ARCTIC CAT®

SERVICE MANUAL CD-ROM

2002



START

SECTION 1 — GENERAL INFORMATION

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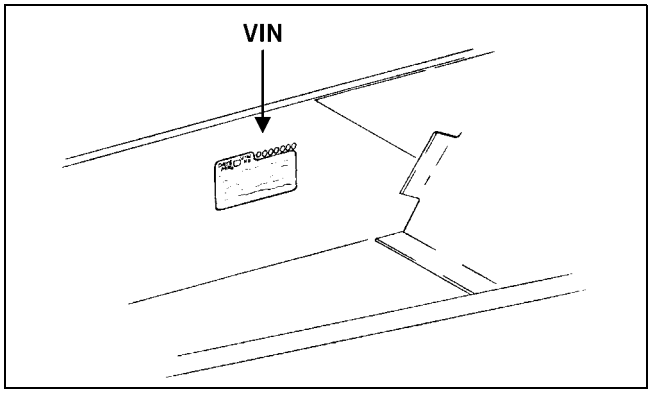
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Snowmobile Identification

The Arctic Cat Snowmobile has two important identification numbers. The Vehicle Identification Number (VIN) is stamped into the tunnel near the right-side footrest. The Engine Serial Number (ESN) is stamped into the crankcase of the engine.



0726-383

These numbers are required to complete warranty claims properly. No warranty will be allowed by Arctic Cat Inc. if the engine serial number or VIN is removed or mutilated in any way.

Recommended Gasoline and Oil

RECOMMENDED GASOLINE (Carbureted Models)

The recommended gasoline to use in these snowmobiles is 87 minimum octane regular unleaded. In many areas, oxygenates (either ethanol or MTBE) are added to the gasoline. Oxygenated gasolines containing up to 10% ethanol or up to 15% MTBE are acceptable gasolines; however, whenever using oxygenated gasolines, the carburetor main jet must be one size larger than the main jet required for regular unleaded gasoline. For example, if a 400 main jet is recommended for regular unleaded gasoline, a 410 main jet must be installed if using an oxygenated gasoline.

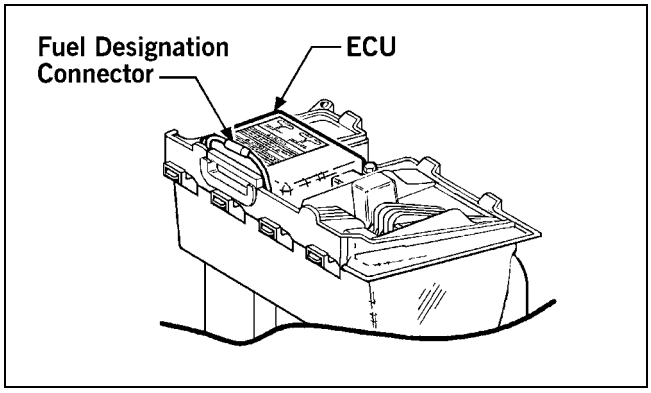
When using ethanol blended gasoline, it is not necessary to add a gasoline antifreeze since ethanol will prevent the accumulation of moisture in the fuel system.

⚠ CAUTION

Do not use white gas or gasolines containing methanol. Only Arctic Cat approved gasoline additives should be used.

RECOMMENDED GASOLINE (EFI Models)

The recommended gasoline to use in these snowmobiles is 87 minimum octane regular unleaded, and the Fuel Designation Connector at the ECU must be connected. In many areas, oxygenates (either ethanol or MTBE) are added to the gasoline. Oxygenated gasolines containing up to 10% ethanol or up to 15% MTBE are acceptable gasolines; however, if oxygenated gasoline is used, the Fuel Designation Connector at the ECU must be disconnected. Do not use gasolines containing methanol.



734-482A

⚠ CAUTION

Do not use white gas or gasoline containing methanol. Only Arctic Cat approved gasoline additives should be used.

⚠ CAUTION

If oxygenated gasoline is to be used, it is extremely important that the Fuel Designation Connector at the ECU is disconnected. If the connector is not disconnected when using oxygenated gasoline, severe engine damage may occur.

■ NOTE: In order for the ECU to change modes, the engine must be OFF when connecting or disconnecting the Fuel Designation Connector.

RECOMMENDED OIL (Oil-Injection System)

The recommended oil to use in the oil-injection system is Arctic Cat 50:1 Injection Oil (for standard models) or Arctic Cat Synthetic APV 2-Cycle Oil (for APV models). The oil is specially formulated to be used either as an injection oil or as a pre-mix oil (for carbureted model break-in) and meets all of the lubrication requirements of the Arctic Cat snowmobile engine.

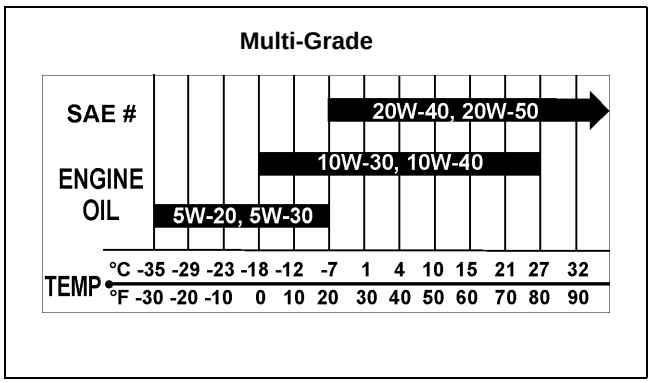
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RECOMMENDED OIL (4-Stroke Model)

The recommended oil to use is a multi-grade oil calibrated to the ambient temperature at which the engine is run. See the viscosity chart for details.

⚠ CAUTION

Any oil used in place of the recommended oil may cause serious damage.



GEN-0048

After the engine break-in period, the engine oil should be changed every 3500 miles (on the 4-Stroke Touring and Trail) and before prolonged storage.

Break-In Procedure (2-Stroke Models)

The Arctic Cat 2-stroke engine (when new or rebuilt) requires a short break-in period before the engine is subjected to heavy load conditions. Arctic Cat requires that the first tankful of fuel be premixed at a 100:1 ratio in all oil-injection models.

During the break-in period, a maximum of 1/2 throttle is recommended; however, brief full-throttle accelerations and variations in driving speeds contribute to good engine break-in.

⚠ CAUTION

DO NOT exceed the one (1) tankful limitation of a 100:1 gas/oil break-in mixture. Continuous use of a gas/oil mixture, unless consistently operating in extremely cold conditions (-26°C/-15°F or colder), could cause spark plug fouling and excessive carbon buildup. A 100:1 gas/oil mixture must be used in conjunction with the oil-injection system to ensure adequate engine lubrication in extremely cold conditions.

1

Break-In Procedure (4-Stroke Model)

The Arctic Cat 4-stroke engine (when new or rebuilt) requires a short break-in period before the engine is subjected to heavy load conditions.

This engine does not require any pre-mixed fuel during the break-in period.

⚠ CAUTION

DO NOT use premixed fuel in the snowmobile gas tank. Engine damage will occur.

To ensure trouble-free operation, careful adherence to the following break-in guidelines will be beneficial.

0-200 miles	1/2 Throttle (45 MPH-max)
200-400 miles	1/2-3/4 Throttle
400-600 miles	1/2-3/4 Throttle *

* With occasional full-throttle operation.

To ensure proper engine break-in, Arctic Cat recommends that the engine oil and filter be changed after 600 miles or after one month, whichever comes first. This service is at the discretion and expense of the snowmobile owner.

Genuine Parts

When replacement of parts is necessary, use only genuine Arctic Cat parts. They are precision-made to ensure high quality and correct fit.

High Altitude Operation

Operating a snowmobile at varying altitudes requires changes in performance components. These changes affect drive train components (on all models) and carburetion components (on carbureted models).

A high altitude information decal is located beneath the hood of the snowmobile. On carbureted models, the information is incorporated into the Main Jet Chart decal.

⚠ CAUTION

On carbureted models, carefully follow the Main Jet Chart recommendations for proper main jet selection for altitude, temperature, and gasoline being used.

A number of Arctic Cat snowmobiles are initially set up at the factory for operation between 5000-9000 feet. Consult the appropriate specifications for this information.

Drive Chain Lubrication
(120 cc)

The drive chain should be lubricated every 20 operating hours with a dry, graphite-based chain lubricant. By using a dry, graphite-based chain lubricant, dirt buildup on the drive chain will be minimized. Before each lubrication, inspect the drive chain for dirt accumulation.

To lubricate the drive chain, shut the engine off and wait for all moving parts to stop, remove the drive chain guard and lubricate the drive chain. After lubricating the drive chain, install the drive chain guard.

If the drive chain is excessively dirty, it should be removed and cleaned prior to being lubricated (see Drive Chain and Sprockets in Section 8).

■ NOTE: If a dry, graphite-based chain lubricant is not available, lubricate the drive chain with several drops of petroleum-based oil. If the snowmobile is operated in the summer with the optional wheel kit, the drive chain should be lubricated more frequently.

Preparation For Storage

Prior to storing the snowmobile, it must be properly serviced to prevent corrosion and component deterioration. An authorized Arctic Cat Snowmobile dealer should perform this service; however, the owner/operator can perform this service if desired. To prepare the snowmobile for storage, Arctic Cat recommends the following procedure:

1. Clean the seat cushion with a damp cloth and Arctic Cat Vinyl Protectant (p/n 0638-313).
2. Clean the snowmobile thoroughly by hosing dirt, oil, grass, and other foreign matter from the skid frame, tunnel, hood, and belly pan. Allow the snowmobile to dry thoroughly. DO NOT get water into any part of the engine.

■ NOTE: Steps 3-7 are only for models with an oil-injection system.

3. Place the rear of the snowmobile up on a shielded safety stand.

■ NOTE: On some models, the air-intake silencer is a one-piece unit, and the silencer boot(s) can be removed to access the intake bore(s). Remove the boots; then proceed to step 7.

■ NOTE: On some models, the air-intake silencer includes a cover/tool tray assembly and a baffle/resonator, and the silencer boot cannot be removed to access the intake bores. Proceed to step 4.

4. Open the air-intake silencer cover; then remove the three screws securing the cover/tool tray assembly to the silencer.
5. Close the cover; then tip the cover/tool tray assembly forward and out of its slots and remove the assembly.
6. Using a large flat-blade screwdriver, remove the baffle/resonator tabs from the air-intake silencer slots and remove the baffle/resonator to access the intake bores.

■NOTE: The baffle/resonator can be removed more easily by removing the back tabs first.

7. Start the engine and allow to idle. With the engine idling, spray Arctic Cat Engine Storage Preserver (p/n 0636-177) into the intake(s) until the engine exhaust starts to smoke heavily or until the engine starts to drop in RPM. Turn engine off.

■NOTE: On some models, install the air-intake silencer boot(s); on some models, install the baffle/resonator and the cover/tool tray assembly.

8. Plug the exhaust system outlet with a clean cloth.

⚠ CAUTION

Do not do step 9 on the 4-stroke model; severe engine damage could result.

9. With the ignition switch in the OFF position:

   A. Disconnect the high tension lead(s) from the spark plug(s); then remove the plug(s), connect it/them to the lead(s), and ground it/them on the cylinder head(s).

⚠ CAUTION

Never crank the engine over without grounding the spark plug(s). Damage to coils and/or CDI unit may result.

   B. Pour 29.5 ml (1 fl oz) of SAE #30 petroleum-based oil into each spark plug hole and pull the recoil starter handle slowly about 10 times.

   C. Install the spark plug(s) and connect the high tension lead(s).

10. On the 4-stroke model, change the engine oil; then clean the air filter.

11. On carbureted models, drain the gas from each carburetor float chamber.

12. Fill the gas tank to its rated capacity; then add Arctic Cat Fuel Stabilizer (p/n 0638-165) to the gas tank following directions on the container for the stabilizer/gasoline ratio. Tighten the gas tank cap securely.

13. If applicable, drain the chain-case lubricant by removing the chain-case drain plug located on the backside of the chain-case assembly. Remove the chain-case cover and inspect chain, sprockets, chain tensioner, and rollers for wear and the chain for proper tension. Install the drain plug, chain-case cover, and seal; then pour Arctic Cat Transmission Lube (p/n 0636-817) into the filler hole according to appropriate specifications.

14. Clean and inspect the drive clutch and driven pulley.

15. If applicable, remove the drive belt from the drive clutch/driven pulley. Lay the belt on a flat surface or slide it into a cardboard sleeve to prevent warping or distortion during storage; then clean and inspect the drive clutch and driven pulley.

16. Apply light oil to the upper steering post bushing, ski spindles and bolts, front and rear pivot bushings of the skid frame, and plungers of the shock absorbers.

17. Lubricate all grease fittings (front and rear suspension, spindles, speedometer drive adapter, and the driven shaft support bearing) with a low-temperature grease.

18. Tighten all nuts, bolts, and cap screws making sure all calibrated nuts, bolts, and cap screws are tightened to specifications. Make sure all rivets holding the components together are tight. Replace all loose rivets.

19. Clean and polish the hood, console, and chassis with Arctic Cat Hood and Windshield Cleaner/Polish (p/n 0636-174). DO NOT USE SOLVENTS OR SPRAY CLEANERS. THE PROPELLENT WILL DAMAGE THE FINISH.

20. On electric start models, disconnect the battery cables making sure to disconnect the negative cable first; then clean the battery posts and cables.

21. If possible, store the snowmobile indoors. Raise the track off the floor by blocking up the back end making sure the snowmobile is secure. Loosen the track adjusting bolts to reduce track tension. Cover the snowmobile with a machine cover or a heavy tarpaulin to protect it from dirt and dust.

22. If the snowmobile must be stored outdoors, position the snowmobile out of direct sunlight; then block the entire snowmobile off the ground making sure the snowmobile is secure. Loosen the track adjusting bolts to reduce track tension. Cover with a machine cover or a heavy tarpaulin to protect it from dirt, dust, and rain.

⚠ CAUTION

Avoid storing in direct sunlight and using a plastic cover as moisture may collect on the snowmobile causing corrosion.

Preparation After Storage

Taking the snowmobile out of storage and correctly preparing it for another season will assure many miles and hours of trouble-free snowmobiling. Arctic Cat recommends the following procedure:

⚠ CAUTION

On carbureted models if the gas in each carburetor float chamber was not drained prior to storage, the carburetor(s) must be cleaned before starting the engine.

1. Clean the snowmobile thoroughly. Polish the exterior of the snowmobile.
2. Clean the engine. Remove the cloth from the exhaust system. Check exhaust system and air-intake silencer/air filter for obstructions.
3. Inspect all control wires and cables for signs of wear or fraying. Replace if necessary. Use cable ties or tape to route wires and cables away from hot or rotating parts.
4. If applicable, inspect the drive belt for cracks and tears. Check belt specifications. Replace if damaged or worn. Install the drive belt.

■NOTE: If the old belt is worn but in reasonable condition, retain it with the snowmobile as a spare in case of emergency.

5. On carbureted models, inspect the in-line fuel filter and replace if necessary.
6. Inspect all fuel hoses and oil hoses for deterioration or cracks; replace if necessary. Make sure all connections are tight; then on 2-stroke models, fill the oil-injection reservoir with the recommended 50:1 injection oil.

■NOTE: On 2-stroke models after prolonged storage, Arctic Cat recommends one tankful of 100:1 gas/oil mixture be used in conjunction with the oil-injection system to ensure proper lubrication.

7. Inspect the entire brake system, all controls, headlight, taillight, brakelight, ski wear bars, and headlight aim; adjust or replace as necessary.
8. Inspect each spark plug. Replace, gap, or clean as necessary.
9. Adjust the track to the proper tension and alignment. Lock the jam nuts.
10. Adjust the carburetor(s) and choke cable on carbureted models and throttle cable on all models.

⚠ WARNING

On VM-style carburetors, be sure to tighten the swivel adapter jam nuts securely. If a jam nut isn't tightened, the adjuster can rotate out of the carburetor cap causing the piston valve not to return to the full-closed position.

11. Tighten all nuts, bolts, and cap screws making sure all calibrated nuts, bolts, and cap screws are tightened to specifications.
12. Lubricate all grease fittings (rear suspension, spindles, speedometer drive adapter, and the driven shaft support bearing) with a low-temperature grease.
13. On the 120 cc model, inspect the drive chain and drive chain tightener. Replace if necessary; then lubricate the binding screw drum with WD-40 and the drive chain with a dry, graphite-based chain lubricant.
14. On liquid cooled models, check the coolant level and all coolant hoses and connections for deterioration or cracks. Add properly mixed coolant as necessary.
15. On fan cooled models, clean the engine cooling fins and all vents.
16. On EFI models, place the rear of the snowmobile on a shielded safety stand; then start the engine. Allow the engine to idle; then using a long stiff wire with a hooked end, raise the oil-injection pump control arm to the wide-open position until the engine starts to smoke heavily. Release the control arm and turn off the engine.
17. On electric start models, charge the battery; then connect the battery cables making sure to connect the positive cable first. Test the electric start system.

After Break-In Checkup
(100 Miles)

The 100 mile checkup offered by some dealerships reduces problems and warranty costs. A program of this kind should be offered by all dealerships. Many dealerships have added the price of the checkup into the selling price of the snowmobile, and others offer it as a bonus to the customers who purchase snowmobiles from their dealership.

There are three areas that require adjustment after the break-in period in order to obtain peak performance. These areas are the following.

A. Carburetor jetting

B. Drive belt deflection

C. Track tension and alignment

CARBURETOR JETTING (2-Stroke Carbureted Models)— Altitude, temperature, and the use of oxygenated gasoline affect the carburetion needed for optimum engine performance. The carburetor main jets must be changed in conjunction with changes in operating altitude, oxygenated gasoline usage, and temperature.

DRIVE BELT DEFLECTION — Drive belt deflection is very important to the snowmobile. Even if it is checked and is correct when the snowmobile is set up, it does change (more so during the break-in period). This is because the rubber engine mounts and the rubber snubber on the torque link will all take a "set" during the first 100 miles, which allows the distance between the drive clutch and driven pulley to shorten. When this happens, the snowmobile will appear to have a too long drive belt. To add to this, the drive belt itself wears and stretches somewhat. This all leads to a low-end performance problem and, if not corrected, causes premature drive belt wear.

After the break-in period, drive belt deflection should be checked according to the instructions given in this manual. To correct for too much deflection, washer(s) from between the driven pulley sheaves can be removed to "tighten the drive belt" and allow the belt to return to the proper ratio for drive clutch engagement.

DRIVE BELT BREAK-IN — It is critical for maximum drive belt life to allow the belt to break in before subjecting it to hard use such as wide-open-throttle operation or hill climbing.

The first 20 miles on the drive belt should be at 1/2 throttle or lower. This will allow the belt to cure totally before it is subjected to hard use.

If this procedure isn't followed, it is possible to destroy a new drive belt in less than 50 miles. This should be explained to customers at the time of drive belt sales.

To increase the life of a drive belt, it is very important that the belt be warmed up before subjecting it to any type of use. In cold temperature (0° or below), the engine should be allowed to idle for a period of 8 to 10 minutes. This will allow heat from the engine compartment to soften the drive belt. Not only will this procedure increase belt life but will also help prevent engine damage from cold seizure.

⚠ WARNING

When following the above procedure, the operator must not leave the snowmobile unattended during the warm-up period.

Each operator should be instructed to drive the snowmobile for several minutes at a low throttle setting to warm the belt up before using wide-open-throttle. This practice should be followed on all models for maximum belt life.

TRACK TENSION AND ALIGNMENT — There is a certain amount of stretch on all tracks during the first 500 miles. The track must be adjusted after the first 50 to 100 miles to the specifications given in the Setup and Predelivery Manual and periodically thereafter. If these adjustments aren't performed, the track may "derail" which leads to track and slide rail damage.

Along with these three major areas, there are also other areas that should be checked and adjusted during the "After Break-In Checkup." A checklist to assist you with this service follows. Not only will the customer be happier, but it also gets the customer back into your dealership, which in many cases will mean additional sales in accessories, belts, oil, etc.

After Break-In Checkup Checklist

Below is a recommended list of items to check after the break-in period. By performing this inspection, warranty cost can be reduced and customer satisfaction can be increased.

The recommended mileage for this inspection is between 100 and 300 miles. Please encourage the customers to have this important checkup done.

- ❑ Jet carburetor(s) according to average temperature, type of gasoline being used, and altitude
- ❑ Adjust drive belt deflection
- ❑ Adjust track tension and alignment
- ❑ Adjust throttle cable tension
- ❑ Check oil-injection pump adjustment
- ❑ Check engine idle
- ❑ Check coolant level
- ❑ Check chain case lubricant level
- ❑ Check lights (high/low beam, brakelight)
- ❑ Check safety switch operation
- ❑ Check driveshaft area for any rubbing components
- ❑ Check steering hardware for tightness
- ❑ Check skid frame and A-arm mounting hardware for tightness
- ❑ Check brake lever travel and adjustment
- ❑ Grease all lubrication points

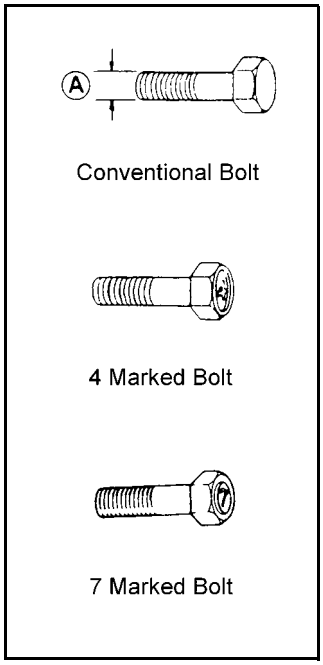
Torque Conversions

kg-m x 7.235 = ft-lb
ft-lb x 0.1383 = kg-m

ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m
1	0.1	21	2.9	41	5.7	61	8.4	81	11.2
2	0.3	22	3.0	42	5.8	62	8.6	82	11.3
3	0.4	23	3.2	43	5.8	63	8.7	83	11.5
4	0.6	24	3.3	44	6.1	64	8.9	84	11.6
5	0.7	25	3.5	45	6.2	65	9.0	85	11.8
6	0.8	26	3.6	46	6.4	66	9.1	86	11.9
7	1.0	27	3.7	47	6.5	67	9.3	87	12.0
8	1.1	28	3.9	48	6.6	68	9.4	88	12.2
9	1.2	29	4.0	49	6.8	69	9.5	89	12.3
10	1.4	30	4.2	50	6.9	70	9.7	90	12.5
11	1.5	31	4.3	51	7.1	71	9.8	91	12.6
12	1.7	32	4.4	52	7.2	72	10.0	92	12.8
13	1.8	33	4.6	53	7.3	73	10.1	93	12.9
14	1.9	34	4.7	54	7.5	74	10.2	94	13.0
15	2.1	35	4.8	55	7.6	75	10.4	95	13.1
16	2.2	36	5.0	56	7.7	76	10.5	96	13.3
17	2.4	37	5.1	57	7.9	77	10.7	97	13.4
18	2.5	38	5.3	58	8.0	78	10.8	98	13.6
19	2.6	39	5.4	59	8.2	79	10.9	99	13.7
20	2.8	40	5.5	60	8.3	80	11.1	100	13.8

Tightening Torque
(General Bolts)

Type of Bolt	Thread Diameter A (mm)	Tightening Torque	
		kg-m	ft-lb
(Conventional or 4 Marked Bolt)	5	0.2-0.4	1.5-3.0
	6	0.4-0.7	3.0-5.0
	8	1.0-1.6	7.0-11.5
	10	2.2-3.5	16.0-25.5
(7 Marked Bolt)	5	0.3-0.6	2.0-4.5
	6	0.8-1.2	6.0-8.5
	8	1.8-2.8	13.0-20.0
	10	4.0-6.0	29.0-43.5



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Fraction/Decimal Conversion Chart

8ths	16ths	32nds	64ths	64ths (cont)
1/8 = .125	1/16 = .0625	1/32 = .03125	1/64 = .015625	33/64 = .515625
1/4 = .250	3/16 = .1875	3/32 = .09375	3/64 = .046875	35/64 = .546875
3/8 = .375	5/16 = .3125	5/32 = .15625	5/64 = .078125	37/64 = .578125
1/2 = .500	7/16 = .4375	7/32 = .21875	7/64 = .109375	39/64 = .609375
5/8 = .625	9/16 = .5625	9/32 = .28125	9/64 = .140625	41/64 = .640625
3/4 = .750	11/16 = .6875	11/32 = .34375	11/64 = .171875	43/64 = .671875
7/8 = .875	13/16 = .8125	13/32 = .40625	13/64 = .203125	45/64 = .703125
—	15/16 = .9375	15/32 = .46875	15/64 = .234370	47/64 = .734375
—	—	17/32 = .53125	17/64 = .265625	49/64 = .765625
—	—	19/32 = .59375	19/64 = .296875	51/64 = .796875
—	—	21/32 = .65625	21/64 = .328125	53/64 = .828125
—	—	23/32 = .71875	23/64 = .359375	55/64 = .859375
—	—	25/32 = .78125	25/64 = .390625	57/64 = .890625
—	—	27/32 = .84375	27/64 = .421875	59/64 = .921875
—	—	29/32 = .90625	29/64 = .453125	61/64 = .953125
—	—	31/32 = .96875	31/64 = .484375	63/64 = .984375

