to the handlebar end of the cable and attach it to the throttle lever and housing.
- On 2-stroke models, attach the cable to the oil injection pump control lever (Figure 26).
- Adjust the cable free play as described in Chapter Three.
- On 2-stroke models, adjust the oil injection pump as described in Chapter Three.
- Operate the throttle lever and make sure the carburetor throttle linkage is operating correctly with no binding. If operation is incorrect or there is binding, make sure the cable is attached correctly and there are no tight bends in the cable.
- Test ride the vehicle and make sure the throttle is operating correctly.

CHOKE CABLE

The choke control provides a rich fuel/air mixture for starting the engine. This starting enrichment is accomplished by opening a valve in the carburetor that permits the flow of more fuel. This starting enrichment (choke) valve is shown at 26, Figure 1 or 34, Figure 6. The valve is attached to the choke control knob by a cable, which must be free to open and close the valve. Starting may be difficult if the valve cannot open and the mixture is too rich to run correctly, if it does not close.

Removal/Installation

The starting enrichment valve is shown at 26, Figure 1 for Mikuni VM carburetors used on models with a 2-stroke engine. The similar valve is shown at 34, Figure 6 for the Mikuni CV carburetor used on Magnum models with a 4-stroke engine.

- Locate the choke cable at the carburetor and remove the retainer (28, Figure 1 or 36, Figure 6).

2. Withdraw the cable, retainer, spring and valve (26, **Figure 1** or 34, **Figure 6**) from the carburetor bore.
3. Inspect the operation as follows.
 - a. Hold the choke valve end of the control cable and operate the choke knob.
 - b. Observe the movement of the valve at the end of the cable.
 - c. The cable should move easily inside its housing and the spring should move the valve smoothly. The pressure of the spring must be sufficient to move the cable and close the valve.
 - d. Inspect the valve for scratches or other damaged surfaces that would affect smooth movement or cause leakage.
4. Compress the spring (27, **Figure 1** or 35, **Figure 6**) and detach the valve from the control cable.
5. Detach the upper end of the choke cable and remove any clips holding the cable to the frame.
6. Make a note of the cable's path through the frame, then remove it.
7. Lubricate the new cable as described in Chapter Three.
8. Reverse the removal procedure to install the new cable assembly.
9. On Magnum models with Mikuni CV carburetor, adjust the choke cable as follows.
 - a. Remove the fuel tank as described in this chapter.
 - b. Remove the *Diaphragm/Vacuum Slide/Jet Needle* as described in this chapter.
 - c. The choke lever has three positions, choke off, 1/2 choke and full choke. Move the choke to OFF position and observe the small hole shown in **Figure 29**. The starting enrichment plunger should close the hole.
 - d. Move the choke control to the 1/2 choke position and observe the small hole **Figure 29**. The hole should be half-way covered by the valve.
 - e. Move the choke control to the FULL choke position and observe the small hole **Figure 29**. The hole should be fully open. The choke valve should not cover any part of the hole when the choke control is in the FULL choke position.
 - f. If the choke control does not move the valve to each of the three positions shown in **Figure 29**, loosen the locknut and turn the cable adjuster (**Figure 30**) as necessary. Tighten the

locknut on the cable adjuster when adjustment is complete.

- g. Reinstall the diaphragm, vacuum slide and jet needle.
- h. Reinstall the fuel tank.

FUEL TANK

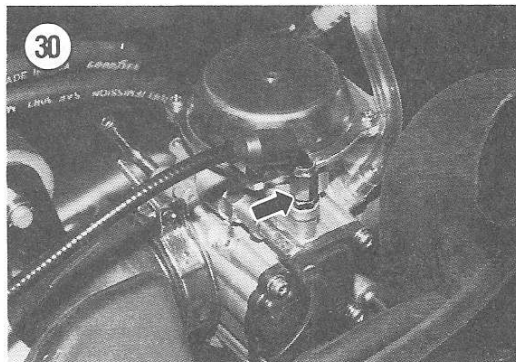
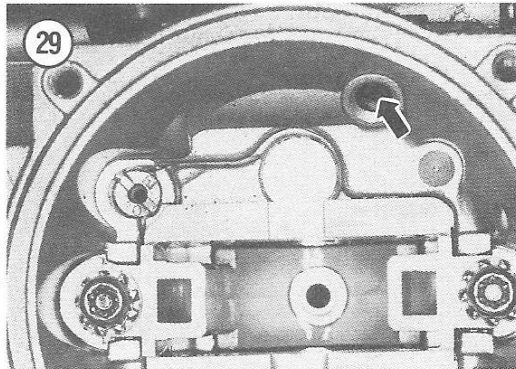
Removal/Installation

Refer to **Figure 31** or **Figure 32** for this procedure.