Drill Bit Sizes (Number) Chart

No.	Size of Drill in Inches	No.	Size of Drill in Inches	No.	Size of Drill in Inches	No.	Size of Drill in Inches
1	.2280	21	.1590	41	.0960	61	.0390
2	.2210	22	.1570	42	.0935	62	.0380
3	.2130	23	.1540	43	.0890	63	.0370
4	.2090	24	.1520	44	.0860	64	.0360
5	.2055	25	.1495	45	.0820	65	.0350
6	.2040	26	.1470	46	.0810	66	.0330
7	.2010	27	.1440	47	.0785	67	.0320
8	.1990	28	.1405	48	.0760	68	.0310
9	.1960	29	.1360	49	.0730	69	.0292
10	.1935	30	.1285	50	.0700	70	.0280
11	.1910	31	.1200	51	.0670	71	.0260
12	.1890	32	.1160	52	.0635	72	.0250
13	.1850	33	.1130	53	.0595	73	.0240
14	.1820	34	.1110	54	.0550	74	.0225
15	.1800	35	.1100	55	.0520	75	.0210
16	.1770	36	.1065	56	.0465	76	.0200
17	.1730	37	.1040	57	.0430	77	.0180
18	.1695	38	.1015	58	.0420	78	.0160
19	.1660	39	.0995	59	.0410	79	.0145
20	.1610	40	.0980	60	.0400	80	.0135

MM/IN. Conversion Chart

mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
.01	.00039	.41	.01614	.81	.03189	21	.82677	61	2.40157
.02	.00079	.42	.01654	.82	.03228	22	.86614	62	2.44094
.03	.00118	.43	.01693	.83	.03268	23	.90551	63	2.48031
.04	.00157	.44	.01732	.84	.03307	24	.94488	64	2.51968
.05	.00197	.45	.01772	.85	.03346	25	.98425	65	2.55905
.06	.00236	.46	.01811	.86	.03386	26	1.02362	66	2.59842
.07	.00276	.47	.01850	.87	.03425	27	1.06299	67	2.63779
.08	.00315	.48	.01890	.88	.03465	28	1.10236	68	2.67716
.09	.00354	.49	.01929	.89	.03504	29	1.14173	69	2.71653
.10	.00394	.50	.01969	.90	.03543	30	1.18110	70	2.75590
.11	.00433	.51	.02008	.91	.03583	31	1.22047	71	2.79527
.12	.00472	.52	.02047	.92	.03622	32	1.25984	72	2.83464
.13	.00512	.53	.02087	.93	.03661	33	1.29921	73	2.87401
.14	.00551	.54	.02126	.94	.03701	34	1.33858	74	2.91338
.15	.00591	.55	.02165	.95	.03740	35	1.37795	75	2.95275
.16	.00630	.56	.02205	.96	.03780	36	1.41732	76	2.99212
.17	.00669	.57	.02244	.97	.03819	37	1.45669	77	3.03149
.18	.00709	.58	.02283	.98	.03858	38	1.49606	78	3.07086
.19	.00748	.59	.02323	.99	.03898	39	1.53543	79	3.11023
.20	.00787	.60	.02362	1.0	.03937	40	1.57480	80	3.14960
.21	.00827	.61	.02402	1	.03937	41	1.61417	81	3.18897
.22	.00866	.62	.02441	2	.07874	42	1.65354	82	3.22834
.23	.00906	.63	.02480	3	.11811	43	1.69291	83	3.26771
.24	.00945	.64	.02520	4	.15748	44	1.73228	84	3.30708
.25	.00984	.65	.02559	5	.19685	45	1.77165	85	3.34645
.26	.01024	.66	.02598	6	.23622	46	1.81102	86	3.38582
.27	.01063	.67	.02638	7	.27559	47	1.85039	87	3.42519
.28	.01102	.68	.02677	8	.31496	48	1.88976	88	3.46456
.29	.01142	.69	.02717	9	.35433	49	1.92913	89	3.50393
.30	.01181	.70	.02756	10	.39370	50	1.96850	90	3.54330
.31	.01220	.71	.02795	11	.43307	51	2.00787	91	3.58267
.32	.01260	.72	.02835	12	.47244	52	2.04724	92	3.62204
.33	.01299	.73	.02874	13	.51181	53	2.08661	93	3.66141
.34	.01339	.74	.02913	14	.55118	54	2.12598	94	3.70078
.35	.01378	.75	.02953	15	.59055	55	2.16535	95	3.74015
.36	.01417	.76	.02992	16	.62992	56	2.20472	96	3.77952
.37	.01457	.77	.03032	17	.66929	57	2.24409	97	3.81889
.38	.01496	.78	.03071	18	.70866	58	2.28346	98	3.85826
.39	.01535	.79	.03110	19	.74803	59	2.32283	99	3.89763
.40	.01575	.80	.03150	20	.78740	60	2.36220	100	3.93700

Servicing Symbols

Listed in the table below are symbols indicating special instructions and other important information necessary for proper servicing. Please note the definition for each symbol. These symbols are used throughout this two-volume set.

SYMBOL	DESCRIPTION
	Torque control required
	242 - apply blue Loctite #242 (p/n 1639-815) 243 - apply blue Loctite #243 (p/n 1639-413) 270 - apply green Loctite #270 (p/n 1639-817) 271 - apply red Loctite #271 (p/n 1639-820) 609 - apply green Loctite #609 (p/n 1639-821)
	Lubricate with Arctic Cat 50:1 Injection Oil (p/n 0636-286) Lubricate with Arctic Cat Extreme 50:1 Injection Oil (p/n 0639-112)
	Lubricate with Arctic Cat Low-Temp Grease (p/n 0636-593)
	3B - Three Bond Sealant (p/n 0636-070) HT - High-Temp Sealant (p/n 0636-069) AS - Anti-Seize Thread Compound (p/n 0678-146)

NOTES

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SECTION 2 — ENGINE

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Engine

This engine servicing section has been organized into sub-sections which show a progression for the complete servicing of the Arctic Cat engine. For consistency purposes, this section shows a complete and thorough progression; however, for efficiency it may be preferable to remove the engine as a complete assembly, to remove and disassemble only those components which need to be addressed, and to service only those components. Also, some components may vary from model to model. The technician should use discretion and sound judgment.

■ **NOTE: Some illustrations and photographs used in this section are used for clarity purposes only and are not designed to depict actual conditions.**

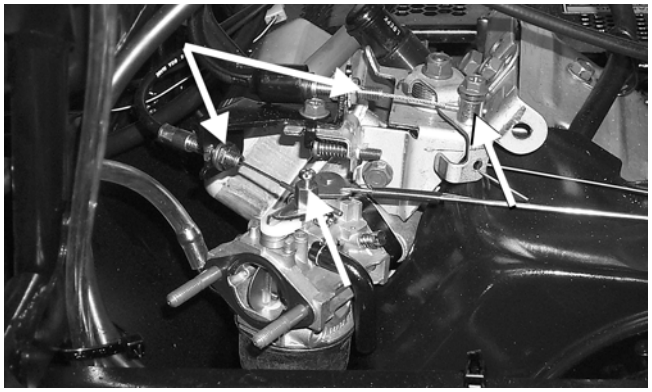
Removing Engine Table of Contents

120 cc Model 2-2
Twin F/C Models 2-3
500/600/800 cc Twin Models 2-5
550 cc Models 2-7
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Removing Engine (120 cc Model)

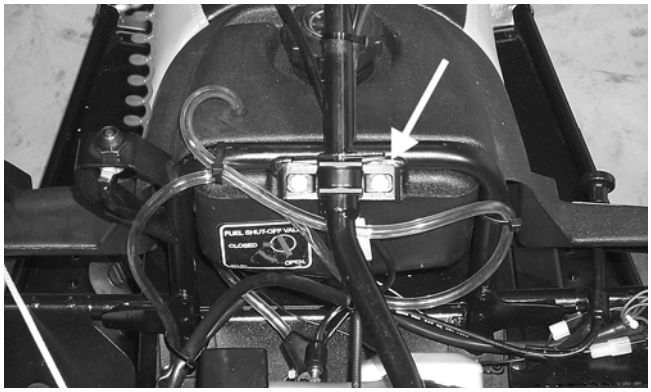
■ **NOTE: The drive chain must be removed in order to remove the engine (see Drive Chain and Sprockets sub-section in Section 8).**

1. Disconnect the choke and throttle cables from the carburetor; then on each cable, loosen the adjustment jam nut closest to the carburetor and remove the cables from the bracket. Route the cables out of the way.



A046A

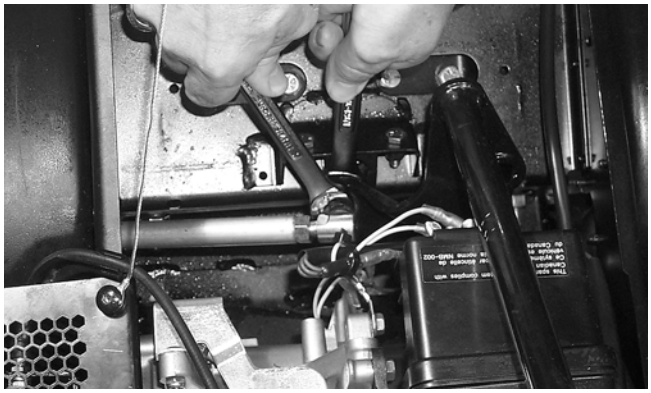
2. Remove the two cap screws securing the steering post to the steering post support. Account for two bearing halves, two lock nuts, and a bearing retainer.



A023A

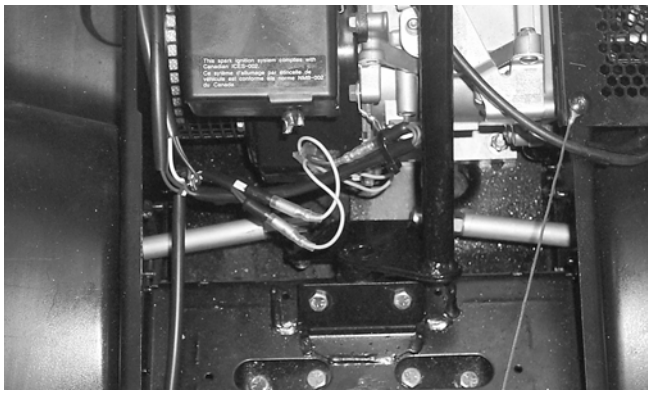
3. Pull the steering post up and back and then out of the lower steering post bearing.

4. Remove the two lock nuts securing the tie rods to the steering post; then remove the tie rods from the steering post. Place the steering post out of the way on the right-hand side of the engine compartment.



A024

5. Cut the cable tie; then disconnect all wires (a total of four) at the front of the engine. Route them out of the way.



A047

6. Turn the gas tank shut-off valve to the CLOSED position.

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⚠ WARNING

Whenever any maintenance or inspection is made on a fuel system when there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

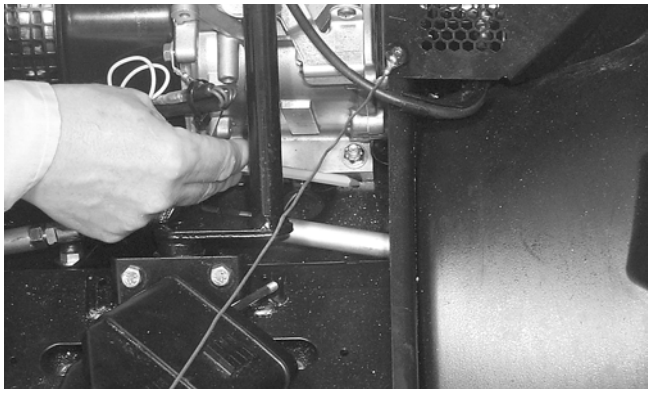
7. Disconnect the fuel hose from the carburetor.

■ **NOTE: Be prepared to wipe up any fuel spillage.**

8. Pull the recoil starter rope out approximately 60 cm (24 in.); then tie a slip-knot in the starter rope below the console and allow the rope to slowly retract against the starter case.

9. Remove the knot at the handle and remove the handle; then thread the rope through the bushing in the console.

10. At this point, scribe a line at the front of the engine and measure the distance between the crankshaft and the driveshaft. Record the measurement for installing purposes.

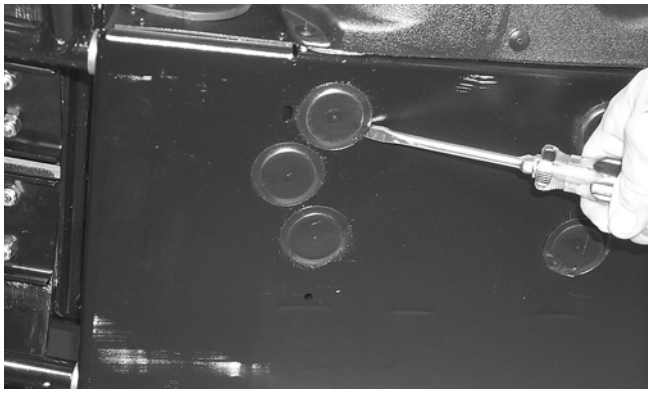


A048

11. Lay the snowmobile on its side.

■ **NOTE: A piece of cardboard should be used to protect the finish.**

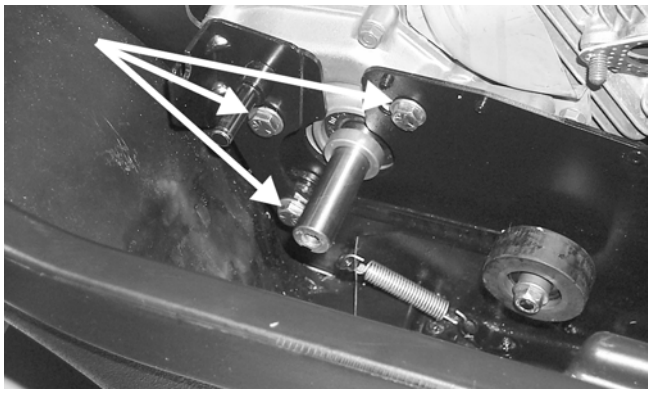
12. Using a flat-blade screwdriver, remove the four belly pan plugs covering the engine mounting cap screws; then remove the cap screws. Account for eight washers and four lock nuts.



A049

■ **NOTE: The front center plug is to access the oil drain plug.**

13. Place the snowmobile in the upright position; then on the left-hand side of the engine, remove the three cap screws securing the engine and brake bracket to the front end.



A050A

14. Remove the engine from the engine compartment.

Removing Engine
(Twin F/C Models)

■ **NOTE: If equipped with electric start, disconnect the battery.**

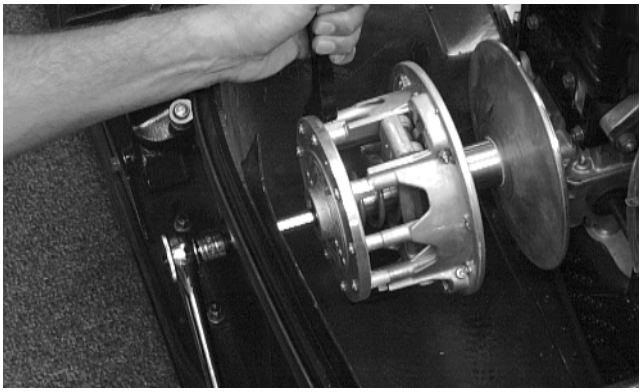
1. Turn the gas tank shut-off valve to the CLOSED position.

2. Open the belt guard.

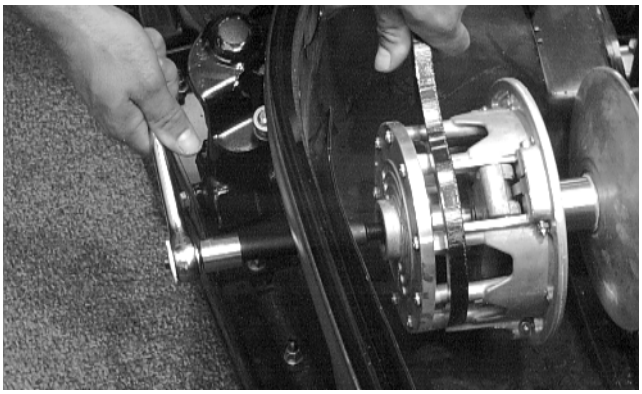
3. Remove the drive belt; then remove the plug from the belly pan.

■ **NOTE: Before installing the clutch puller, apply oil to the threads of the puller and a small amount of grease to the tip of the puller.**

4. Remove the bolt and lock washers securing the drive clutch to the crankshaft; then using the Drive Clutch Puller (p/n 0644-207) and an impact wrench or a breaker bar and Drive Clutch Spanner Wrench (p/n 0644-136), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller with a hammer. Repeat this procedure until the clutch releases.



AF472D



AF476D

5. Remove the clutch from the engine compartment.

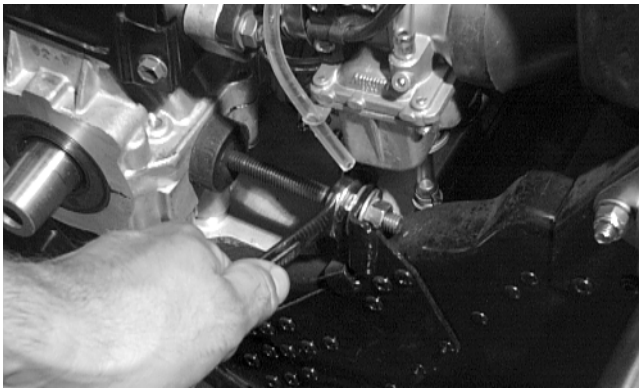
6. Remove the cap screw and washer securing the driven pulley; then slide the pulley off the driven shaft. Account for and note the position of any alignment washers.

■ **NOTE: If the driven pulley will not slide off the driven shaft, use the Driven Pulley Puller (p/n 0744-023) for removal.**



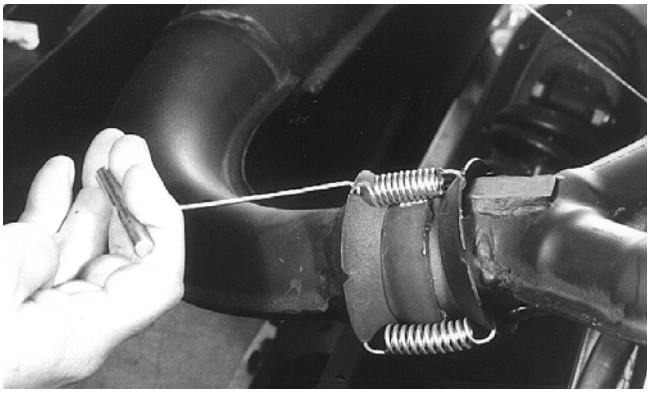
SC013D

7. Remove the torque bumper. Account for any engine mount shims.



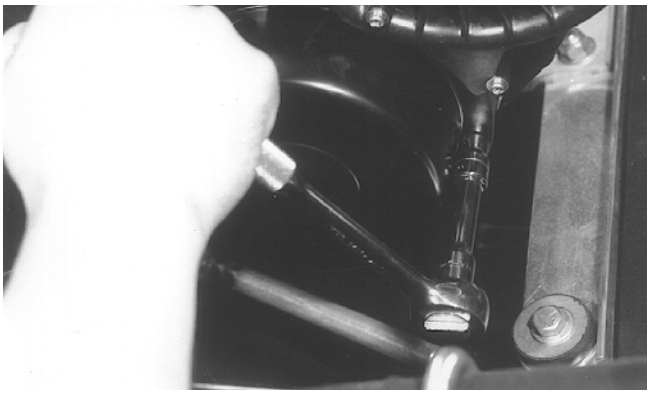
AF473D

8. Remove the springs securing the expansion chamber to the exhaust manifold and resonator; then remove expansion chamber.



AC067

9. Remove the cap screws and lock washers securing the recoil starter; then remove the starter. Leave it in the engine compartment.



AB082

10. Disconnect the four-prong main wiring harness connector and the CDI unit wiring harness.

11. Disconnect the impulse hose from the crankcase.

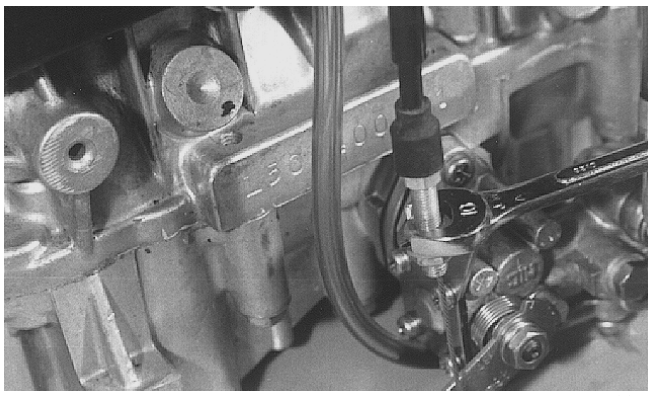
12. Disconnect the spark plug caps.

13. Loosen the carburetor flange clamp(s). Remove the carburetor(s) from the intake flange(s) and carburetor boot(s). Place the carburetor(s) to the side in an upright position.

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■ **NOTE: If equipped with electric start, remove the lock nuts and washers securing the starter motor to the engine mounting bracket and remove the starter motor.**

14. Disconnect the oil-injection cable from the oil-injection pump. Account for the E-clip and washer; then disconnect the oil supply hose from the pump and plug the hose to prevent leakage.



AB081

■ **NOTE: If equipped with electric start, remove the two lock nuts and washers securing the starter motor bracket; then remove the three remaining cap screws, washers, and lock washers securing the starter motor bracket and ground cable. Remove the starter motor bracket.**

15. Remove the cap screws securing the engine to the front end. Account for washers, cap screws, and lock nuts.



AL201D

16. Lift the engine out of the engine compartment.

17. Remove the cap screws, washers, and lock washers securing the engine mounting brackets to the engine; then remove the brackets.

Removing Engine
(500/600/800 cc Twin Models)

■ **NOTE: Some engines are equipped with Arctic Power Valves (APV). Closely observe the NOTE: introducing this important information.**

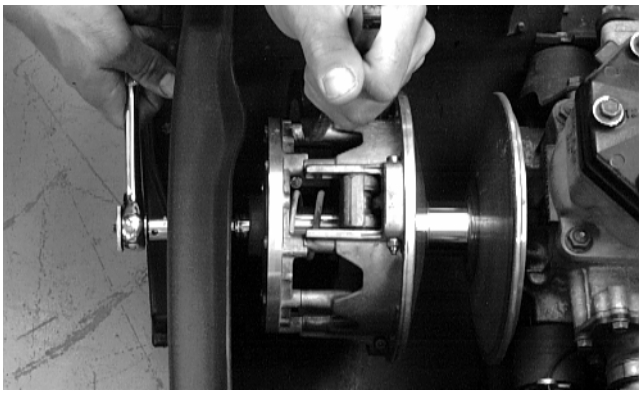
■ **NOTE: If applicable, disconnect the battery cables.**

1. Turn the gas tank shut-off valve to the CLOSED position.

2. Remove all springs securing the expansion chamber(s) and remove the expansion chamber(s) from the engine compartment.

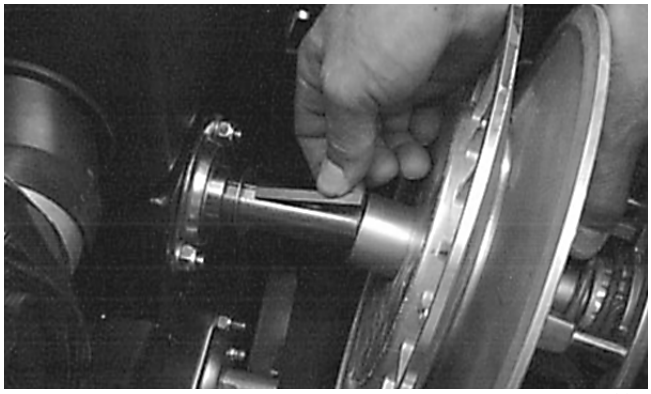
3. Open the belt guard; then remove the drive belt.

4. Remove the plug from the belly pan. Using a ½-in. 12-point socket, remove the cap screw and lock washer securing the drive clutch to the crankshaft; then using Clutch Puller (p/n 0644-207) and an impact wrench or a breaker bar and Spanner Wrench (p/n 0644-136), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases. Remove the drive clutch. If applicable, account for the two sleeves.