1. Place the vehicle on level ground and set the parking brake.
2. Remove the seat.
3. Disconnect the battery negative lead.

WARNING

Several different types of shut-off valves are used. If the shut-off valve is attached directly to the fuel tank, it can be turned off and remain attached to the tank. If fuel hoses run from the tank to a shut-off valve that is attached to the frame, the



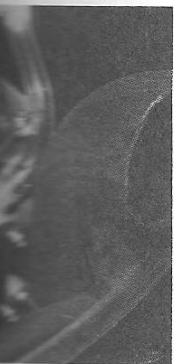
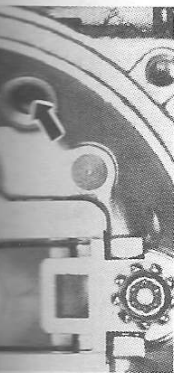
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32 for this proce-

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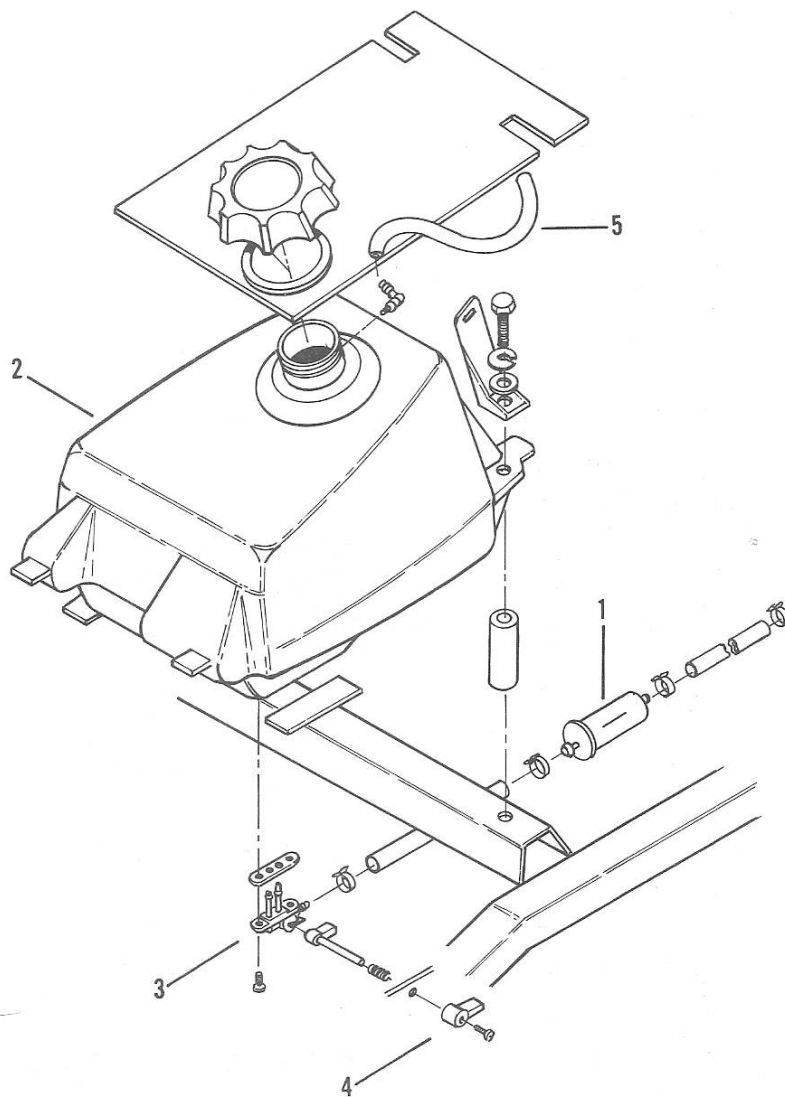
lead.

shut-off valves
is attached
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the tank. If
to a shut-off
frame, the



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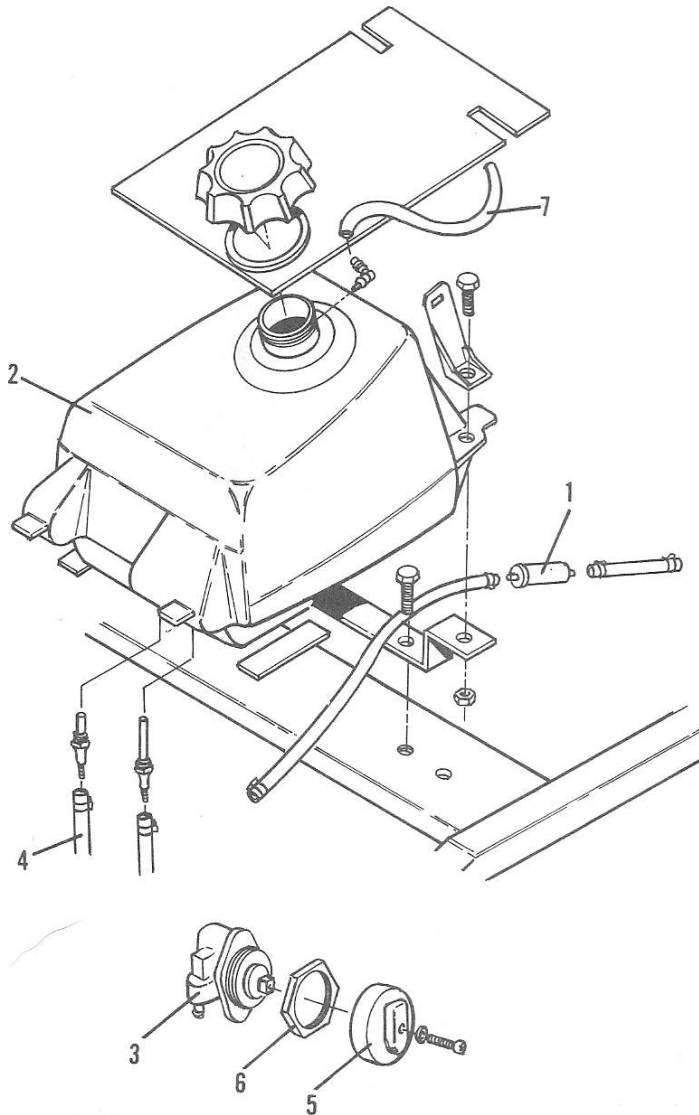
FUEL TANK, TYPICAL (FUEL VALVE ATTACHED TO THE TANK)



1. Fuel filter
2. Fuel tank
3. Shut-off valve
4. Knob
5. Vent hose

32

FUEL TANK, TYPICAL (FUEL VALVE INLINE WITH HOSES)



1. Fuel filter
2. Fuel tank
3. Shut-off valve
4. Hoses from tank to valve
5. Knob
6. Nut
7. Vent hose

tank should
plugged. It is
hoses and at
of the hazard

4. Drain all fuel
- 5A. On models
the tank, refer to E
- a. Turn the fu
tion.
- b. Disconnect
plug the ope
- 5B. On models w
fuel tank as show
- a. Loosen the
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valve.
- b. Disconnect
openings to
6. Remove the sc
(Figure 33), then

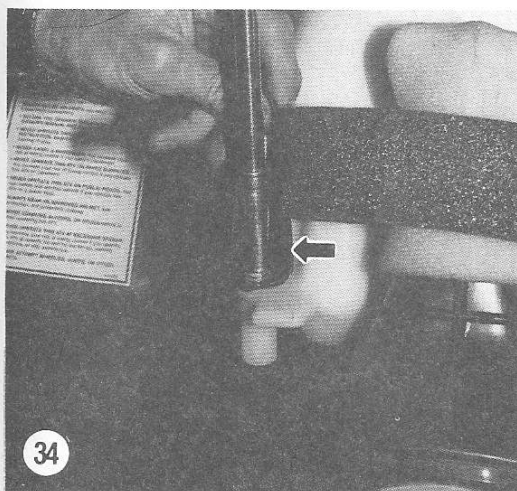
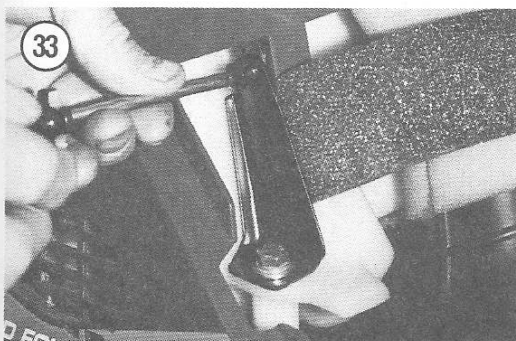
33



34

tank should be drained and the hoses plugged. It is unsafe to disconnect both hoses and attach them together, because of the hazard of spilled fuel.