AN380D

5. Remove the cap screw and washer securing the driven pulley; then slide the driven pulley off the driven shaft. Account for a key, stub shaft, and alignment washers.



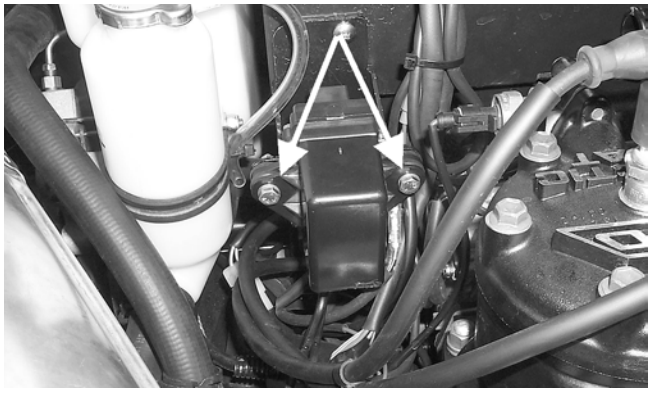
AF120D

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■**NOTE: If the driven pulley is tight on the driven shaft, pull the driven pulley off using the Driven Pulley Puller (p/n 0744-023).**

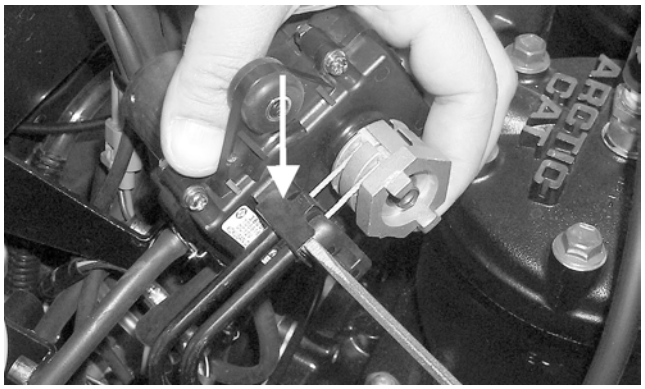
■**NOTE: Steps 6 through 12 are for APV equipped engines.**

6. Remove the two cap screws securing the servomotor cover.



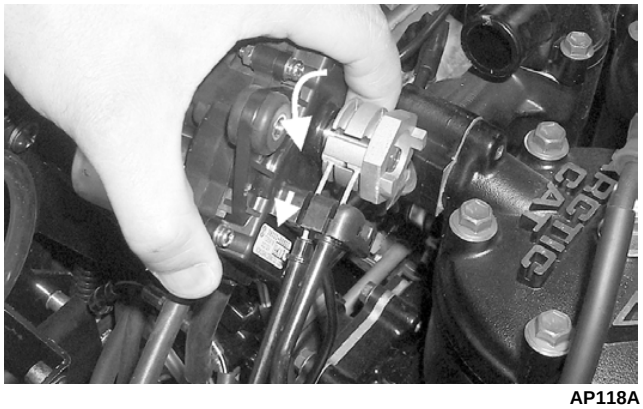
AP116A

7. Using a small screwdriver, pry off the cable retaining cover.



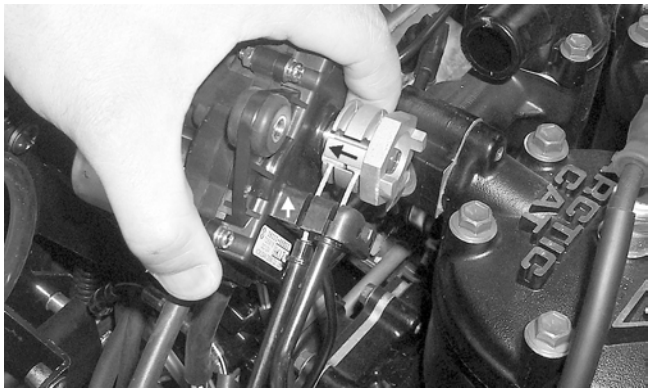
AP117A

8. Rotate the servomotor actuator counterclockwise to loosen the cable; then pull the cable housings out of the holder.



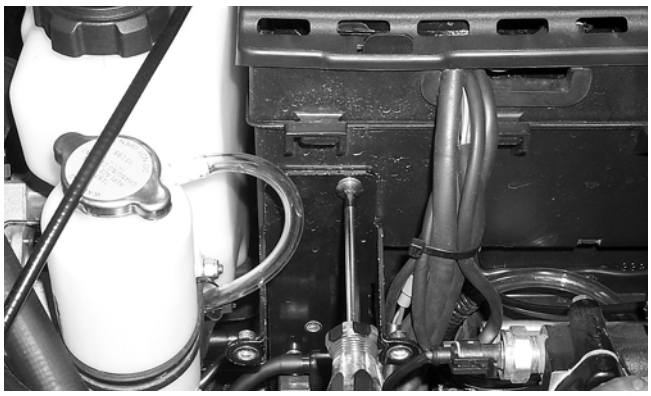
AP118A

9. Pull the cable up and out of the cable housing holder; then slide each cable drum to the left and out of the servomotor actuator.



AP118B

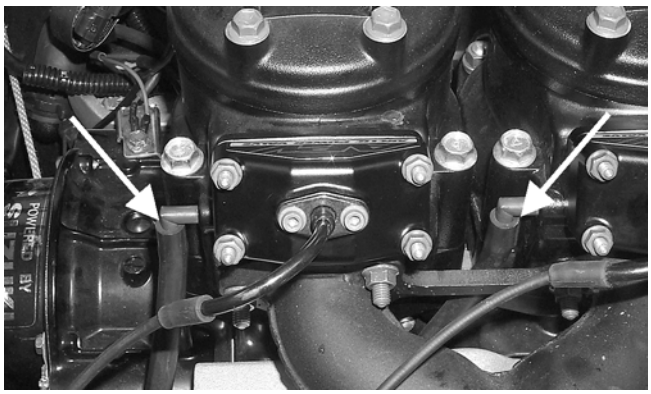
10. Remove the screw securing the servomotor mounting plate to the air-intake silencer; then pull the mounting plate forward and up to remove it from the silencer. Lay the mounting plate aside out of the way.



AP127

11. Lift the silencer cover and remove the CDI unit; then lay the unit aside out of the way.

12. Remove the two APV drain hoses and route them out of the way.



AP128A

13. If applicable, remove the machine screw and washer securing the mounting plate (for the ignition coil and fuel pump) to the air-intake silencer.

14. Remove the screws securing the air-intake silencer; then move the silencer forward and out of the engine compartment.

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15. Disconnect the oil-injection cable/control rod from the oil-injection pump; then disconnect the oil-supply hose from the pump and plug the hose to prevent oil drainage.

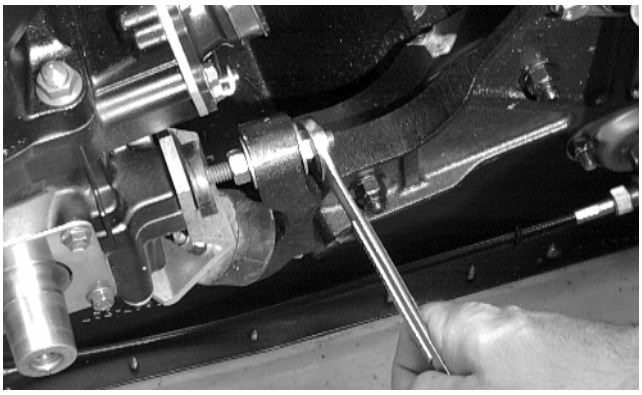
16. Loosen the flange clamps securing the throttle body/carburetor to the flange; then remove the throttle body/carburetor. Place them to one side in an upright position.

17. On carbureted models, disconnect the impulse hose from the crankcase.



AN385D

18. Loosen the engine torque bumper and remove the left rear engine nut and washer.



AN610D

19. Secure the hood with a tie-down strap; then remove the hood cable.

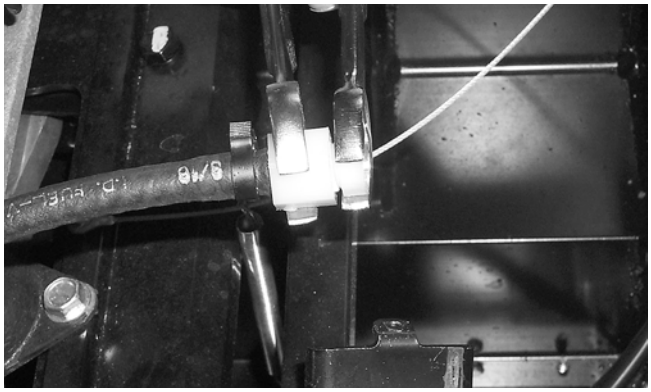
20. Disconnect all electrical wires from the engine.

21. Remove the recoil starter from the engine. Leave it in the engine compartment.

■ **NOTE: If applicable, disconnect the solenoid-to-starter motor cable from the starter motor.**

22. Loosen the cap screws/lock nuts securing the engine mounting brackets to the front end.

23. Remove the cap from the coolant drain hose and route the hose into a suitable container. Remove the filler cap; then once the coolant stops draining, install the drain hose cap.



AP126

24. Loosen the clamp securing the supply hose to the coolant tank and remove the hose. Loosen the clamp securing the hose to the thermostat cap; then remove the hose from the cap.

■ **NOTE: Inspect the engine to ensure all wires, hoses, and cables have been removed.**

25. Lift the engine with mounting brackets out of the engine compartment.

26. Remove the cap screws securing the engine mounting brackets to the crankcase; then remove the brackets.

27. Remove the exhaust manifold from the engine. Account for nuts, washers, and gaskets.

28. Remove the clamp securing the coolant supply hose to the water pump. Then remove the hose from the pump.

Removing Engine
(550 cc Models)

1. Disconnect the battery cables making sure to disconnect the negative cable first.

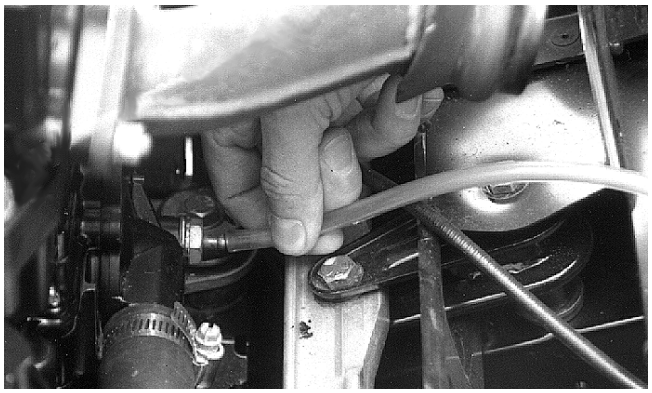
2. Turn the gas tank shut-off valve to the CLOSED position.

3. Remove the cable tie and positive battery cable from the starter motor.

4. On the Wide Track, remove the two lock nuts securing the starter motor to the engine mounting bracket; then place the starter motor and end cap off to the side.

5. Remove the springs securing the expansion chamber to the exhaust manifold, front end, and resonator. Remove the expansion chamber and grafoil gasket.

6. Attach a long piece of fuel hose to the engine coolant drain (located on the exhaust side of the engine). Route the hose outside the engine compartment and into a container. Open the drain and remove the filler cap. Once the coolant stops flowing, remove the hose and tighten the drain valve.



AP058

7. Open the belt guard: then remove the drive belt.

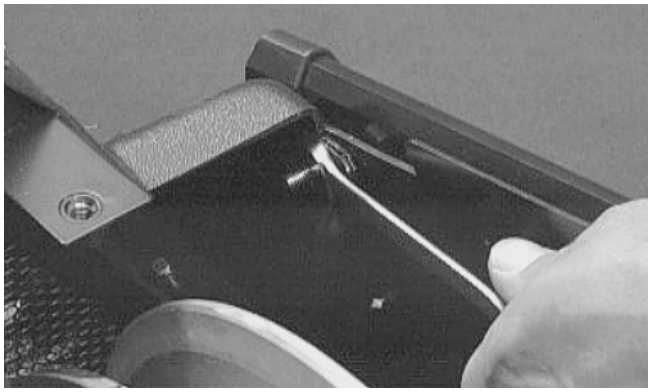
■NOTE: On the Wide Track, remove the machine screws securing the side panel to the belly pan; then remove the side panel. On the Pantera 550 and ZL 550, remove the rubber plug from the belly pan.



AM115D

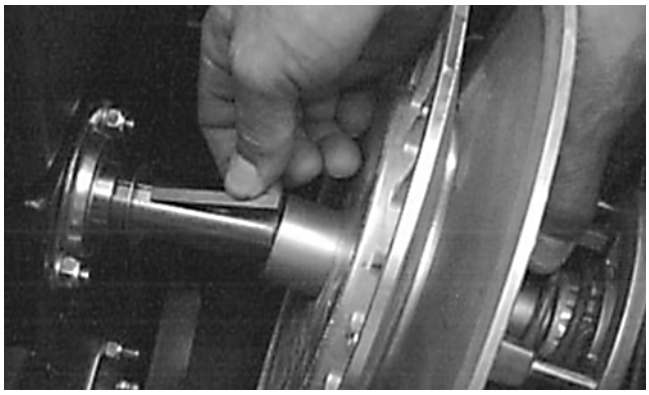
8. Using a ½-in. twelve-point socket, remove the bolt and lock washer securing the drive clutch to the crankshaft. Using the Clutch Puller (p/n 0644-207) and an impact wrench or a breaker bar and the Flywheel Pulley/Spanner Wrench (p/n 0144-310), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases. Remove the drive clutch. If applicable, account for the two sleeves.

■NOTE: On the Wide Track, remove the lock nut securing the belly pan and bumper to the bumper support tube; then remove the rear plug from the belly pan.



AF459D

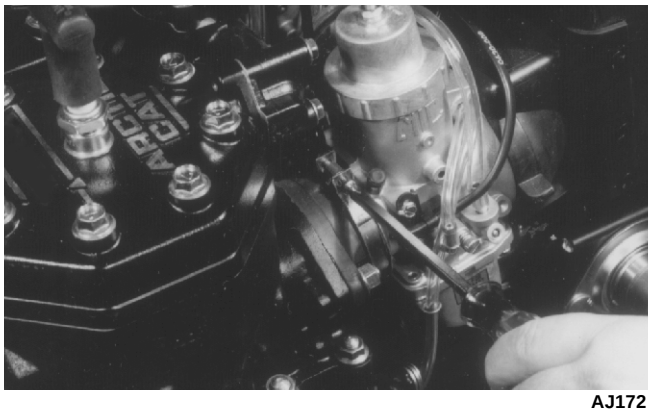
9. Remove the cap screw and washer securing the driven pulley; then slide the driven pulley off the driven shaft. Account for a key and alignment washers.



AF120D

■NOTE: If the driven pulley is tight on the driven shaft, pull the driven pulley off using the Driven Pulley Puller (p/n 0744-023).

10. Loosen the flange clamp securing each carburetor to its flange; then remove the carburetors. Position the carburetors to one side in an upright position.



AJ172

11. Disconnect the impulse hose from the crankcase.

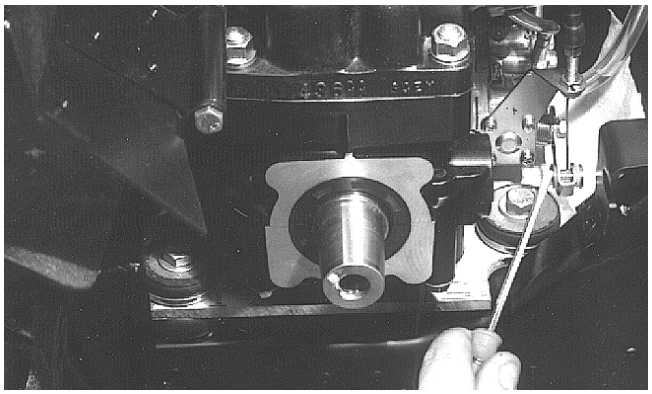
12. Remove the cable tie securing the engine and CDI wiring harnesses to the engine; then disconnect the main wiring harness from the engine and CDI wiring harnesses.

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13. Remove the spark plug caps and the cable tie securing the temperature-gauge sender wire; then disconnect the sender wire.

14. On the Wide Track, remove the ground wire from the magneto housing.

15. Remove the E-clip and washer securing the oil-injection cable; then disconnect the oil-injection cable from the pump. Disconnect the oil-supply hose from the pump and plug the hose to prevent oil drainage.



AN009

16. Loosen the clamp securing the supply hose to the water pump housing; then remove the hose from the water pump. Loosen the clamp securing the hose to the thermostat cap; then remove the hose from the cap.

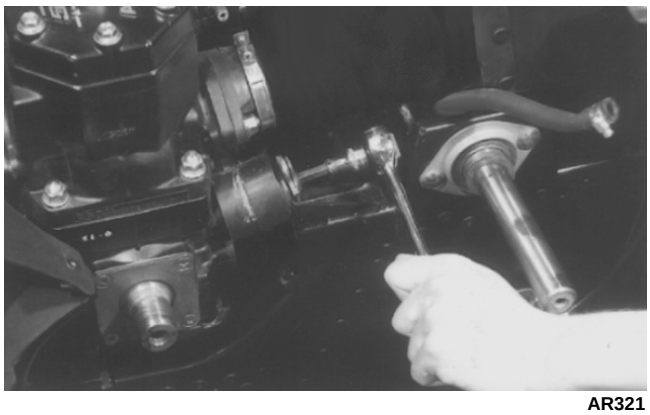
17. Remove the four cap screws and lock washers securing the recoil starter; then remove the starter from the engine. Leave it in the engine compartment.

■ NOTE: On the Pantera 550, account for the ground wire.

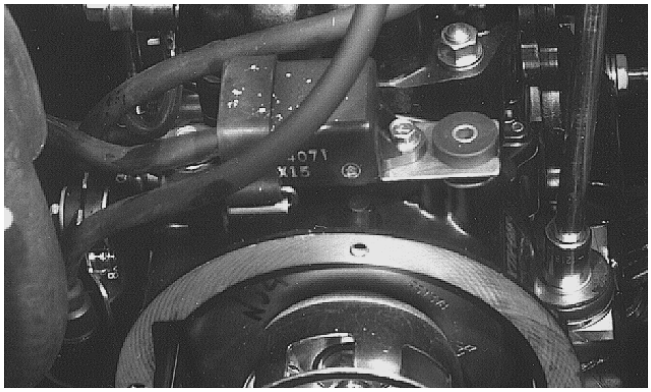
18. Support the hood; then remove the hood cable from the exhaust manifold.

19. Remove the mounting hardware securing the engine to the front end.

■ NOTE: On the Wide Track, account for shims and note their position on the left rear engine mount for assembly purposes.



AR321



AN013

20. Lift the engine with mounting brackets out of the engine compartment.

⚠ CAUTION

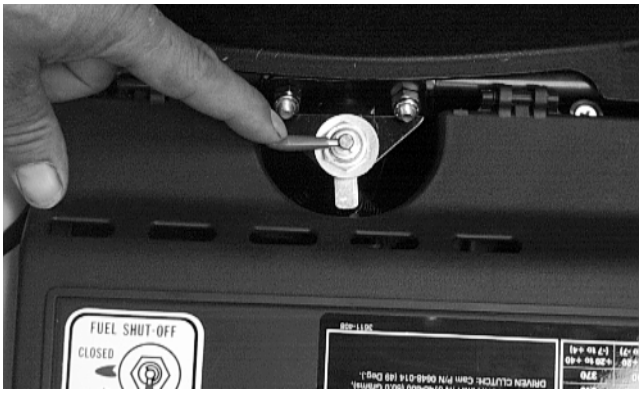
Do not use the starter motor shaft to lift the engine. Damage may occur.

21. Remove the engine mounting brackets.

Removing Engine
(Triple Models)

■ NOTE: Some engines are equipped with Arctic Power Valves (APV). Closely observe the NOTE: introducing this important information.

1. Turn the gas tank shut-off valve to the CLOSED position.



AL658D

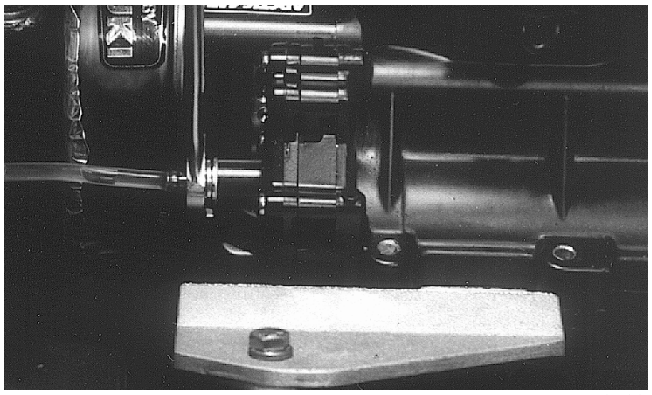
2. Secure the hood with a hold-down strap; then remove the hood cable.

3. Remove the springs securing the expansion chambers to the header pipes, the front end, and the resonator. Remove the expansion chambers and three grafoil gaskets.

■ NOTE: Number the expansion chambers before removing to aid in assembly.

4. Remove the cap screws securing the resonator. Account for and note the location of the engine ground cable with star washer, washers, bushings, spacers, and retaining nuts.

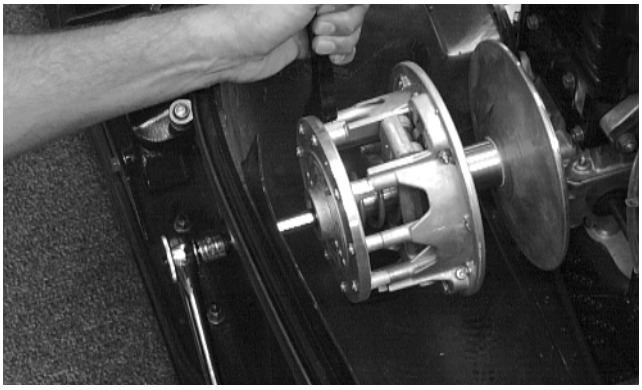
5. Attach a long piece of fuel hose to the engine coolant drain. Route the hose outside the engine compartment and into a container. Open the drain valve; then remove the coolant filler cap to vent the system. Once the coolant stops flowing, remove the hose and tighten the drain valve.



AQ123

6. Open the belt guard; then remove the drive belt.

7. Remove the plug from the belly pan; then using a 1/2 in. twelve-point socket, remove the bolt and lock washer securing the drive clutch to the crankshaft. Using the Drive Clutch Puller (p/n 0644-207) and an impact wrench or a breaker bar and Spanner Wrench (p/n 0644-136), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases. Remove the drive clutch. If applicable, account for the two sleeves.



AF472D

8. Remove the cap screw securing the driven pulley; then slide the driven pulley off the driven shaft. Account for a stub shaft, the location of all washers, and a key.

■ NOTE: If the driven pulley is tight on the shaft, pull the driven pulley off using the Driven Pulley Puller (p/n 0744-023).

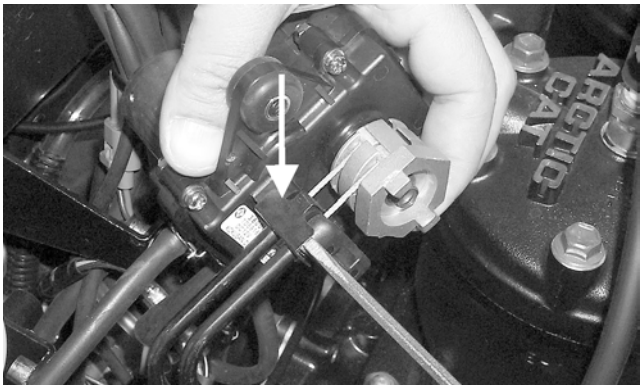
■ NOTE: Steps 9 through 15 are for APV equipped engines.

9. Remove the two cap screws securing the servomotor cover.



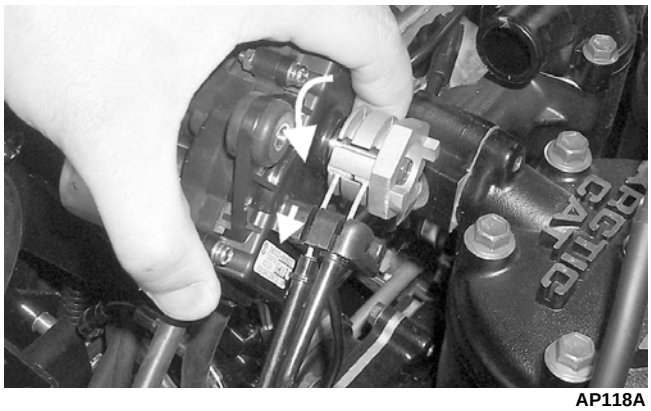
AP116A

10. Using a small screwdriver, pry off the cable retaining cover.



AP117A

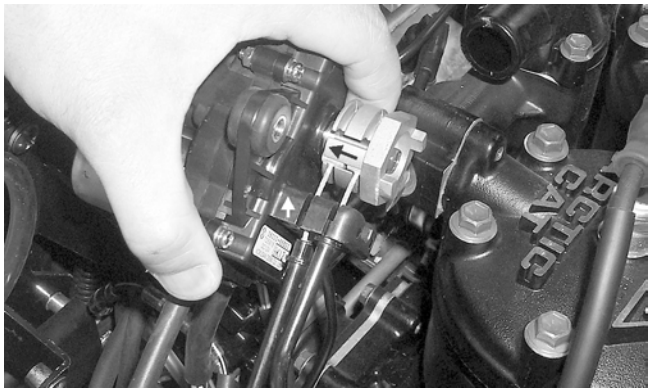
11. Rotate the servomotor actuator counterclockwise to loosen the cable; then pull the cable housings out of the holder.