4. Drain all fuel from the tank.
- 5A. On models with the shut-off valve attached to the tank, refer to **Figure 31** and proceed as follows.
 - a. Turn the fuel shutoff valve to the OFF position.
 - b. Disconnect the fuel line from the valve and plug the open end to prevent contamination.
- 5B. On models with the shut-off separate from the fuel tank as shown in **Figure 32**, proceed as follows.
 - a. Loosen the clamps on hoses (4, **Figure 32**) leading from the fuel tank to the shut-off valve.
 - b. Disconnect both fuel lines and plug all of the openings to prevent contamination.
6. Remove the screws attaching the fuel tank cover (**Figure 33**), then remove the cover.



7. Remove the fuel tank mounting bolts (**Figure 34**), washers and collars, then lift the fuel tank from the frame.
8. Inspect the tank for any damage or leaking.
9. Store the tank in a place where there is little chance for fire and where the tank will not be damaged.
10. Install by reversing these removal steps, check for fuel leakage after installation is completed. Tighten fuel tank mounting bolts securely.

FUEL SHUTOFF VALVE

Refer to **Figure 31** and **Figure 32**. Several different types of shut-off valves have been used.

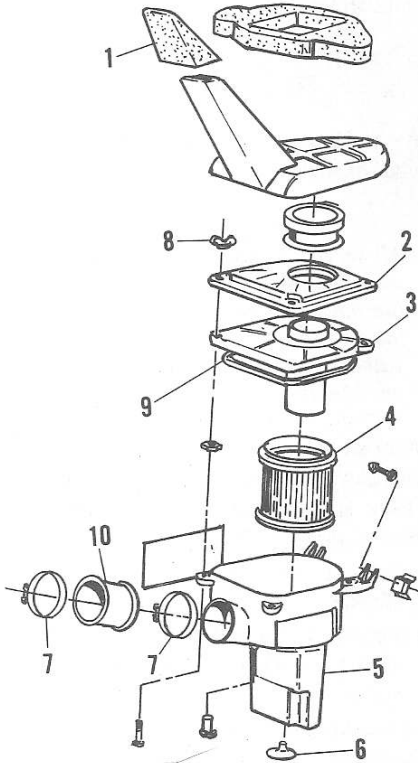
WARNING

All service to the fuel system is somewhat dangerous because of the flammable nature of gasoline. It is extremely unsafe to attempt removal of the shut-off valve in any way that increases the hazard of spilled fuel.

1. Drain all of the gas from the fuel tank. Store the fuel in a can approved for gasoline storage.
- 2A. If the shut-off valve is attached directly to the fuel tank as shown in **Figure 31**, proceed as follows.
 - a. Remove the fuel tank as described in this chapter.
 - b. Remove the screws securing the fuel shutoff valve to the fuel tank and remove the valve and gasket.
- 2B. If fuel lines run from the tank to a shut-off valve that is attached to the frame as shown in **Figure 32**, proceed as follows.
 - a. Loosen the clamps on hoses (4, **Figure 32**) leading from the fuel tank to the shut-off valve.
 - b. Disconnect both fuel lines from the tank and the third fuel line from the carburetor. Plug all of the openings to prevent contamination.
 - c. Remove the screw from the knob (5, **Figure 32**), then pull the knob from the valve.
 - d. Remove the nut (6, **Figure 32**) and withdraw the valve (3, **Figure 32**) from the frame mount.
3. The valve should not be disassembled. Install a new valve assembly if the old valve has failed in any way.
4. Install by reversing these steps.

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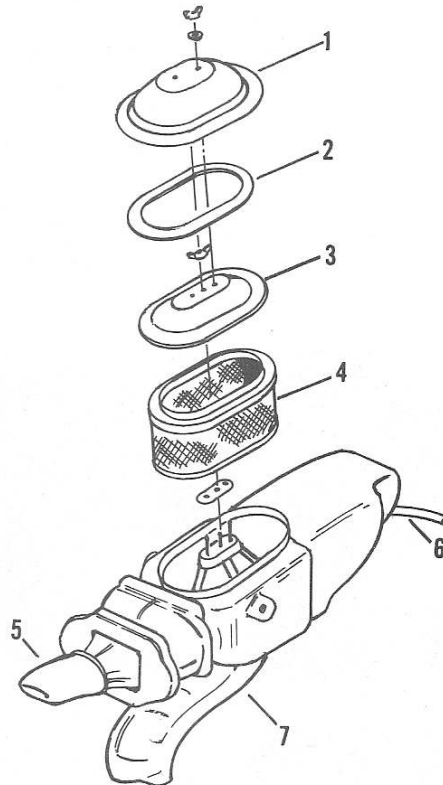
AIR BOX ASSEMBLY (TYPICAL, 2-STROKE MODELS)



1. Pre-filter
2. Top cover
3. Bottom cover
4. Filter element
5. Air box
6. Vent valve
7. Clamp
8. Wing nut
9. Gasket
10. Hose

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AIR BOX ASSEMBLY (TYPICAL, 4-STROKE MODELS)



1. Access cover
2. Gasket
3. Filter cover
4. Air filter element
5. Pre-filter
6. Sediment drain tube
7. Air box

5. If the valve is a... install a new fuel... the screws secured...
6. Check for fuel... pleted.

The air box is... air box shown in... models. Magnum... equipped with the... 36.