AP118A

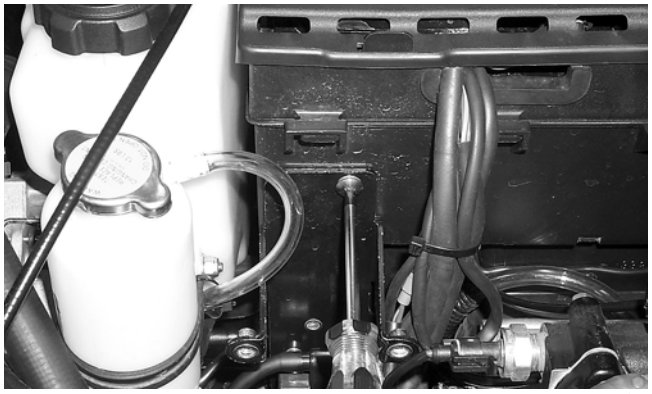
12. Pull the cable up and out of the cable housing holder; then slide each cable drum to the left and out of the servomotor actuator.

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AP118B

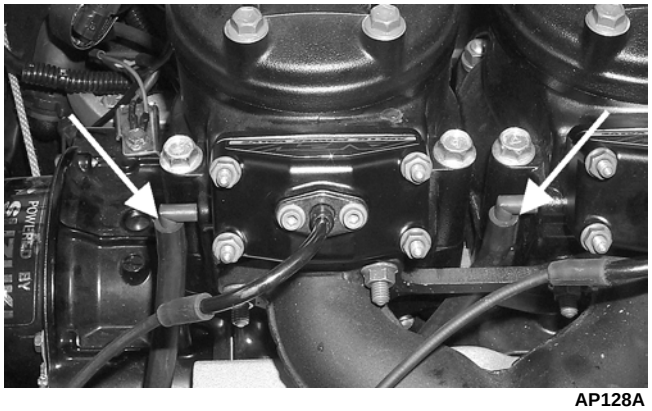
13. Remove the screw securing the servomotor mounting plate to the air-intake silencer; then pull the mounting plate forward and up to remove it from the silencer. Lay the mounting plate aside out of the way.



AP127

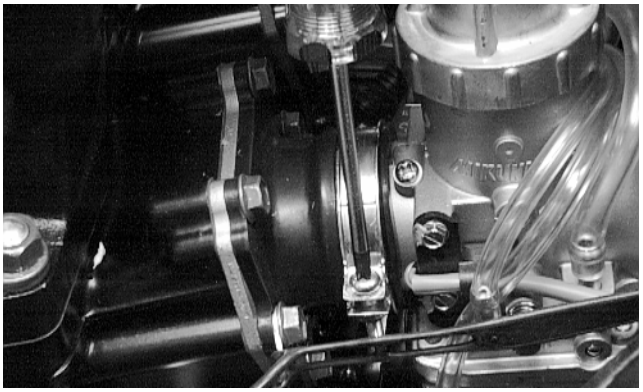
14. Lift the silencer cover and remove the CDI unit; then lay the unit aside out of the way.

15. Remove the two APV drain hoses and route them out of the way.



AP128A

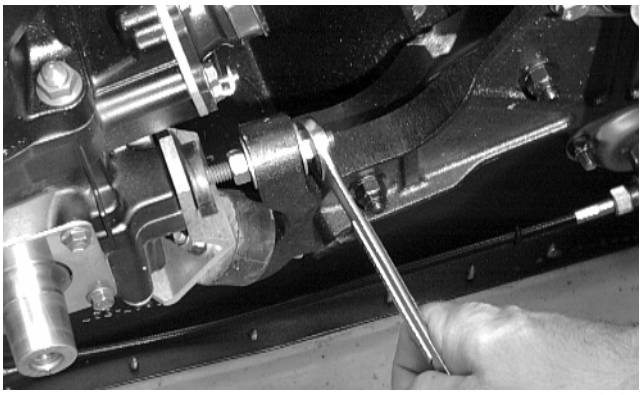
16. Label the carburetors. Loosen the flange clamp securing each carburetor to its flange; then remove the carburetors from the intake flanges. Position the carburetors to one side in an upright position.



AN614D

17. Disconnect the impulse hose from the crankcase.

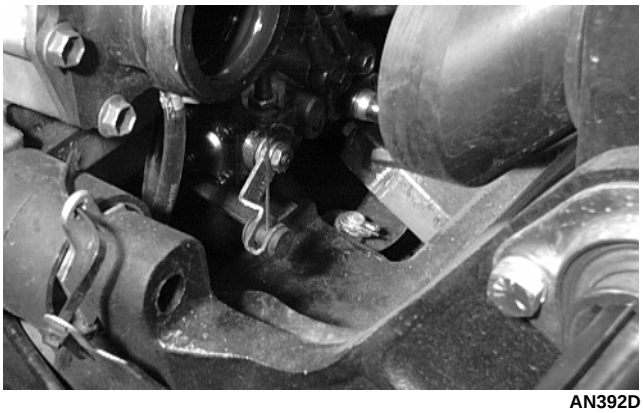
18. Loosen the engine torque bumper; then remove the left-side rear engine nut and washer.



AN610D

19. Disconnect the engine and timing sensor wiring harnesses from the main wiring harness. Remove the spark-plug caps from the spark plugs. Remove the cap screw securing the two ground wires to the magneto housing cover.

20. Remove the E-clip and washer securing the oil-injection cable; then disconnect the oil-injection cable from the oil-injection pump. Disconnect the oil-supply hose and the oil-output hose from the pump and plug the hoses to prevent oil drainage.

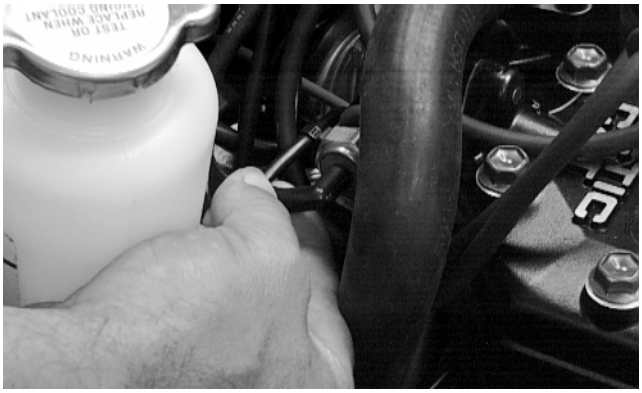


AN392D

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21. Loosen the clamp securing the coolant supply hose to the water pump housing; then remove the hose from the water pump. Loosen the clamp securing the hose to the thermostat cap; then remove the hose from the cap.

22. Disconnect the temperature-gauge sender wire.

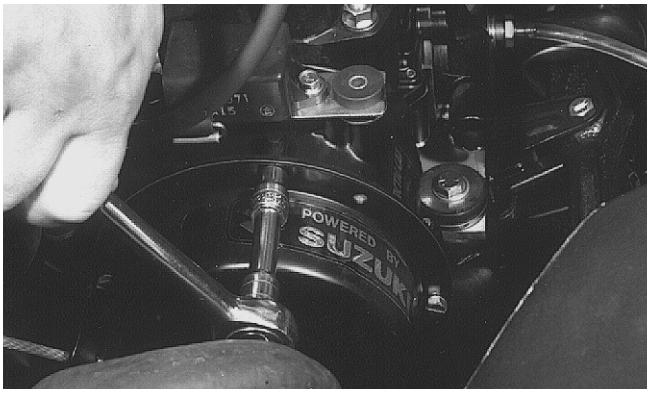


AJ663

23. Remove the cap screws securing the engine mounting brackets to the front end. Account for mounting hardware.

24. Lift the MAG-side of the engine. Remove the four cap screws and lock washers securing the recoil starter; then remove the starter from the engine. Leave it in the engine compartment.

■ NOTE: If applicable, disconnect the solenoid- to-starter motor cable from the starter motor.



AN012

25. Lift the engine with engine mounting brackets out of the engine compartment.

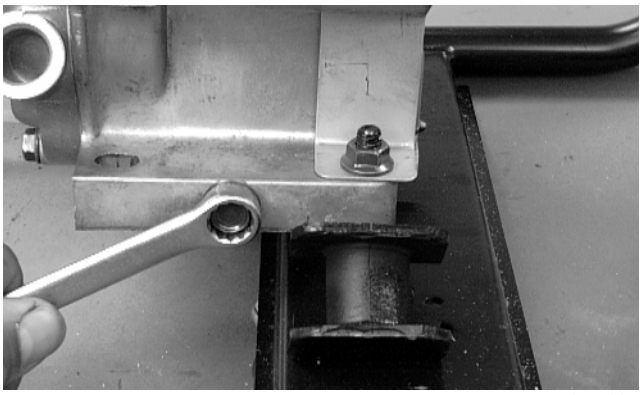
26. Remove the mounting brackets from the crankcase.

Disassembling Engine Table of Contents

120 cc Model 2-12
370/440 cc Models 2-17
550 cc Models 2-20
570 cc Models 2-23
500/600 cc Twin Models 2-29
800 cc Models 2-34
600 cc Triple Model 2-39
1000 cc Models 2-45

Disassembling Engine
(120 cc Model)

1. Remove the oil drain plug and drain the oil; then install the oil plug and tighten securely.



GM300D

2. Remove the wing nut securing the air cleaner end cap to the air cleaner housing.

3. Remove the cap screw and flange nuts securing the air cleaner housing to the carburetor and engine.



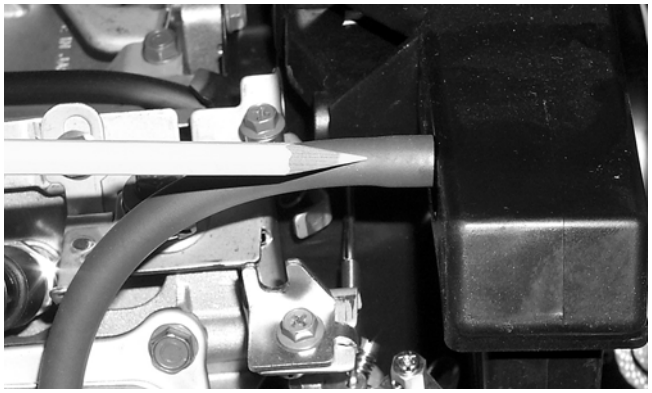
A002

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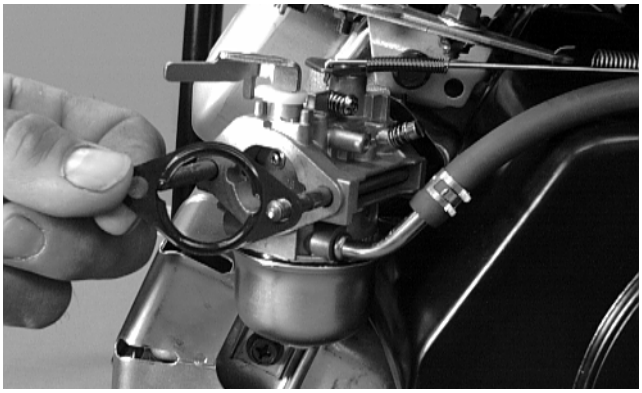


GF314D

4. Remove the air breather hose from the air cleaner housing; then remove the air cleaner housing from the carburetor. Account for the gasket.

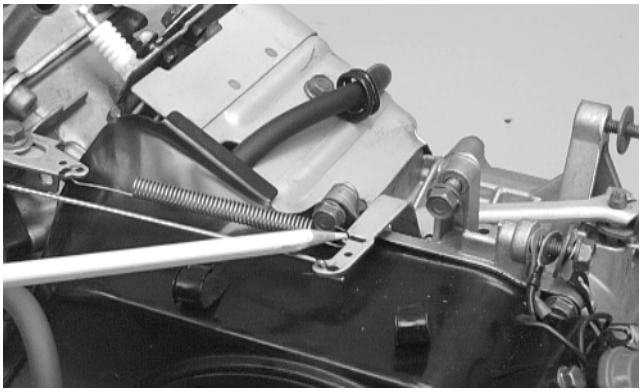


A001



GF316D

5. Mark the locations of the springs for assembly; then disconnect the rod and spring from the carburetor.



GF208D

6. Slide the carburetor off the mounting studs. Account for a gasket, insulator block, and a gasket.



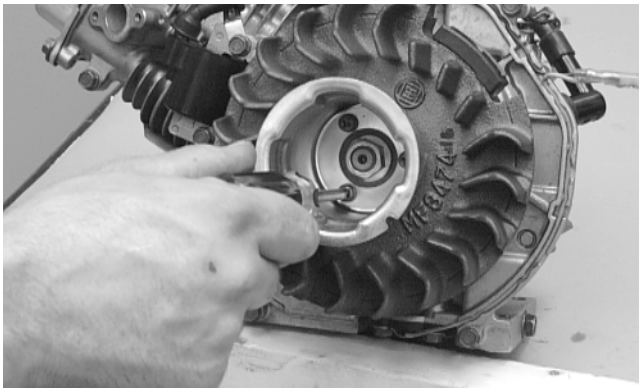
GF318D

7. Remove the recoil starter/fan housing assembly.

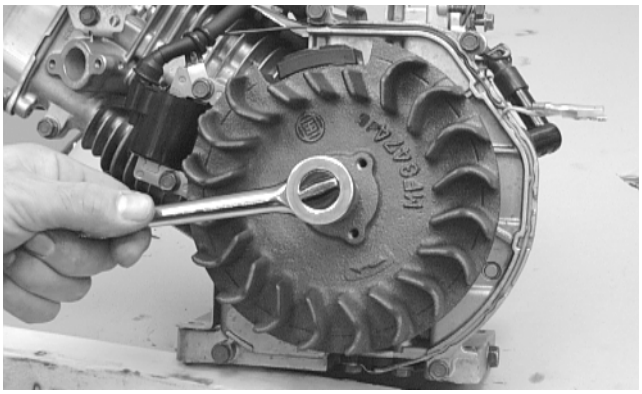


GM201D

8. Remove the screws securing the recoil starter pulley to the flywheel; then remove the nut securing the flywheel to the crankshaft.

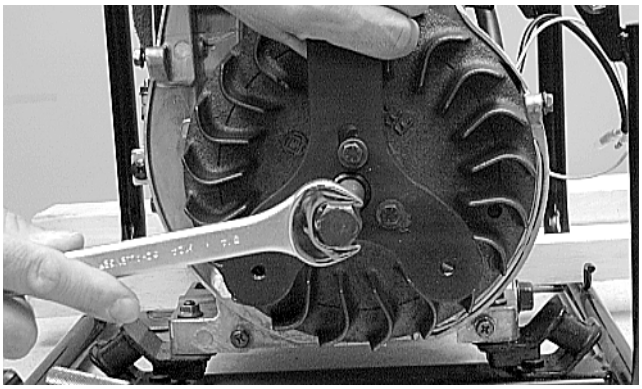


GM202D



GM203D

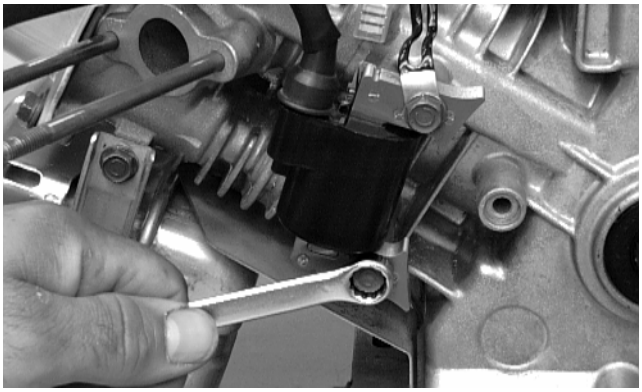
9. Using a flywheel puller, remove the flywheel.



GM110D

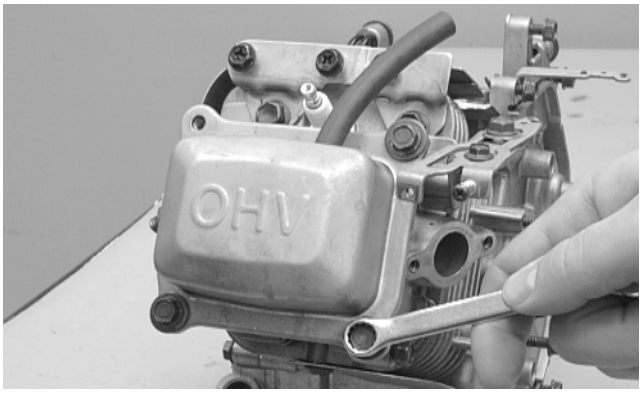
10. Remove the high tension lead from the spark plug and two wire forms; then disconnect the ignition coil wire.

11. Remove the cap screws securing the ignition coil to the crankcase housing.



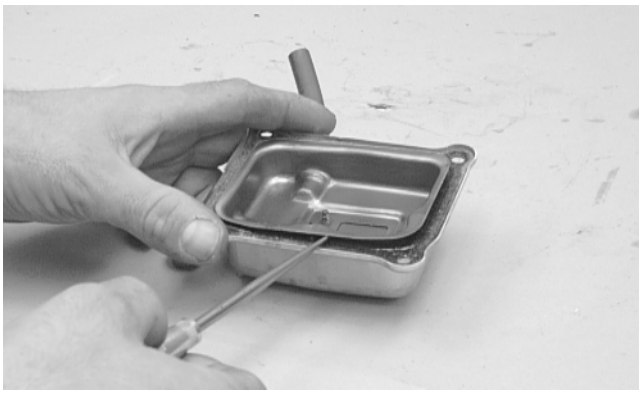
GE318D

12. Remove the cylinder head cover.



GM205D

13. Remove the air breather body assembly from the cylinder head cover. Account for a gasket.



GM206D

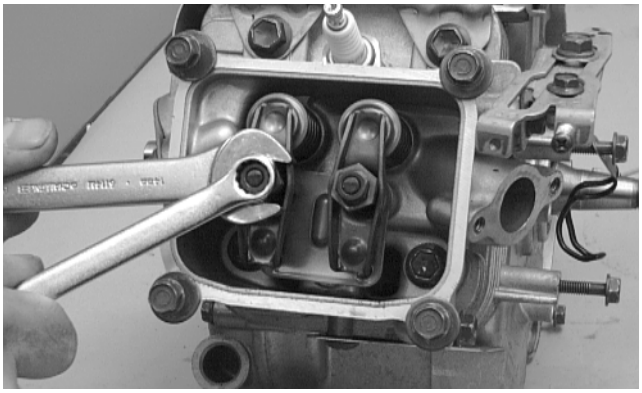
14. Remove the screws securing the reed stopper to the air breather body assembly.

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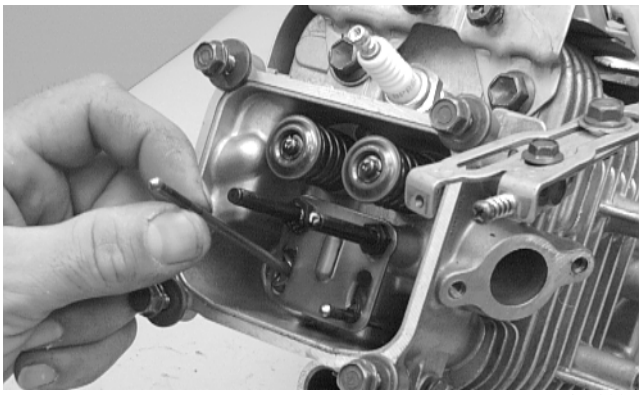
GM207D

15. Remove the lock nuts and pivots securing the rocker arms to the cylinder head.



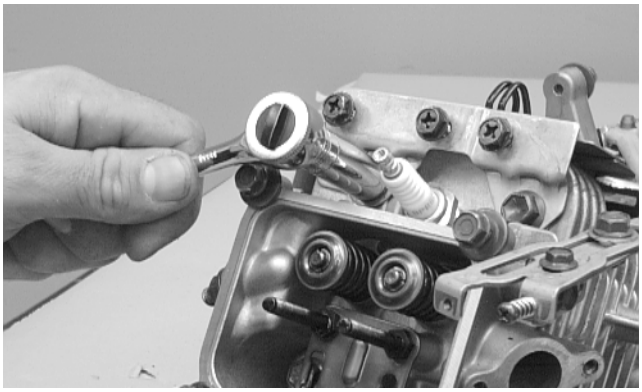
GM208D

16. Remove the push rods.

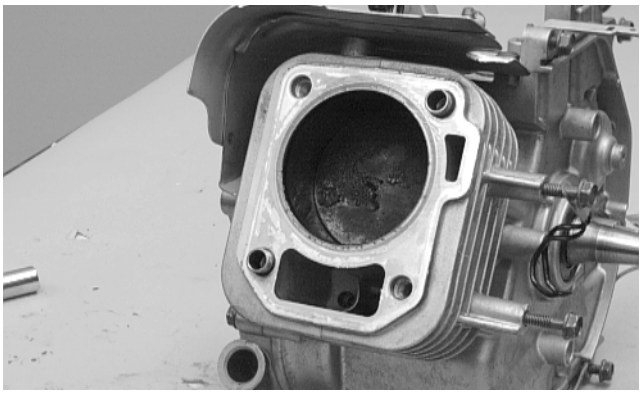


GM209D

17. Remove the cap screws securing the head to the cylinder; then remove the head and account for a gasket. Note the location of the dowel pins.

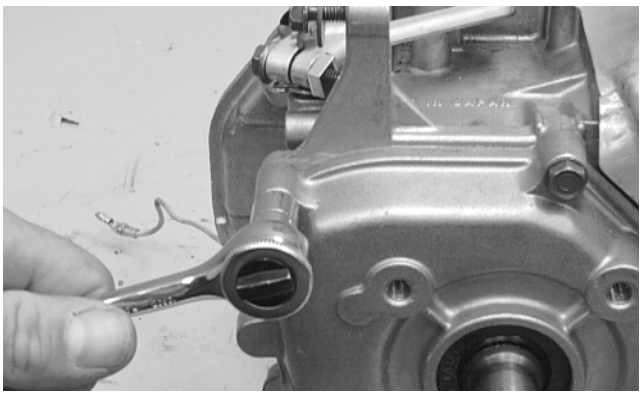


GM210D

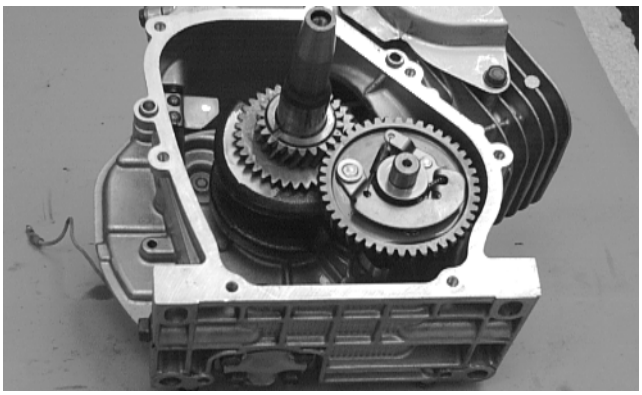


GM211D

18. Remove the cap screws securing the crankcase side cover to the crankcase. Account for dowel pins and a gasket.

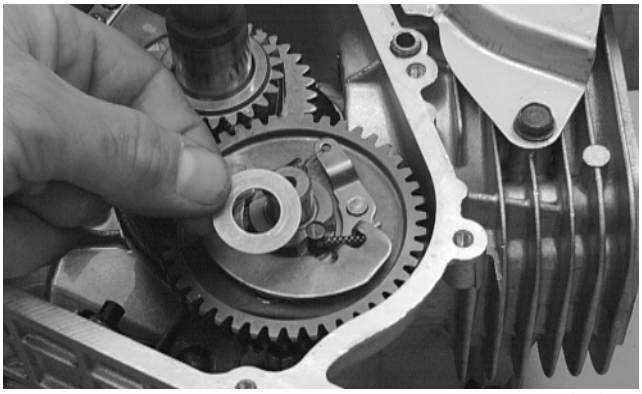


GM212D

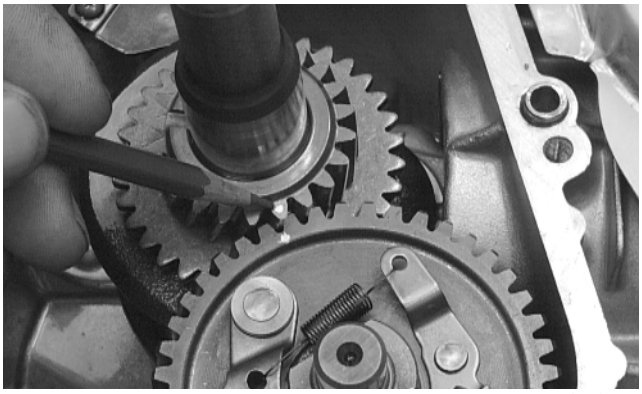


GM213D

19. Remove the washer from camshaft and note the location of the timing marks on the crankshaft and camshaft gears.

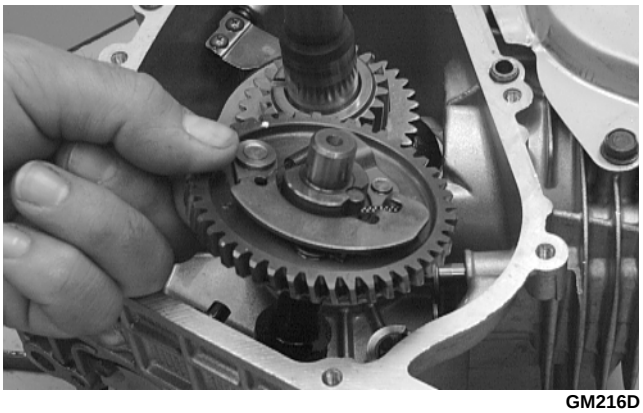


GM214D

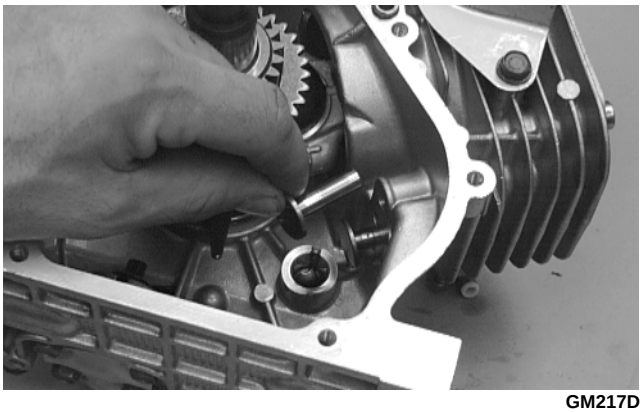


GM215D

20. Remove the camshaft; then remove the tappets.

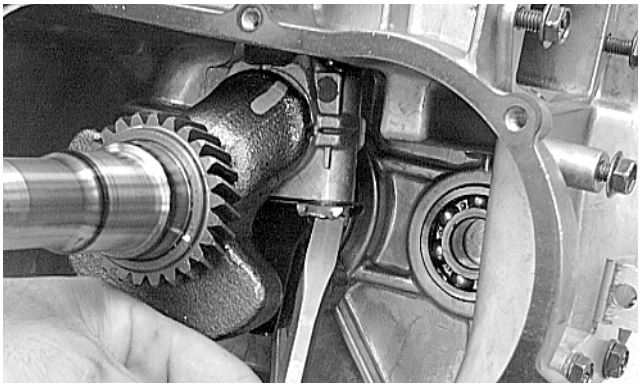


GM216D



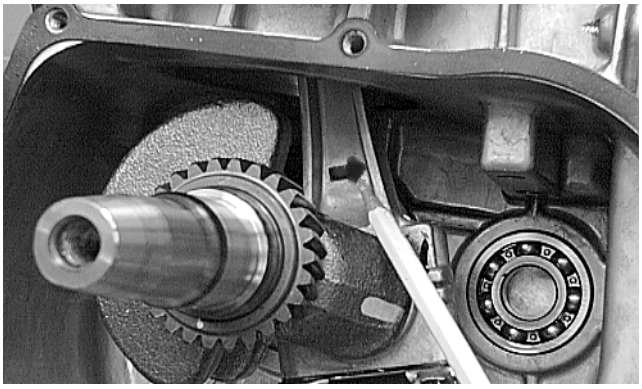
GM217D

21. Rotate the crankshaft until the piston is at the top of the stroke; then using a chisel, loosen the connecting rod nut locking tabs.

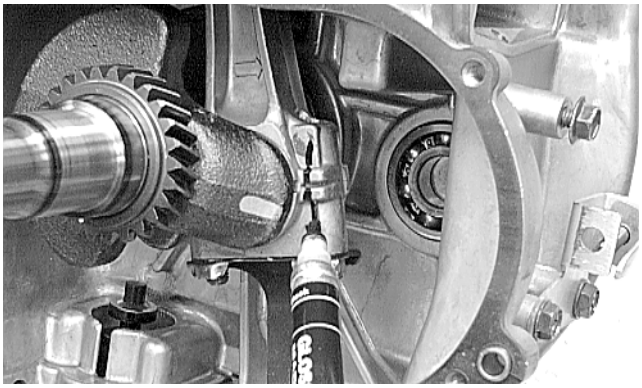


GM119D

22. Note the direction of the arrow on the connecting rod and mark the connecting rod and end cap for reference during installation.



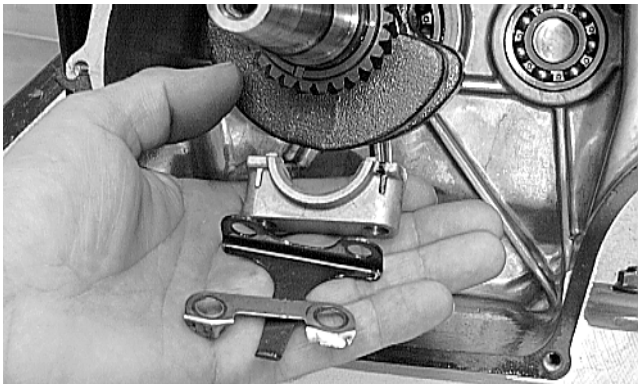
GM121D



GM120D

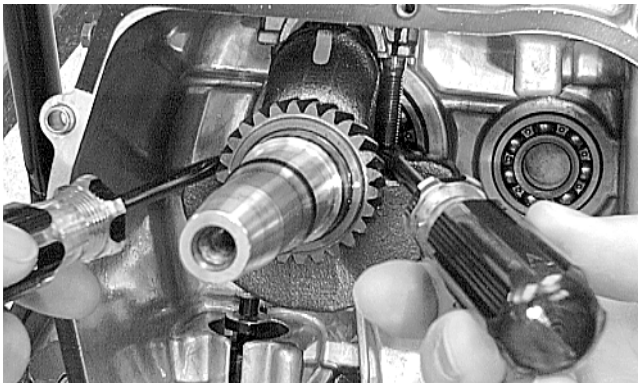
23. Remove the connecting rod end cap and account for the splasher plate and lock tab.

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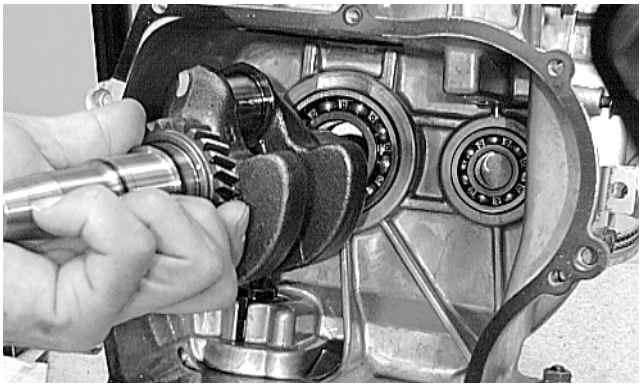
GM123D

24. Using two flat blade screwdrivers between the connecting rod studs and the crankshaft web, push upward on the piston.



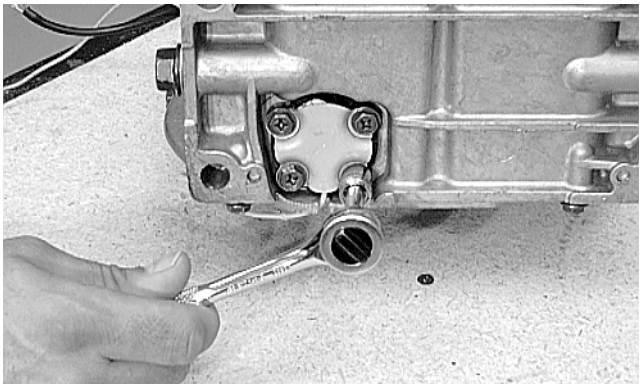
GM122D

25. Remove the crankshaft.



GM124D

26. Remove the cap screws securing the oil level sensor plate to the crankcase; then remove the plate.



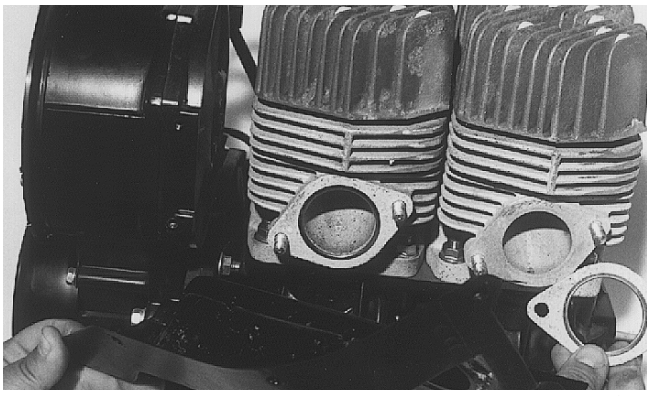
GM126D

Disassembling Engine
(370/440 cc Models)

1. Remove the four nuts and lock washers securing the exhaust manifold; then remove the exhaust manifold. Account for two gaskets.

2. Noting the location of the longer cap screws for assembly purposes, remove the 14 cap screws, lock washers, and washers securing the top and exhaust-side cooling shrouds.

3. Lift the top cooling shroud off the engine and slide the exhaust-side cooling shroud off the exhaust-manifold studs. Account for two exhaust-manifold shroud gaskets.



AB014

4. Disconnect the two oil-injection hoses from their fittings on the intake manifold (single carburetor) or on the adapter plates (twin carburetor).

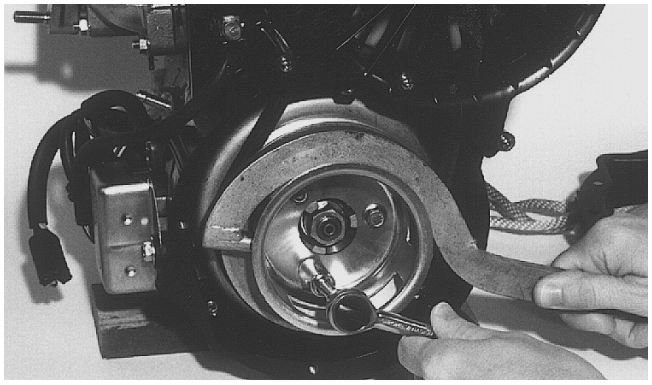
5. A. On the 370 cc, remove the nuts securing the intake manifold; then remove the manifold with flange from the engine. Account for two insulators. Discard the gaskets.

   B. On the 440 cc, remove the nuts, lock washers, and washers securing the intake flanges; then remove the flanges from the engine. Remove the screws securing the adapter plates; then remove the adapter plates. Discard the gaskets.

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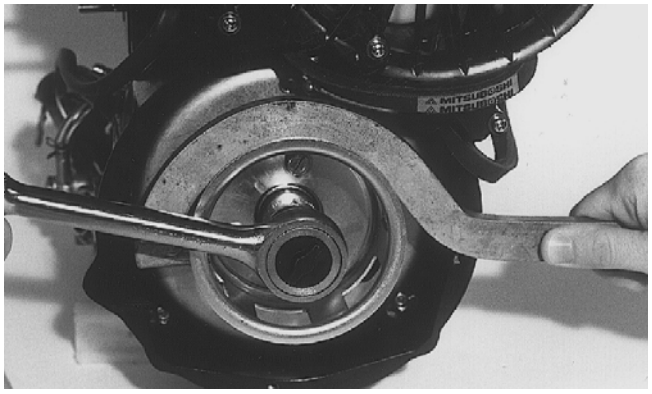
6. Remove the intake-manifold cooling shroud from the engine. Discard the two gaskets.

7. Using Flywheel Spanner Wrench (p/n 0144-007) to secure the crankshaft, remove the three cap screws and lock washers securing the starter pulley to the flywheel. Remove the starter pulley; then carefully pry the fan belt drive pulley from its seated position on the flywheel and remove.



AB020

8. Temporarily install the starter pulley on the flywheel with three cap screws. Using the flywheel spanner wrench to secure the crankshaft, loosen and remove the flywheel nut and washers.



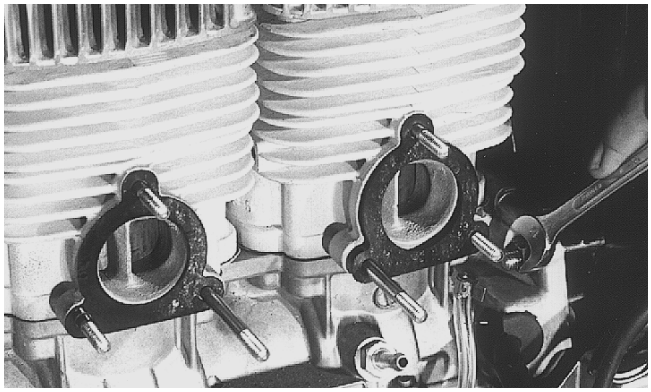
AB021

■ **NOTE: If an impact wrench is being used, use of a flywheel spanner wrench will not be necessary.**

9. Remove the cap screws securing the starter pulley to the flywheel and remove the pulley.

10. Remove the flange nuts securing the fan case to the crankcase; then remove the fan case.

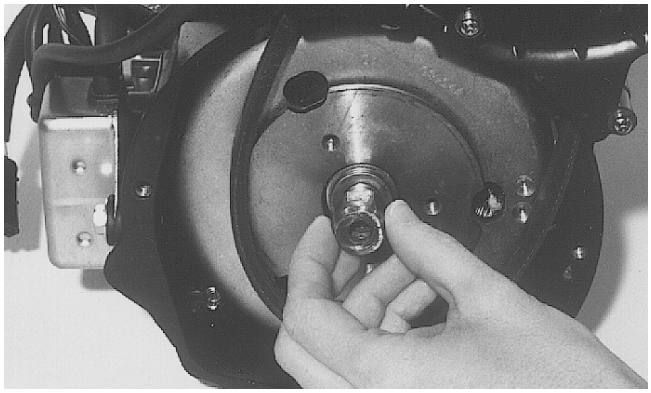
■ **NOTE: For further servicing of the axial fan components, see section 3.**



AB015

11. Install a protective cap onto the end of the crankshaft.

■ **NOTE: A suitable protective cap can be made by welding a 3 mm (1/8 in.) plate on one side of a spare flywheel nut.**

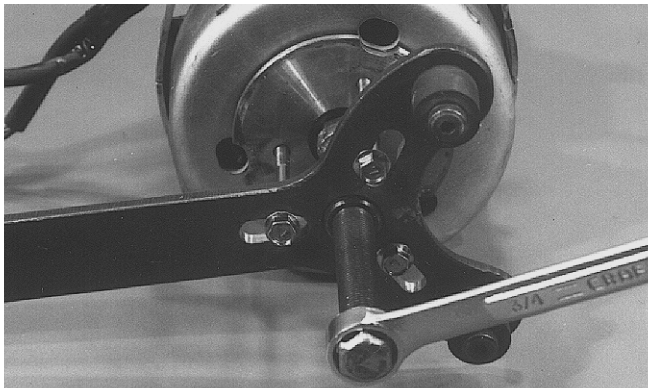


AB022

⚠ CAUTION

To prevent damage to the crankshaft, thread a protective cap onto the crankshaft. The puller must bottom on the cap and not on the crankshaft. Also, do not thread puller bolts more than 12.7 mm (1/2 in.) into the flywheel. Damage to the coils may result.

12. Using the Flywheel Puller/Spanner Wrench (p/n 0144-310) or suitable equivalent, remove the flywheel from the crankshaft by tightening the puller bolt, striking the head of the puller bolt with a hammer, and tightening again. Repeat procedure until the flywheel is free. Account for the key in the end of the crankshaft.

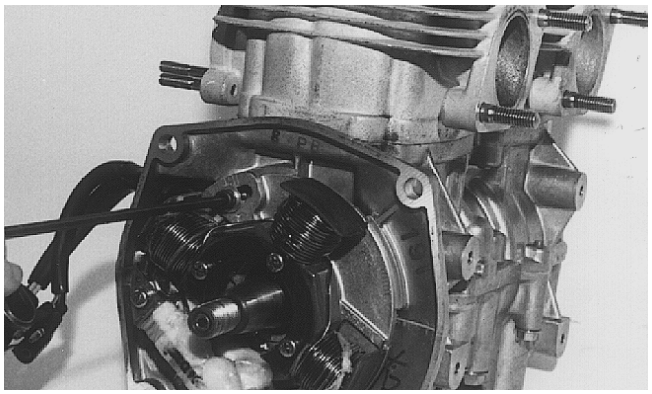


AB098

■**NOTE: To ensure the cleanliness of the flywheel magnets, place the flywheel (with the magnets facing upward) on a clean bench.**

13. Scribe a reference line on the stator plate and crankcase to aid in assembly; then remove the two Allen-head cap screws, lock washers, and washers securing the stator plate.

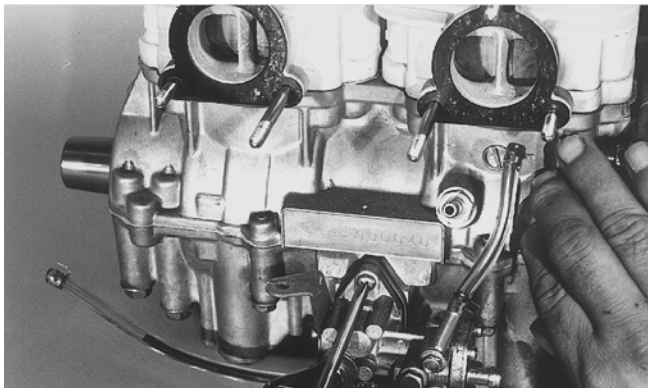
■**NOTE: The two stator plate Allen-head cap screws had Loctite applied to the threads during assembly. Before removing them, apply a sharp blow to the head of each screw to break the Loctite loose. If this isn't done, the screws can be very difficult to remove.**



AB026

14. Remove the stator plate from the engine.

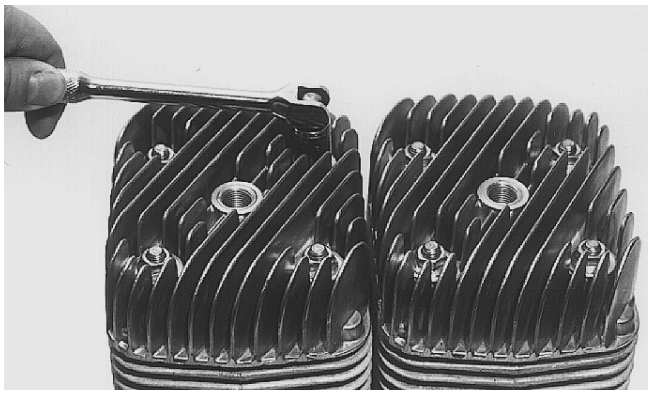
15. Remove the screws, lock washers, and washers securing the oil-injection pump to the crankcase; then remove the pump, retainer, shim, and gear. Account for two gaskets.



AB018

16. Remove the spark plugs.

17. Remove the eight nuts, lock washers, and washers securing the cylinder heads to the cylinders. Note the position of the different-sized nuts. Remove the heads and account for two gaskets and four dowel pins.



B563

18. Using a rubber hammer, gently tap the cylinders and remove from the crankcase by lifting them straight up off their studs. Discard the two gaskets. Account for two dowel pins.

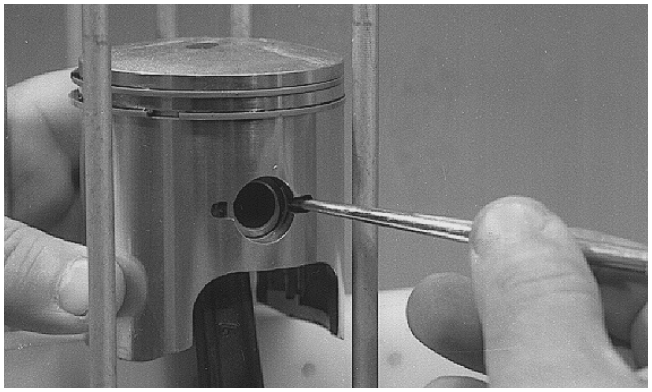
⚠ CAUTION

When removing a cylinder, make sure to support the pistons so they will not be damaged.

19. Using a felt-tipped marker, mark an M on the MAG-side head, cylinder, and piston and a P on the PTO-side head, cylinder, and piston.

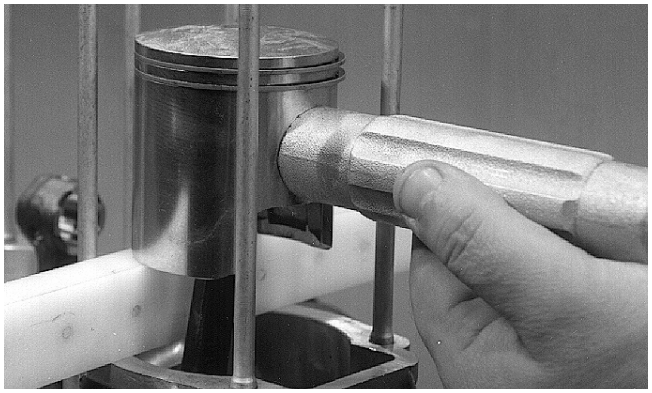
■**NOTE: For proper assembly, keep all MAG-side components and all PTO-side components separated. Assemble them on their proper sides.**

20. Remove the PTO-side piston-pin circlip from the PTO-side piston; remove the MAG-side piston-pin circlip from the MAG-side piston.



A829

21. Using the Piston-Pin Puller (p/n 0644-328), remove the piston pins from both pistons.



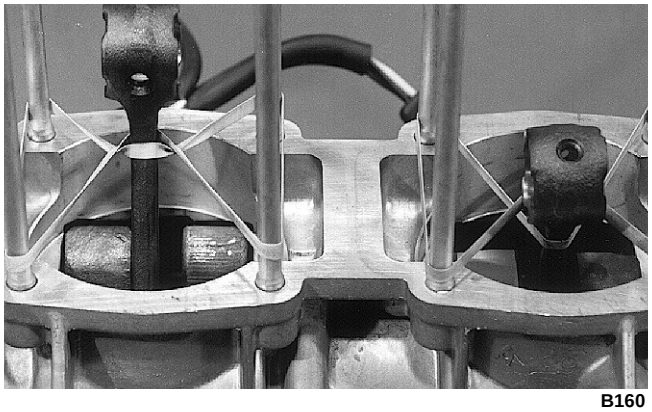
A830

⚠ CAUTION

DO NOT use any type of punch to drive the piston pin free of the piston; damage may result. Use a piston-pin puller only.

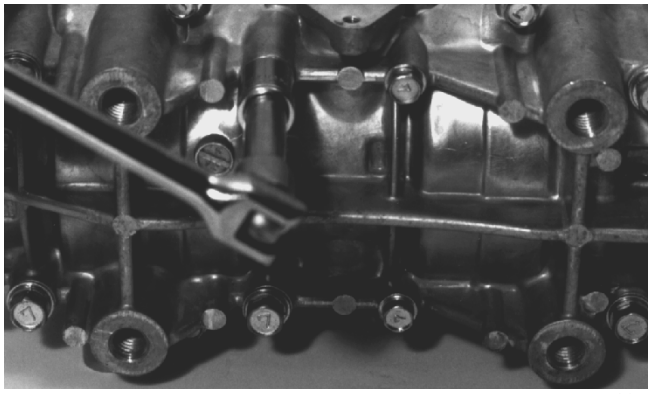
22. Lift the pistons clear of the connecting rods and remove the small end connecting-rod bearings; then remove the piston rings. Keep each piston with its rings, piston pin, and bearing together as a set.

■NOTE: Place rubber bands over the connecting rods and around the cylinder studs. This will keep the connecting rods from damaging the crankcase.



B160

23. Remove the cap screws securing the crankcase halves. Note the position of the different-sized cap screws.



A831

24. Separate the crankcase halves by installing two crankcase cap screws in diagonal corners leaving the heads approximately 6 mm (1/4 in.) out. Using a plastic hammer, tap on each cap screw head until the halves separate. Remove the cap screws.