Removal/Installation

Refer to Figure... dure.

1. Place the vehi... parking brake.

37



38



5. If the valve is attached to the bottom of the tank, install a new fuel shutoff valve gasket and tighten the screws securely.
6. Check for fuel leakage after installation is completed.

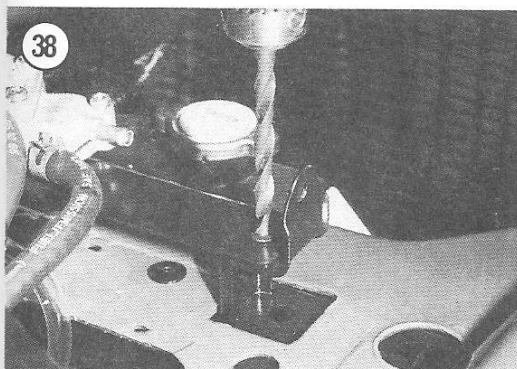
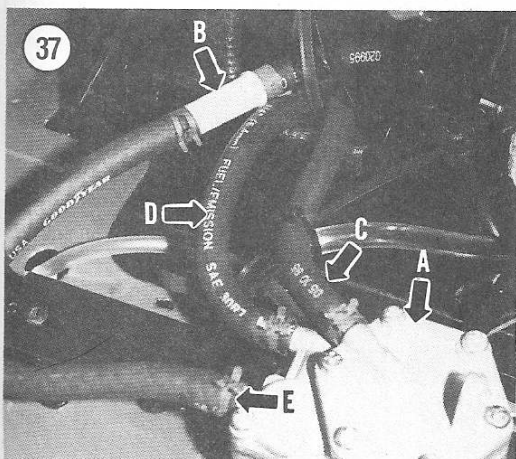
AIR BOX

The air box is mounted underneath the seat. The air box shown in **Figure 35** is typical of 2-stroke models. Magnum models with 4-stroke engines are equipped with the air box and filter shown in **Figure 36**.

Removal/Installation

Refer to **Figure 35** or **Figure 36** for this procedure.

1. Place the vehicle on level ground and set the parking brake.



2. Remove the seat.
3. Unbolt and remove the top cover(s) and air filter (2, 3 and 4, **Figure 35** or 1, 2, 3 and 4, **Figure 36**).
4. If the rear fenders or other body panels interfere, remove the panels as described in Chapter Fifteen.
5. Loosen the hose clamp securing the air box (5, **Figure 35** or 7, **Figure 36**) to the carburetor.
6. Remove the screw attaching the air box to the frame and lift the air box from the frame.
7. Cover the carburetor opening to prevent dust from entering.
8. Inspect all rubber components of the air box assembly and replace any that are damaged or beginning to deteriorate.
9. Install by reversing these removal steps, making sure the carburetor-to-air box hose clamp is seated properly and tightened securely.
10. Service the pre-filter (1, **Figure 35** or 5, **Figure 36**) as described in Chapter Three.

FUEL PUMP

A fuel pump is installed on Magnum models to deliver fuel to the carburetor. The pump (A, **Figure 37**) is mounted on a brace between the front fenders as shown. The in-line fuel filter (B, **Figure 37**) is located in the hose between the fuel tank and the pump.

1. Remove the headlight cover and cowling.
2. Loosen the clamp, then detach the impulse hose (C, **Figure 37**) from the pump.
3. Check the impulse hose for signs of fuel leakage. The presence of fuel in the impulse hose indicates a broken diaphragm.
4. Attach a hand vacuum pump such as a Mity-Vac (part No. 2870975) to the impulse port of the pump.
5. Apply a vacuum equal to 5 in. Hg to the port and observe any leakage. The pump diaphragm should hold the vacuum indefinitely.
6. Alternating pulses of pressure and vacuum at the impulse port of the pump should pump fuel.
7. If the pump is damaged, turn the fuel off at the tank shut-off valve.
8. Loosen the clamp, then disconnect the fuel inlet hose (D, **Figure 37**) from the pump.
9. Loosen the clamp, then detach the fuel outlet hose (E, **Figure 37**) from the pump.
10. Drill the rivets from the fuel pump bracket as shown in **Figure 38**.