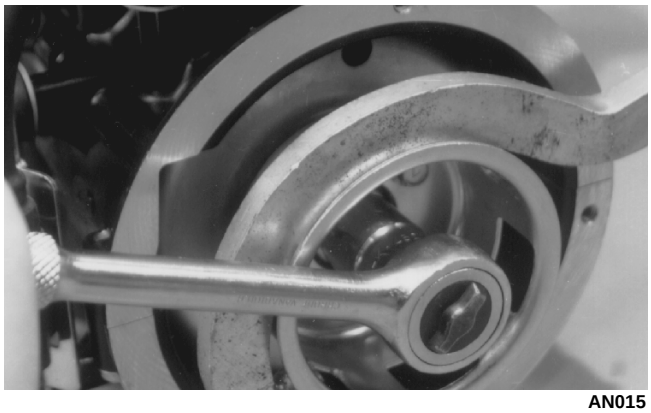
⚠ CAUTION

DO NOT drive any tool between the crankcase halves to separate the crankcase. Damage to the sealing surfaces will result.

25. Remove the rubber bands holding the connecting rods; then separate the crankcase halves. Account for the two dowel pins. Lift the crankshaft free from the crankcase half and slide the two crankshaft seals off the crankshaft. Account for the C-ring and five bearing retaining pins.

Disassembling Engine
(550 cc Models)

1. Using the spanner wrench to secure the flywheel, remove the flywheel nut, lock washer, and flat washer; then remove the three starter pulley cap screws and remove the pulley.



AN015

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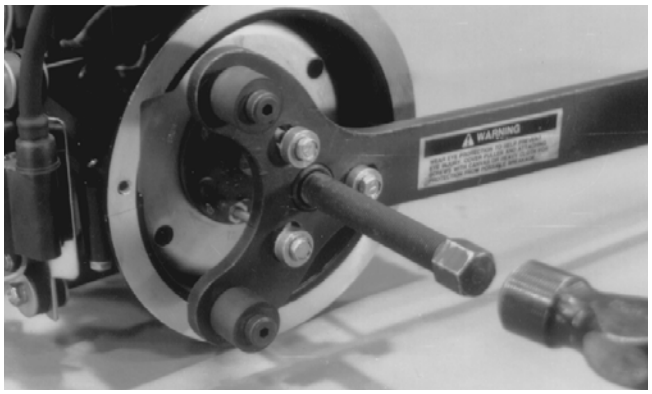
2. Install the Crankshaft Protector Cap (p/n 0644-234) onto the end of the crankshaft.

■NOTE: A suitable substitute protective cap can be made by welding a 3 mm (1/8 in.) plate on one side of a spare flywheel nut.

3. Using the Flywheel Puller/Spanner Wrench (p/n 0144-310) or suitable substitute, remove the flywheel from the crankshaft by tightening the puller bolt, striking the head of the puller bolt with a hammer, and tightening again. Repeat this procedure until the flywheel is free. Account for the key.

⚠ CAUTION

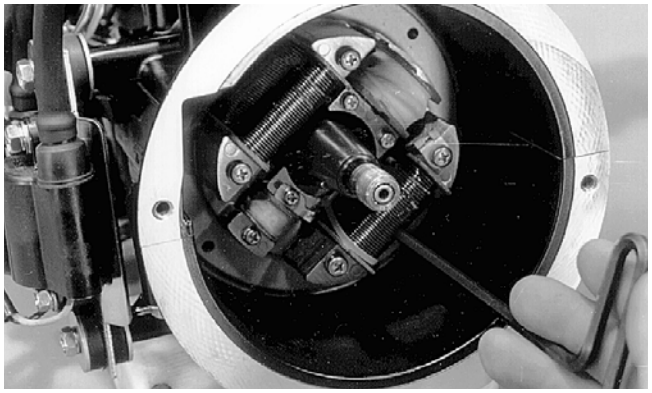
To prevent damage to the crankshaft, the puller must bottom on the cap and not on the crankshaft. Also, do not thread puller bolts more than 12.7 mm (1/2 in.) into the flywheel. Damage to the coils may result.



AN020

■NOTE: To ensure the cleanliness of the flywheel magnets, place the flywheel (with the magnets facing upward) on a clean bench.

4. Scribe a line on the stator plate and magneto case to aid in assembly; then remove the two Allen-head cap screws, lock washers, and washers securing the stator plate. Remove the stator plate from the engine.



AN022

■NOTE: The stator plate screws had Loctite applied to the threads during assembly. Using an impact driver, apply a sharp blow to the head of each screw to break the Loctite loose before removal.

5. Remove the four nuts and lock washers securing the exhaust manifold.

6. Remove the manifold and account for the two exhaust gaskets.

7. Remove the three cap screws securing the thermostat cap; then remove the cap, gasket, and thermostat.

■NOTE: The thermostat is of the lock-open type. If the thermostat is ever allowed to fully open, it will remain open and replacement will be necessary.

8. Remove the four cap screws securing the thermostat manifold to the cylinder heads. Remove the manifold and discard the gaskets.

9. Remove the spark plugs.

10. Remove the six cap screws and O-rings securing each head; then separate from the cylinder. Account for two large O-rings beneath each head.

11. Remove the oil-injection hose from each cylinder and the crankcase nozzle.



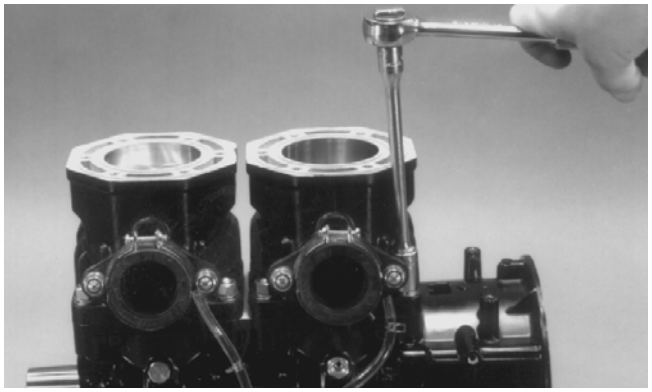
AN032

12. Remove the eight nuts, lock washers, and washers securing the cylinders to the crankcase; then using a rubber hammer, gently tap the cylinders and remove from the crankcase by lifting them straight up off their studs. Account for two gaskets.

⚠ CAUTION

When removing a cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

■NOTE: The metal cylinder base gaskets may be reused. When reusing gaskets, they must be cleaned and sprayed with Copper Coat Gasket Sealant (p/n 0636-092) on each side.



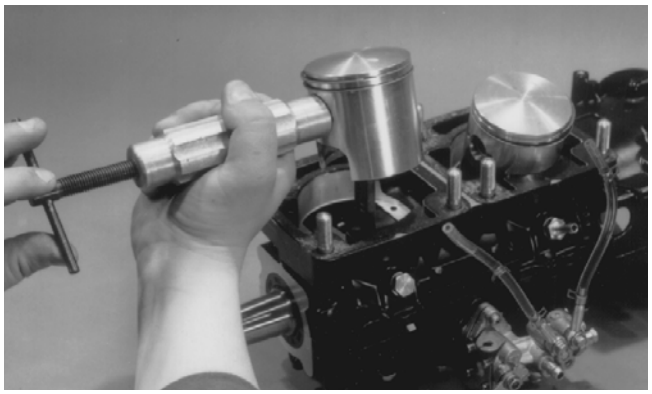
AN033

■**NOTE: If servicing the intake flanges, remove them at this time.**

13. Remove the PTO-side piston-pin circlip from the PTO-side piston; then remove the MAG-side piston-pin circlip from the MAG-side piston.

14. Using the Piston Pin Puller (p/n 0644-328), remove the piston pins from both pistons.

■**NOTE: For proper assembly, keep all MAG-side components and all PTO-side components separated. Assemble them on their proper sides.**



AN036

⚠ CAUTION

DO NOT use any type of punch to drive the piston pin free of the piston; damage may result. Use a piston-pin puller only.

15. Lift the pistons clear of the connecting rods and remove the small-end connecting-rod bearings; then remove the piston rings. Keep each piston with its rings; keep each piston pin and bearing together as a set.

■**NOTE: Place rubber bands over the connecting rods and around the cylinder studs. This will prevent the connecting rods from damaging the crankcase.**

16. Remove the two screws, lock washers, and washers securing the oil-injection pump to the crankcase. Remove the pump, retainer, and O-ring.

17. Remove the water pump cover. Account for the O-ring gasket.

18. Remove the cap screw securing the water pump impeller; then slide the impeller free of the shaft.

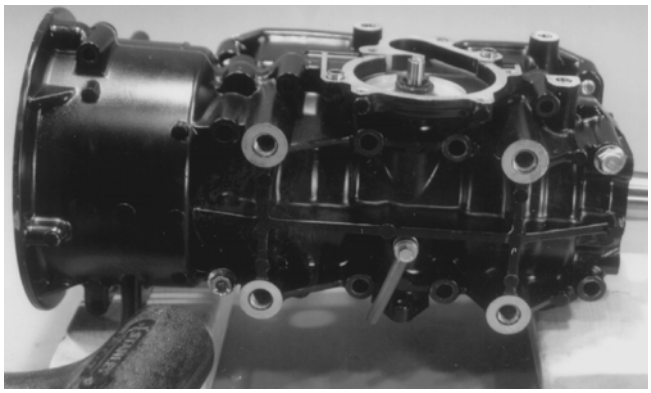
19. Using an impact driver, remove the screws securing the PTO-end plate to the crankcase; then remove the plate.

20. Position the crankcase (with its bottom side up) on two blocks of wood. Remove the fourteen cap screws securing the crankcase halves. Note the position of the different-sized cap screws.

21. Separate the crankcase halves by installing two crankcase cap screws in opposite corners leaving the heads approximately 6 mm (1/4 in.) out. Using a plastic-tipped hammer, tap on each cap screw head until the case halves separate. Remove the cap screws.

⚠ CAUTION

DO NOT drive any tool between halves to separate the crankcase. Damage to the sealing surfaces will result.



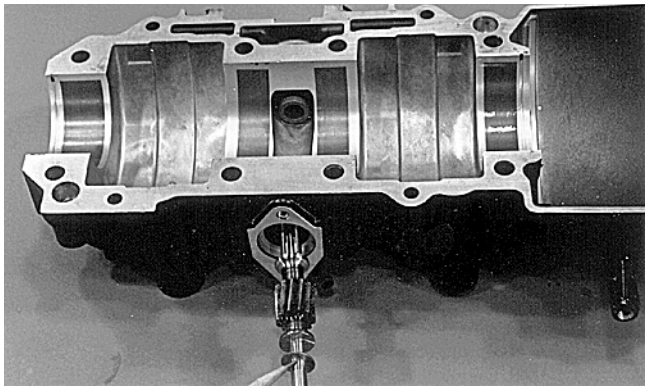
AN045

22. Lift the bottom half of the crankcase off the top half.

23. Lift the crankshaft free from the top half of the crankcase and slide the crankshaft oil seals off the crankshaft. Account for the C-ring. Remove the two dowel pins and the four bearing retaining pins.

24. Remove the oil-injection pump driveshaft from the lower crankcase half. Account for the thrust washer on the outer end of the shaft.

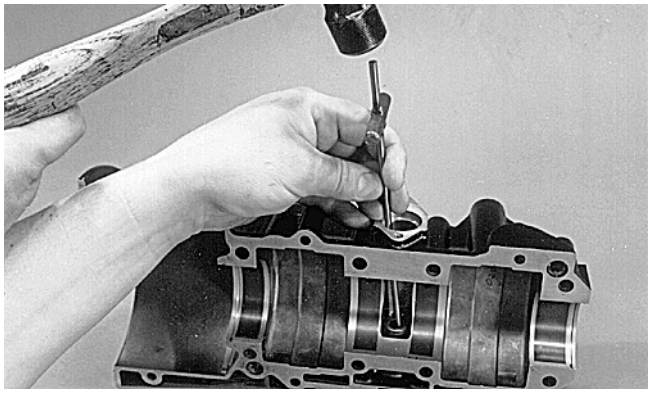
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AN047

■**NOTE: Do not replace the inner seals unless the water pump shows signs of leaking coolant out of the small bleed hole in the bottom half of the crankcase. If a water pump seal is to be replaced, use the Water Pump Bearing and Seal Kit (p/n 0644-084) and see Cleaning and Inspecting Engine in this section.**

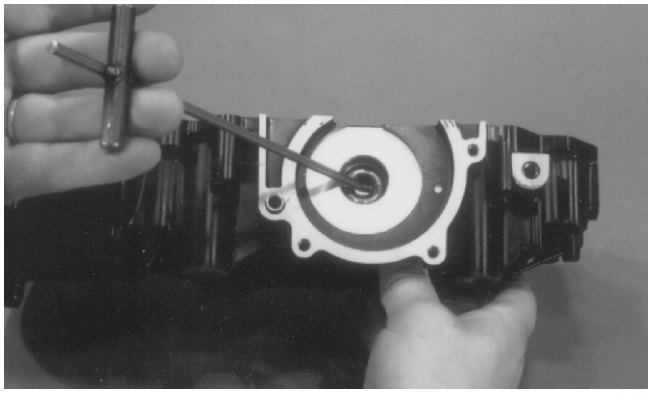
25. Place the crankcase on the bench with the water pump side down. Using the long seal driver, drive the water pump seal from the crankcase.



AN049

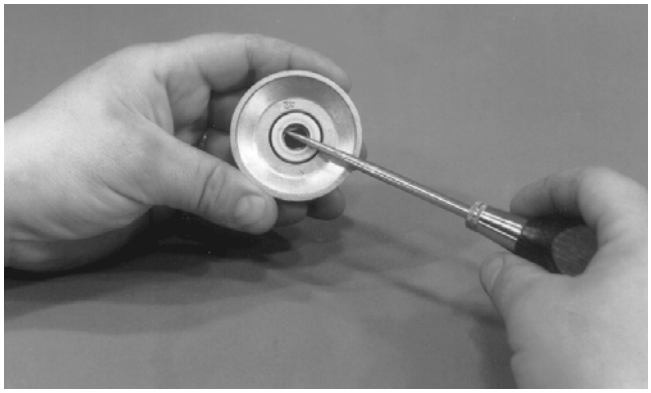
26. Remove the snap ring securing the inner seal in the crankcase.

27. Using the hooked end of the tool, pull the inner seal free of the crankcase.



AN050

28. Using a sharp, pointed tool, pry the seal ring from the backside of the water pump impeller.



AN051

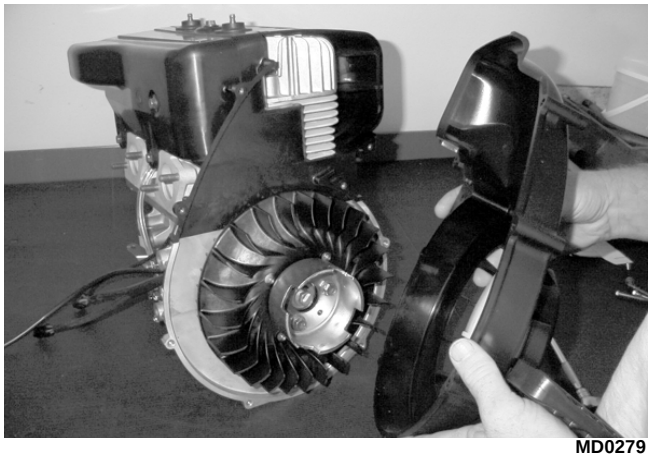
2

Disassembling Engine
(570 cc Models)

1. Remove the exhaust manifold. Account for the gaskets.

2. Remove the nuts, lock washers, and washers securing the intake flange assembly. Account for the gaskets, insulators, and the heat deflector.

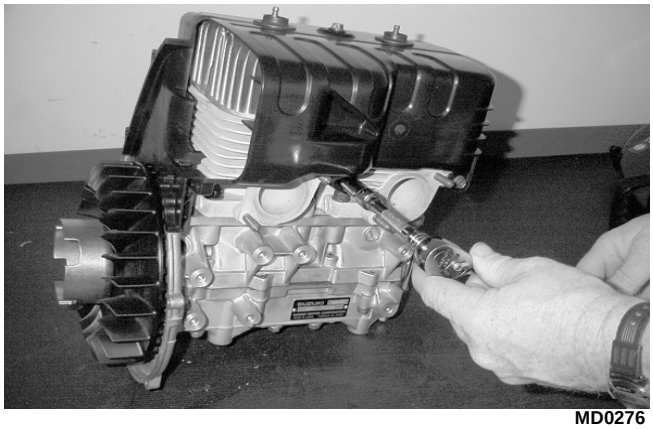
3. Remove eight cap screws securing the main fan shroud; then remove the shroud with the recoil starter assembly.



MD0279

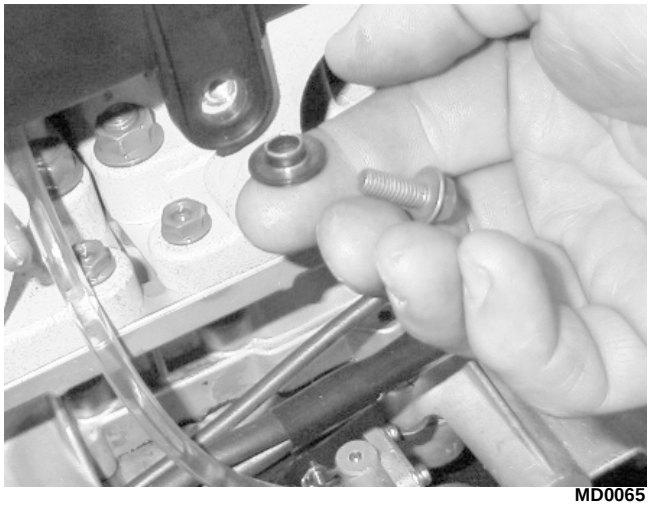
■**NOTE: Cap screws securing the front and rear shrouds use special washers.**

4. Remove the five cap screws securing the front (exhaust-side) shroud to the cylinder head. Account for the special washers.



MD0276

■ **NOTE: Keep the special mounting hardware with the shrouds for assembling purposes.**



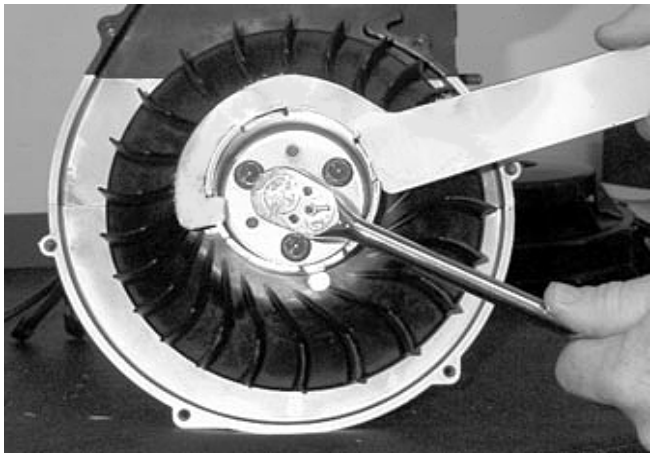
MD0065

5. Remove the spark plug grommets.



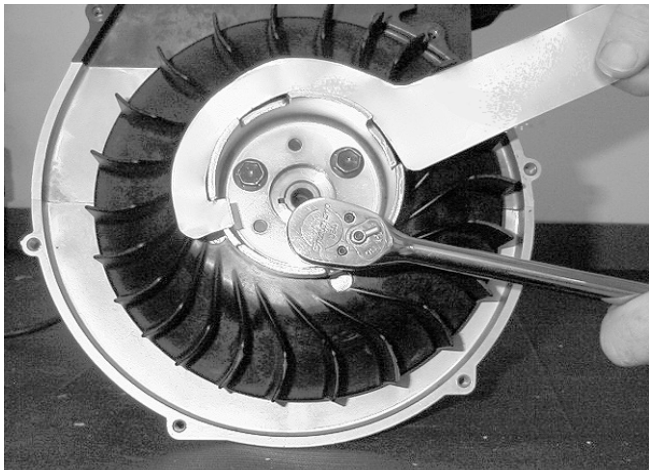
MD0060

6. Using Spanner Wrench (p/n 0144-007) to hold the starter pulley, remove the cap screw securing the flywheel to the crankshaft.



MD0282

7. Using Spanner Wrench (p/n 0144-007) to hold the starter pulley, remove the three cap screws securing the starter pulley and fan to the flywheel.

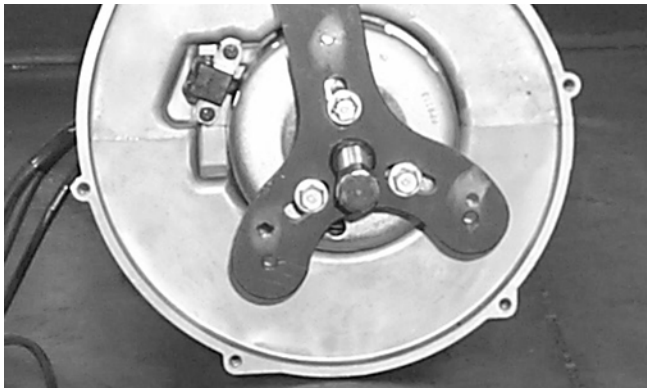


MD0000

⚠ CAUTION

To prevent damage to the crankshaft, install a protective insert into the end of the crankshaft. The puller must bottom on the insert and not on the crankshaft. Also, do not thread puller bolts more than five threads into the flywheel. Damage to the stator coils may result.

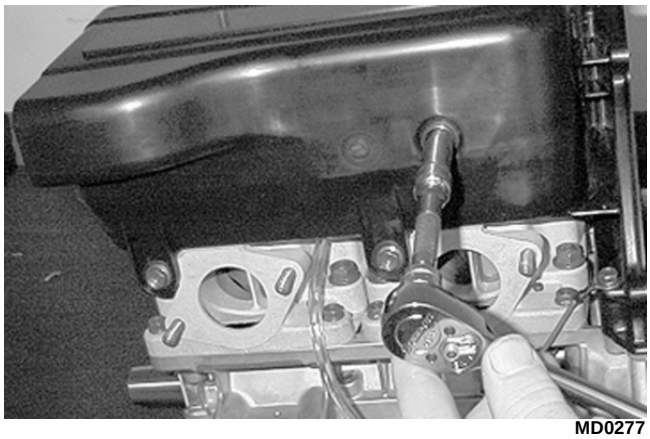
8. Install Flywheel Puller Insert (p/n 0644-179) into the end of the crankshaft. Using Flywheel Puller/ Spanner Wrench (p/n 0144-310) or suitable substitute, remove the flywheel.



AN615

■ **NOTE: To ensure the cleanliness of the flywheel magnets, place the flywheel (with the magnets facing upward) on a clean bench.**

9. Remove the six cap screws securing the rear (intake-side) shroud; then remove the shroud. Account for the special washers.



MD0277



MD0067

10. Remove the rubber insulator grommet from the crankcase; then remove two Phillips-head cap screws securing the ignition timing sensor and pull the wires through the hole in the crankcase.

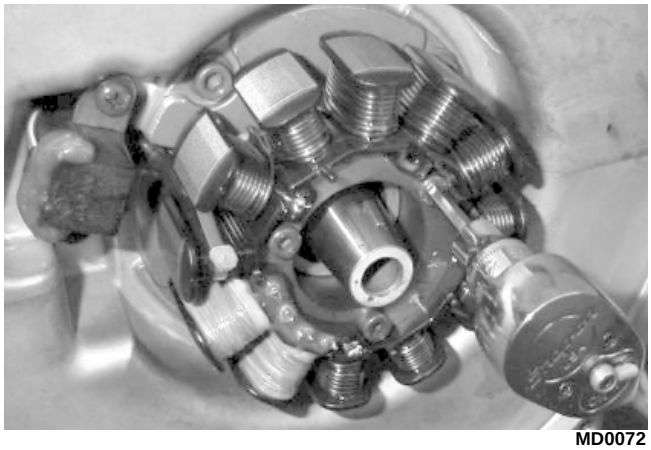


MD0075



MD0074

11. Remove the three Allen-head cap screws securing the stator and remove it along with the stator wiring.



MD0072


MD0076

12. Remove the four Allen-head cap screws securing the stator plate. Remove the stator plate.

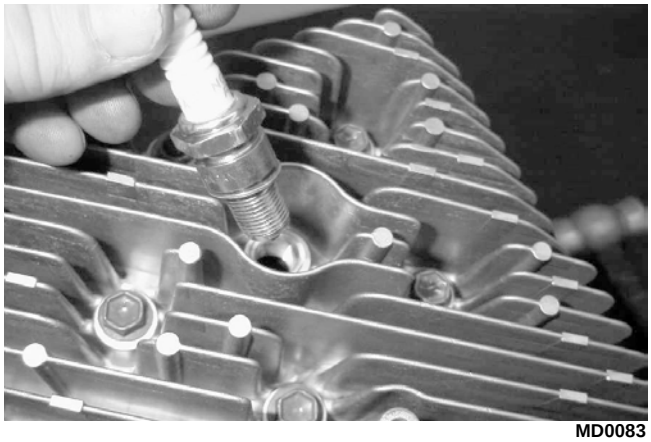

MD0255


MD0078

13. Remove the four cap screws securing the seal retainer plate on the PTO-side; then remove the plate.


MD0081

14. Remove the spark plugs.


MD0083

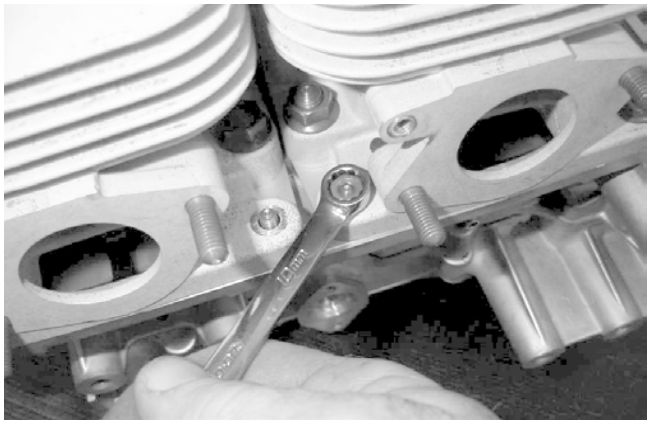
15. Remove the eight cap screws, two nuts, and two washers securing the cylinder head to the cylinders; then remove the cylinder head. Discard the cylinder head gasket.


MD0289

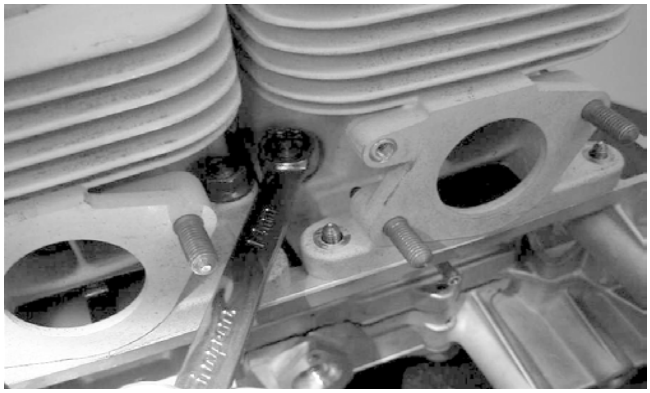
16. Remove the four 6 mm nuts and eight 10 mm nuts securing the cylinders to the crankcase.

■ **NOTE: Using a felt-tip marker, mark the cylinders as to MAG-side and PTO-side for assembling. Also, mark the pistons at this time.**

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MD0087

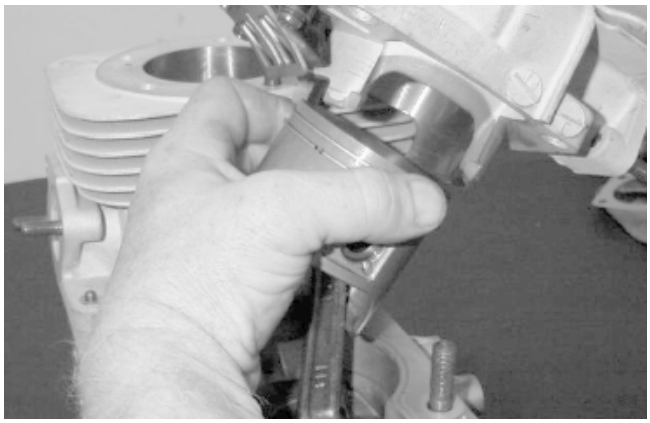


MD0086

17. Remove the cylinders making sure to support the pistons so they are not damaged. Account for four dowel pins.

⚠ CAUTION

When removing a cylinder, make sure to support the piston so it will not be damaged.



MD0230



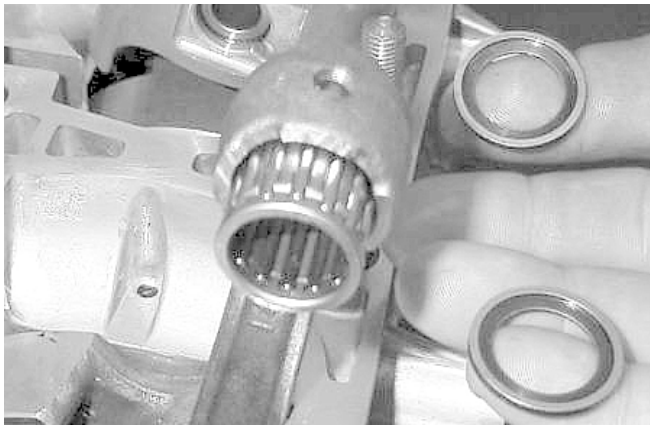
MD0096

18. Using an awl, remove the outside piston-pin circlip and remove the piston pin using Piston Pin Puller (p/n 0644-328) taking care not to drop the piston-pin bearing washers into the crankcase.



MD0094

■NOTE: The open sides of the piston pin bearing washers face inward.

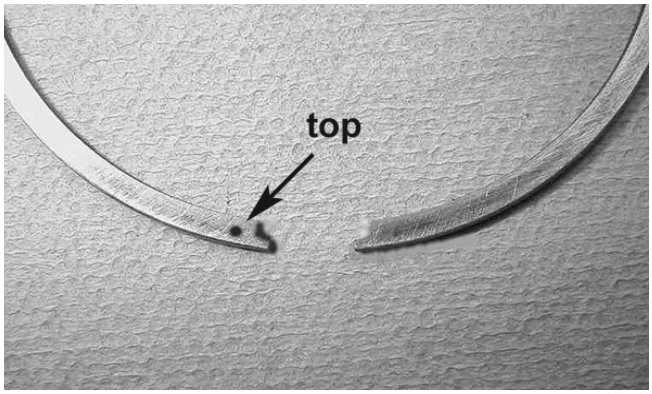


MD0251

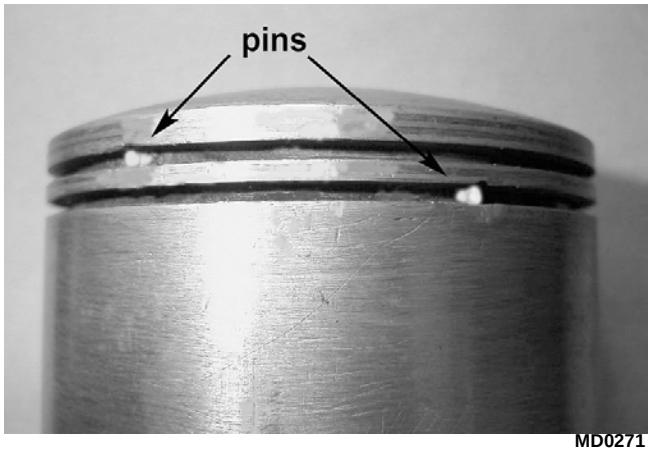


MD0208

■**NOTE: If the existing rings will not be replaced with new rings, note the location and top side of each ring for proper installation. When replacing with new rings, replace as a complete set only. When replacing rings note notches in ring ends which correspond with locating pins in ring grooves on intake side of the piston. This prevents the rings from turning on the piston when assembled.**

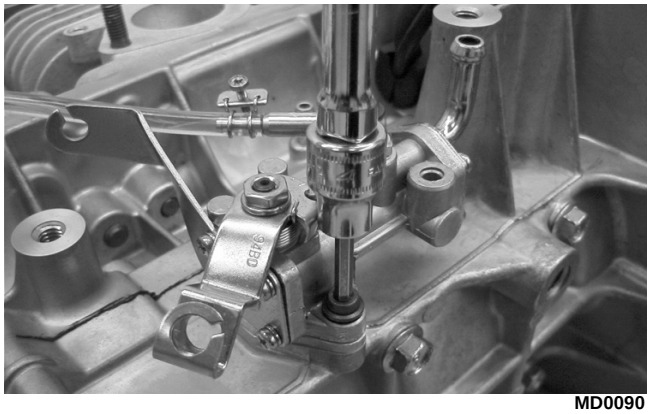


MD0272

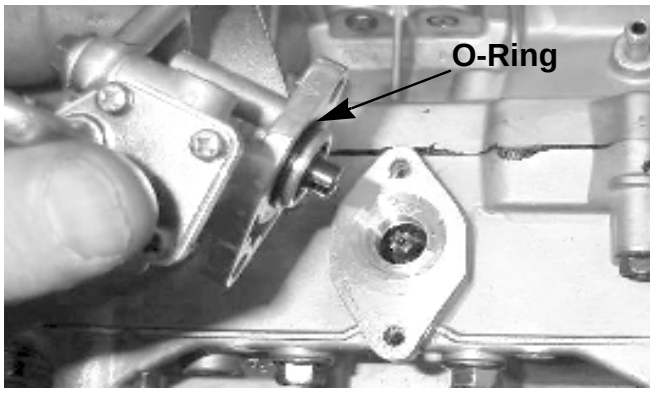


MD0271

19. Remove the two Allen-head cap screws securing the oil-injection pump; then remove the pump. Account for an O-ring.

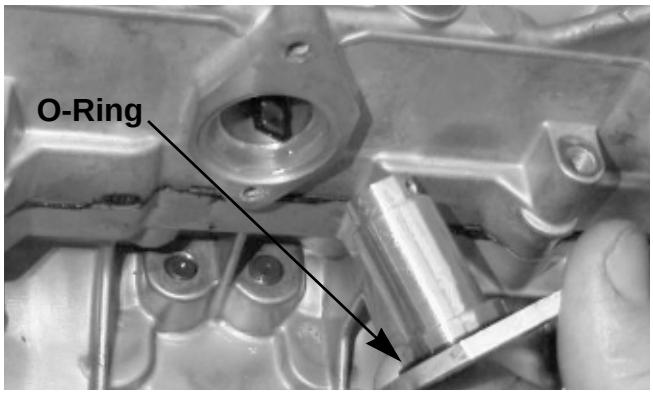


MD0090



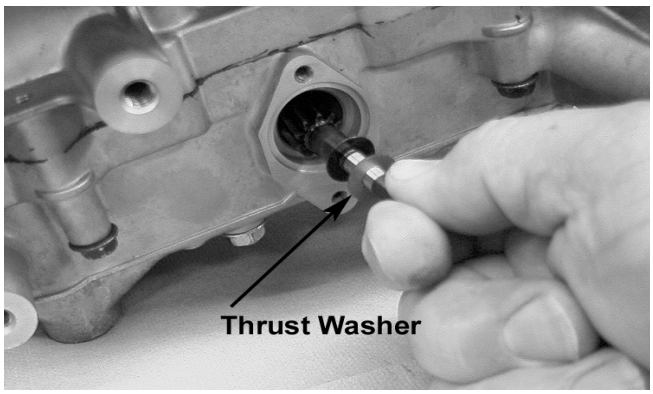
MD0092

20. Remove the oil-injection pump driveshaft retainer. Account for an O-ring.



MD0100

21. Remove the oil-injection pump driveshaft. Account for a thrust washer.

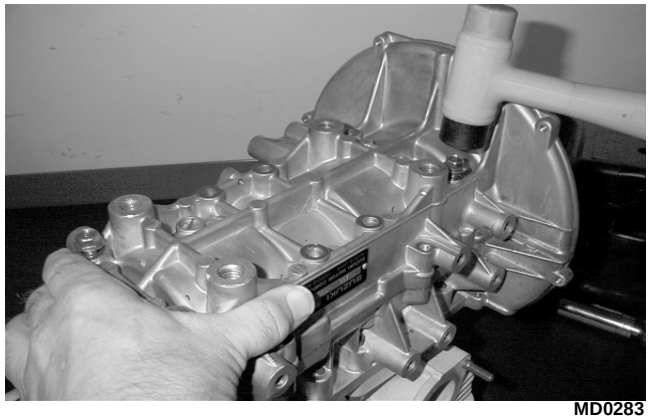


MD0101

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22. Place the crankcase (with its bottom side up) on two blocks of wood. Remove the 12 cap screws securing the crankcase halves. Note the position of the different-sized cap screws.

23. Separate the crankcase halves by installing two of the cap screws in opposite corners leaving the heads approximately 6 mm (1/4 in.) out. Using a plastic mallet, tap on each cap screw until the crankcase halves separate. Account for four dowel pins.



MD0283

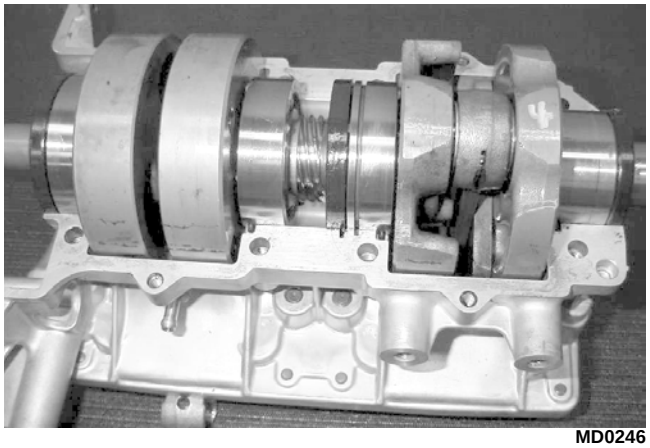


MD0204

24. Remove the two cap screws; then remove the crankshaft assembly from the upper crankcase half making sure to hold both ends of the crankshaft to keep the bearings and seals from falling off. Account for bearings and a C-ring.

⚠ CAUTION

To prevent damage to the crankshaft, crankshaft bearings, or seals, be sure to always lift the crankshaft from both ends.

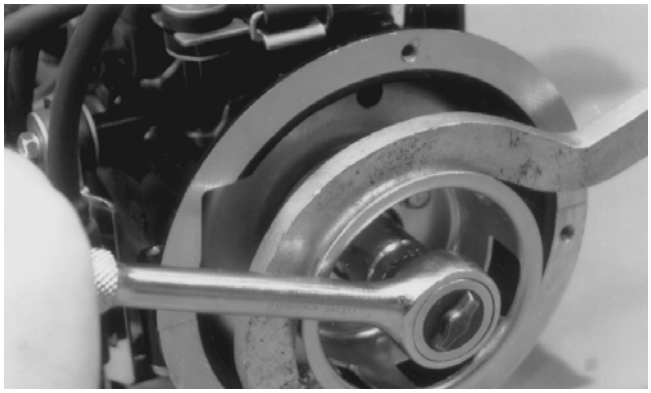


MD0246

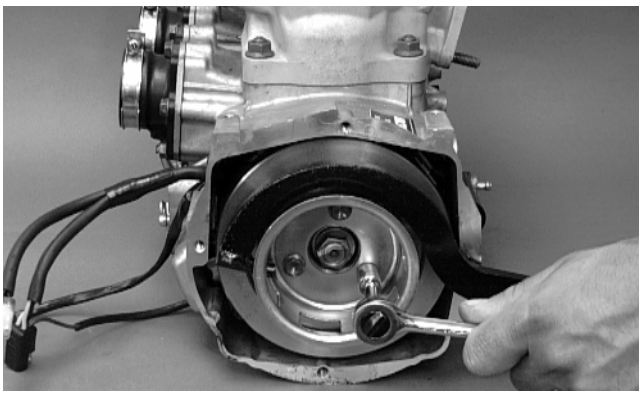
Disassembling Engine
(500/600 cc Twin Models)

■ NOTE: Some engines are equipped with Arctic Power Valves (APV). Closely observe the NOTE: introducing this important information.

1. Using the spanner wrench to secure the flywheel, remove the flywheel nut, lock washer, and flat washer; then remove the three starter pulley cap screws and remove the pulley.

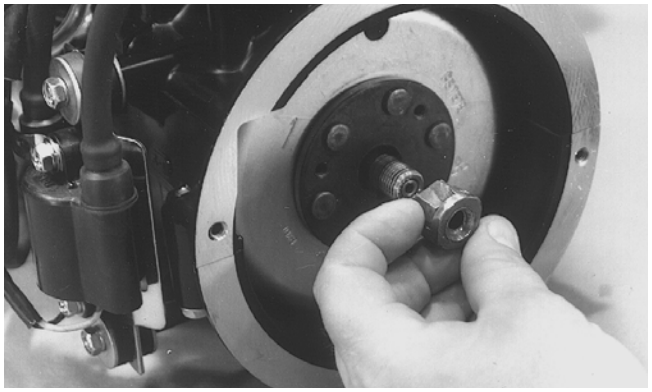


AN015

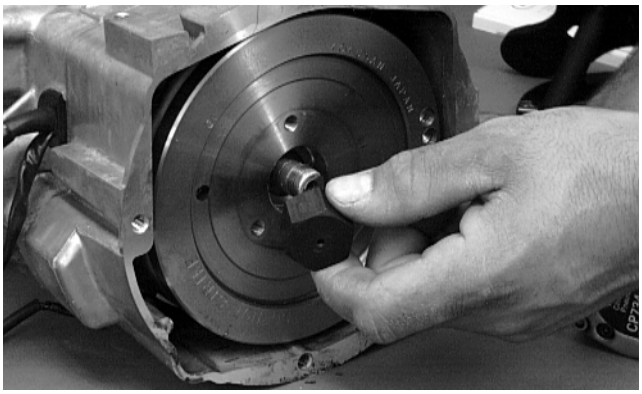


AN407D

2. Install the Crankshaft Protector Cap (p/n 0644-234) onto the end of the crankshaft.



AN018



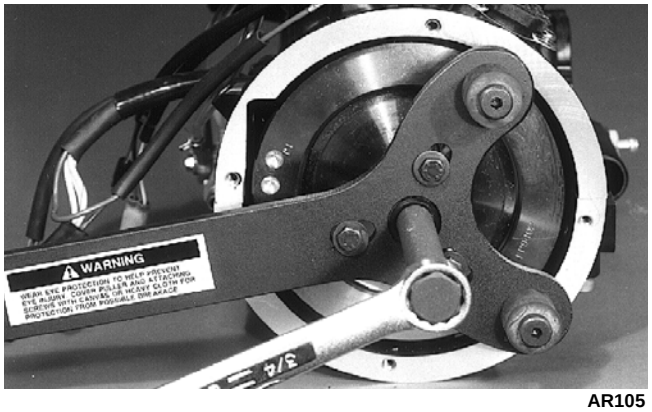
AN408D

■**NOTE: A suitable substitute protective cap can be made by welding a 3 mm (1/8 in.) plate on one side of a spare flywheel nut.**

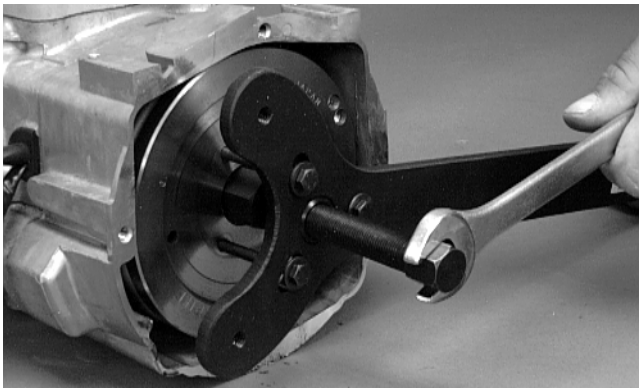
3. Using the Flywheel Puller/Spanner Wrench (p/n 0144-310) or suitable substitute, remove the flywheel from the crankshaft by tightening the puller bolt, striking the head of the puller bolt with a hammer, and tightening again. Repeat this procedure until the flywheel is free. Account for the key.

⚠ CAUTION

To prevent damage to the crankshaft, the puller must bottom on the cap and not on the crankshaft. Also, do not thread puller bolts more than 12.7 mm (1/2 in.) into the flywheel. Damage to the coils may result.



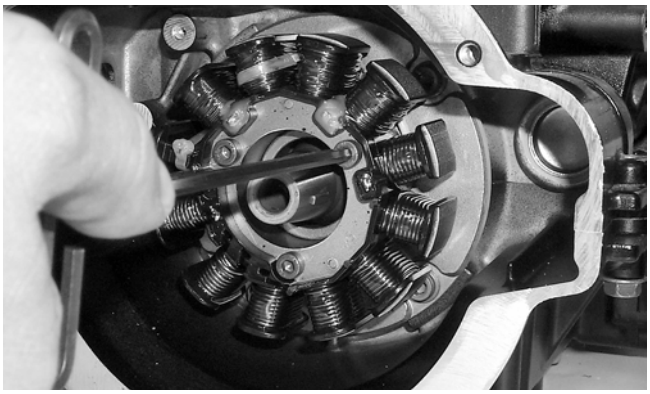
AR105



AN410D

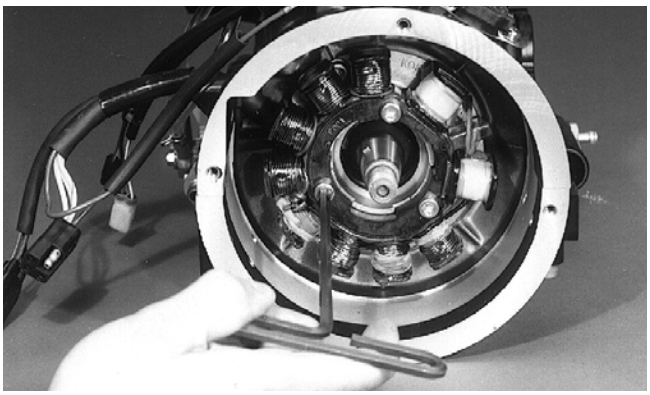
■**NOTE: To ensure the cleanliness of the flywheel magnets, place the flywheel (with the magnets facing upward) on a clean bench.**

4. Remove the Allen-head cap screws securing the stator to the stator plate.



AP132

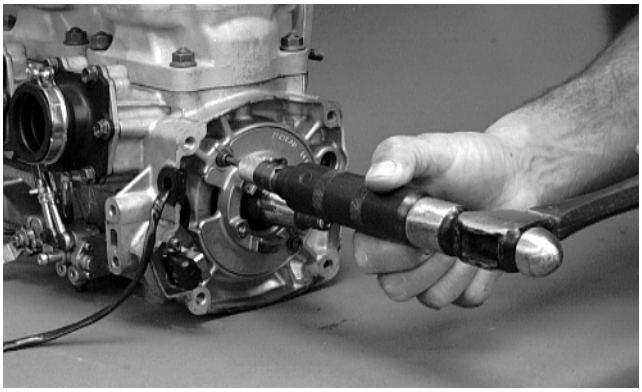
5. Remove the Allen-head cap screws securing the stator plate.



AR106

6. Remove the stator plate from the engine.

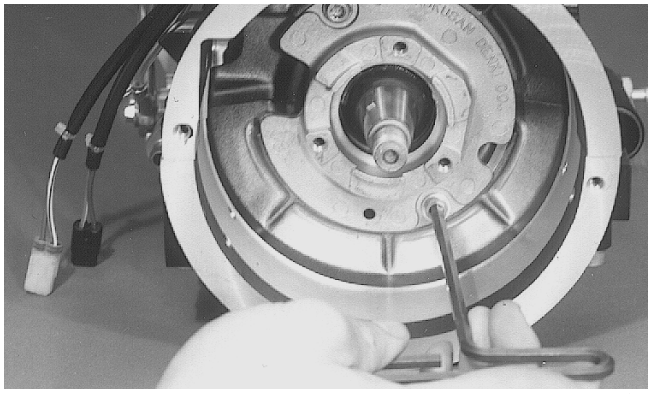
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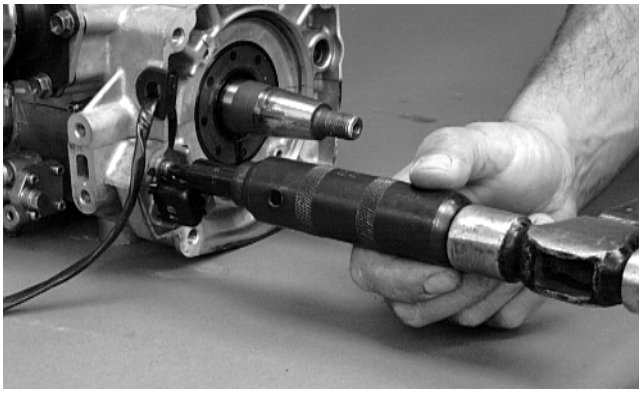
AN414D

■ **NOTE: The stator plate screws had Loctite applied to the threads during assembly. Using an impact driver, apply a sharp blow to the head of each screw to break the Loctite loose before removal.**

7. Remove the ignition timing sensor.



AR107



AN415D

8. Remove the three cap screws securing the thermostat cap; then remove the cap, gasket, and thermostat.

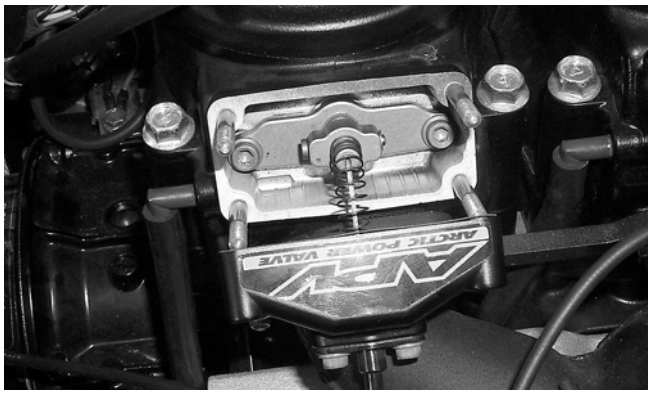
9. Remove the nuts securing the APV covers to the cylinders; then slide the covers back to expose the valves.



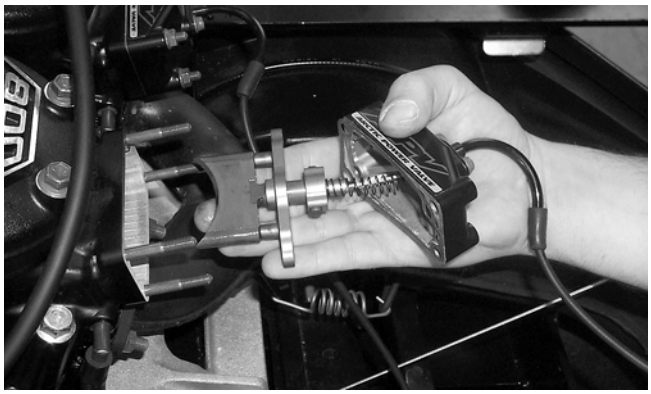
AP134

10. Remove the cap screws securing the valves to the cylinders; then remove the APV assemblies and set them aside.

■ **NOTE: The following illustrations are the 500 cc. Other models may vary slightly.**



AP120

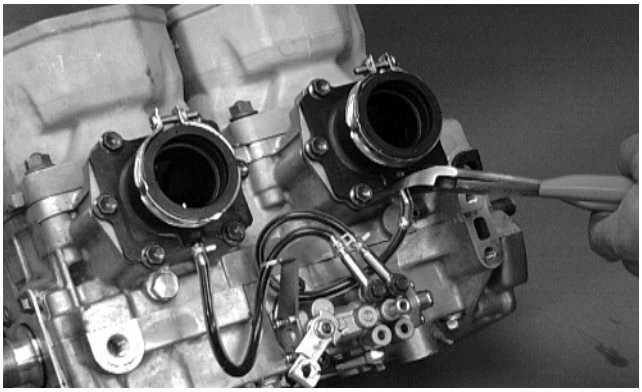


AP121

11. Remove the spark plugs.

12. Remove the cap screws with O-rings securing the cylinder head(s); then separate from the cylinders. Account for the O-rings.

13. Remove the oil-injection hose from each cylinder and the crankcase nozzle.



AN420D

14. Remove the eight nuts (with lock washers and washers) securing the cylinders to the crankcase; then using a rubber hammer, gently tap the cylinders and remove from the crankcase by lifting them straight up off their studs. Account for gasket(s) and any alignment bushings.

⚠ CAUTION

When removing a cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

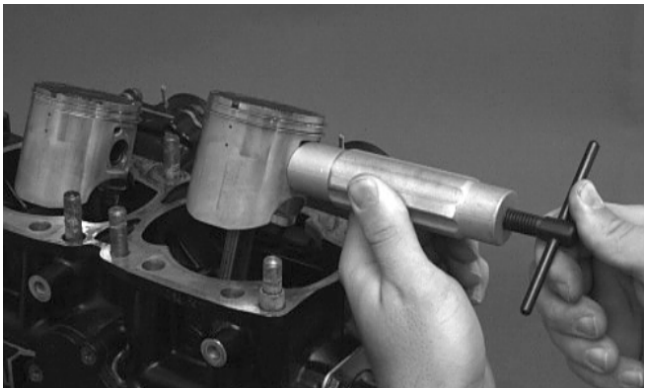
15. Remove the PTO-side piston-pin circlip from the PTO-side piston; then remove the MAG-side piston-pin circlip from the MAG-side piston.



AN315D

16. Using the Piston Pin Puller (p/n 0644-328), remove the piston pins from both pistons.

■ NOTE: For proper assembly, keep all MAG-side components and all PTO-side components separated. Assemble them on their proper sides.

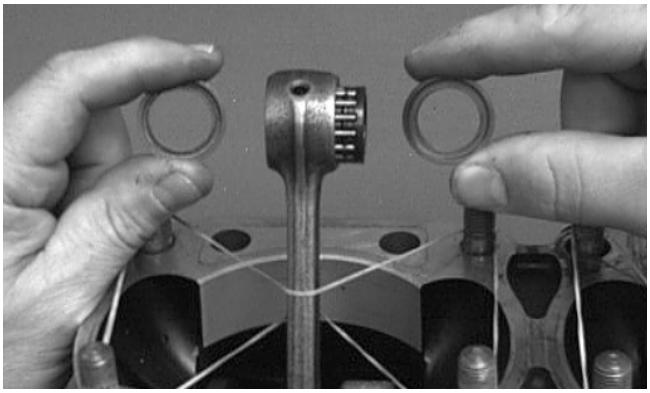


AN316D

⚠ CAUTION

DO NOT use any type of punch to drive the piston pin free of the piston; damage may result. Use a piston-pin puller only.

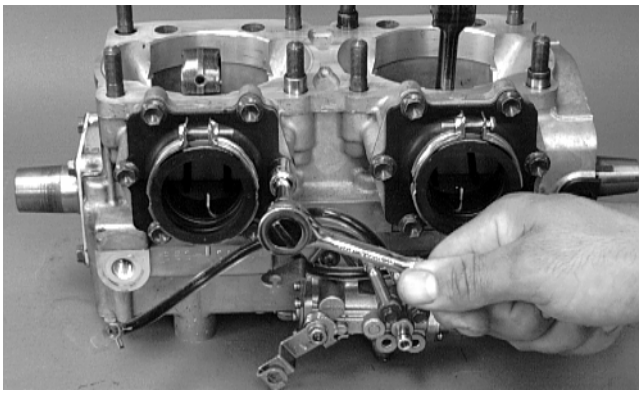
17. Lift the pistons clear of the connecting rods and remove the small-end connecting-rod bearings (account for two washers); then remove the piston rings. Keep each piston with its rings; keep each piston pin and bearing together as a set.



AN317D

■ NOTE: Place rubber bands over the connecting rods and around the cylinder studs. This will prevent the connecting rods from damaging the crankcase.

18. Remove the intake flanges and reed valve assemblies.



AN433D

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19. Remove either lower union cap screw securing the lower check valve assembly; then remove the two screws, lock washers, and washers securing the oil-injection pump to the crankcase. Remove the pump, retainer, and O-ring.

20. Remove the five screws securing the water pump cover to the crankcase and remove the cover. Account for the O-ring gasket.

21. Remove the cap screw securing the water pump impeller; then slide the impeller free of the shaft.

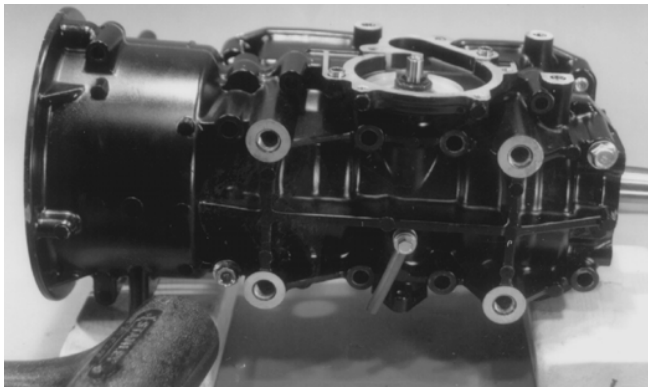
22. Remove the cap screws securing the PTO-end plate to the crankcase; then remove the plate.

23. Position the crankcase, with its bottom side up, on two blocks of wood. Remove the cap screws securing the crankcase halves.

24. Separate the crankcase halves by installing two crankcase cap screws in opposite corners leaving the heads approximately 6 mm (1/4 in.) out. Using a plastic-tipped hammer, tap on each cap screw head until the case halves separate. Remove the cap screws.

⚠ CAUTION

DO NOT drive any tool between halves to separate the crankcase. Damage to the sealing surfaces will result.



AN045

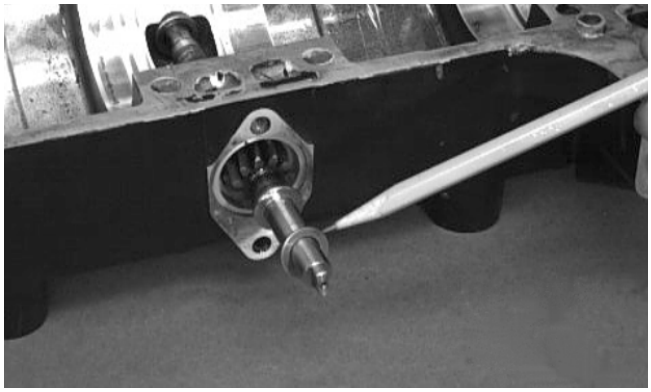
25. Lift the bottom half of the crankcase off the top half.

⚠ CAUTION

Care must be taken to not allow the connecting rods to drop onto the sealing surface of the bottom case half.

26. Lift the crankshaft free from the top half of the crankcase and slide the crankshaft oil seals off the crankshaft. Account for the C-ring. Remove the bearing retaining pins and account for the crankcase dowel pins.

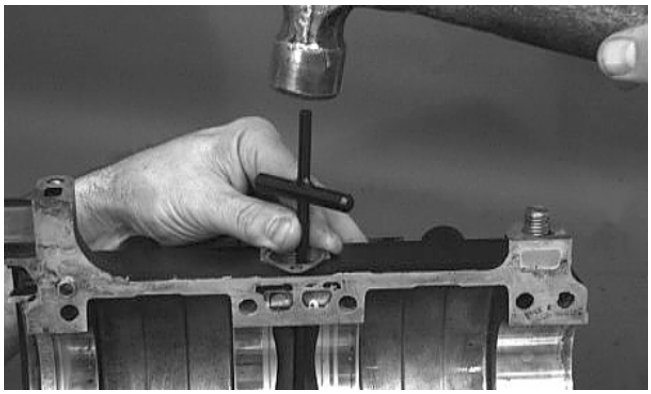
27. Remove the oil-injection pump/water pump driveshaft from the lower crankcase half. Account for the thrust washer on the outer end of the shaft.



AN324D

■ **NOTE: Do not replace the inner seals unless the water pump shows signs of leaking coolant out of the small bleed hole in the bottom half of the crankcase. If a water pump seal is to be replaced, use the Water Pump Bearing and Seal Kit (p/n 0644-084).**

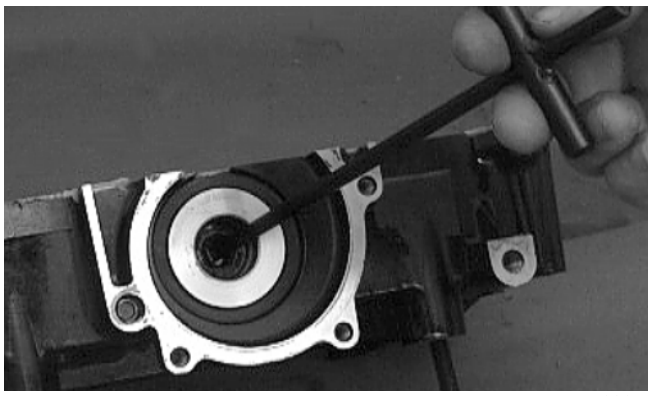
28. Place the crankcase on the bench with the water pump side down. Using the long seal driver, drive the mechanical water pump seal from the crankcase.



AN325D

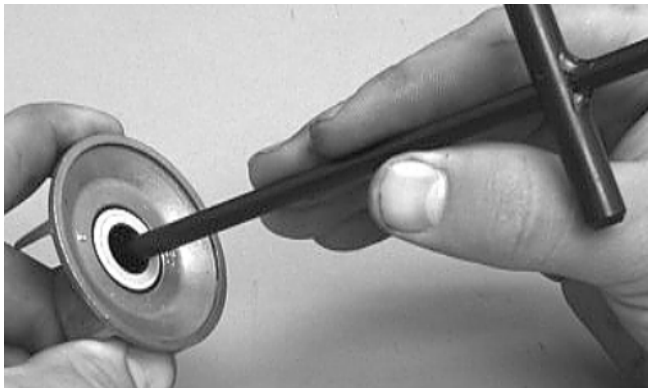
29. Using a pair of snap ring pliers, remove the snap ring securing the inner seal in the crankcase.

30. Using the hooked end of the tool, pull the inner seal free of the crankcase.

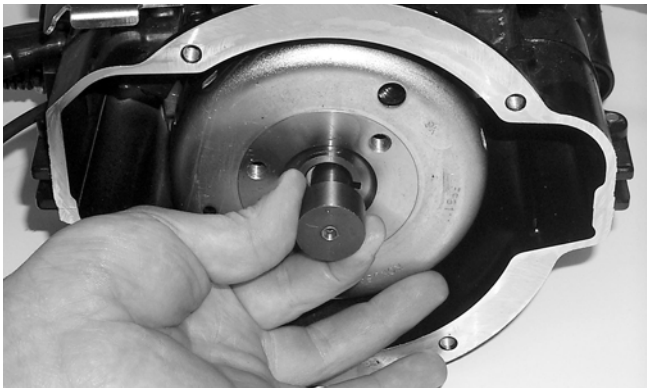


AN326D

31. Using the hooked end of the tool, pry the seal ring from the backside of the water pump impeller.



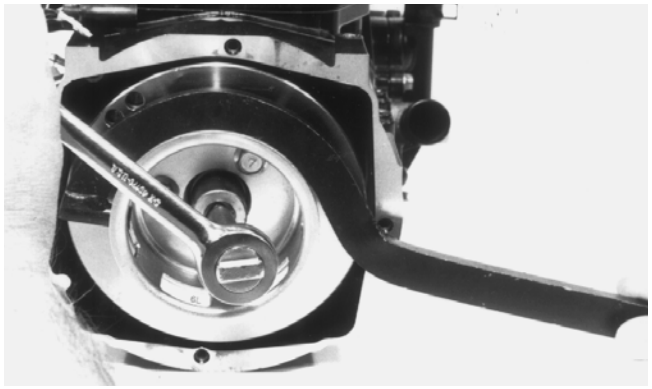
AN327D



AP130

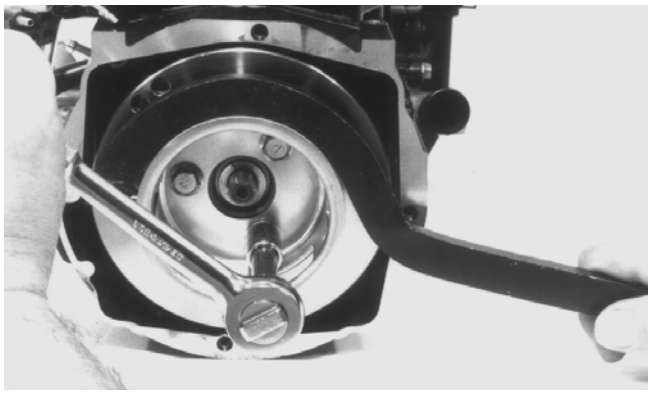
Disassembling Engine
(800 cc Models)

1. Using a spanner wrench to secure the flywheel, remove the flywheel cap screw, lock washer, and flat washer.



AJ012

2. Using a spanner wrench to secure the crankshaft, remove the three cap screws from the starter pulley. Remove the starter pulley.



AJ013

3. Install the Flywheel Puller Insert (p/n 0644-179) into the end of the crankshaft.

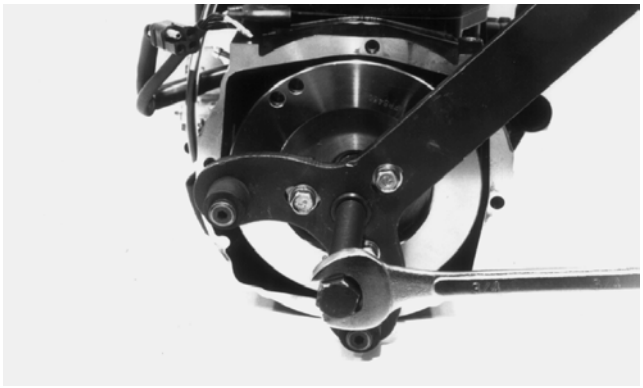
⚠ CAUTION

To prevent damage to the crankshaft, place a puller insert into the crankshaft. The puller must bottom on the insert and not on the crankshaft. Also, do not thread puller bolts more then 12.7 mm (1/2 in.) into the flywheel. Damage to the coils may result.

4. Using Flywheel Puller (p/n 0144-310), remove the flywheel from the crankshaft by tightening the puller bolt, striking the head of the puller bolt with a brass hammer, and tightening again. Repeat procedure until the flywheel is free. Account for the key in the crankshaft keyway.

⚠ CAUTION

When installing Flywheel Puller (p/n 0144-310), it must be installed with its welded side facing outward or the puller will be damaged.



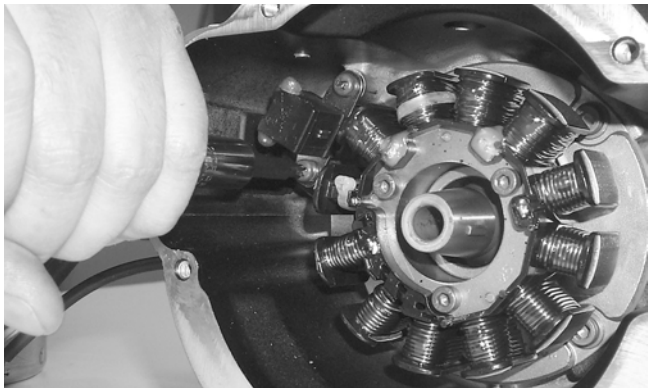
AJ015

⚠ CAUTION

Before applying excessive pressure to the center flywheel puller bolt, check to make sure puller bolt is pulling straight. If it is pulling to one side, the crankshaft will be damaged. Square the puller using the three bolts that attach the puller to the flywheel.

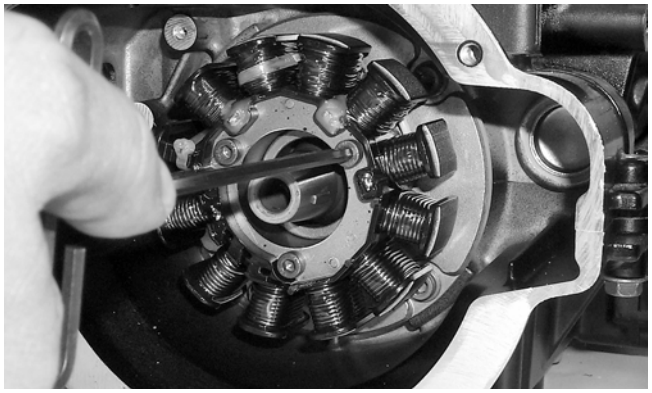
■ NOTE: To ensure the cleanliness of the flywheel magnets, place the flywheel (with the magnets facing upward) on a clean bench.

5. Remove the two screws securing the timing sensor; then loosen the screws securing the wiring harness retainer tab. Remove the timing sensor from the crankcase.



AP131

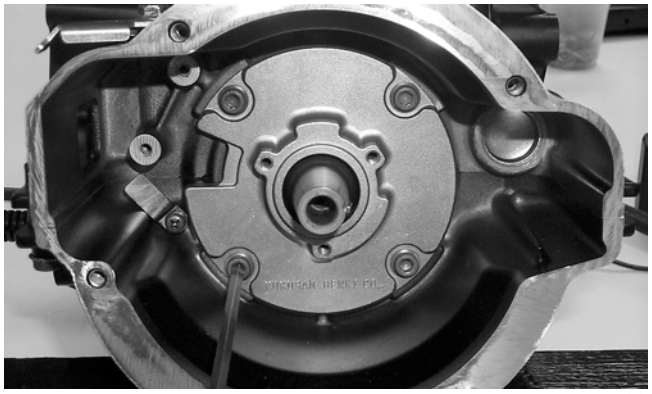
6. Remove the cap screws securing the stator.



AP132

7. Remove the rubber grommet from the stator wiring harness. Slide the stator free of the crankshaft and remove.

8. Remove the cap screws securing the stator backing plate. Remove the plate from the crankcase.



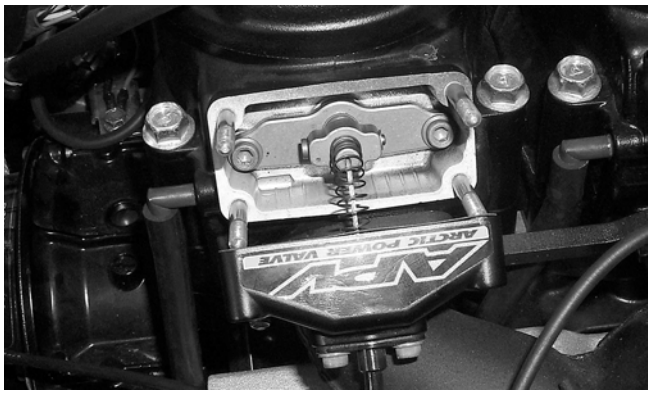
AP133

9. Remove the nuts securing the APV covers to the cylinders; then slide the covers back to expose the valves.

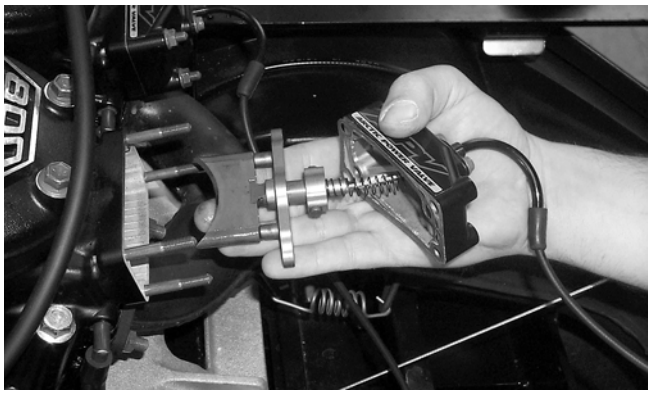


AP134

10. Remove the cap screws securing the valves to the cylinders; then remove the APV assemblies and set them aside.



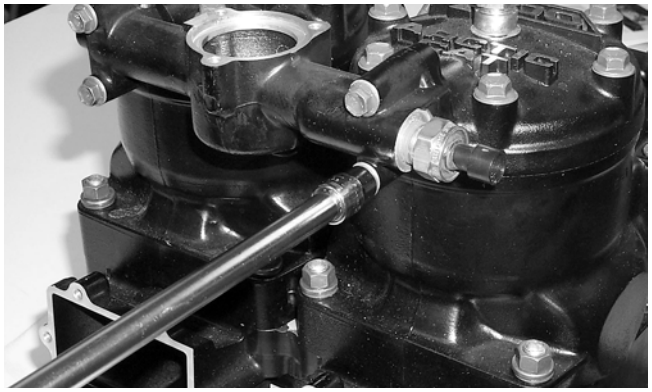
AP120



AP121

11. Remove the three cap screws securing the thermostat cap; then remove cap, rubber gasket, and thermostat.

12. Remove the cap screws securing the thermostat manifold to the cylinder heads. Remove the manifold and discard the gaskets.



AP135

13. Remove the spark plugs.

14. Remove the cap screws and O-rings securing each head; then separate each head from each cylinder. Account for two O-rings beneath each head.

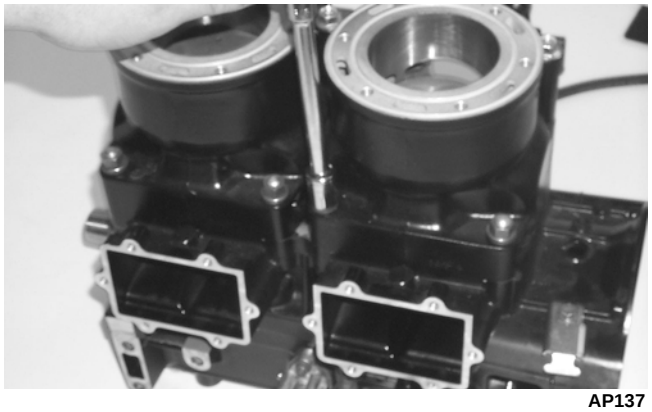
■**NOTE: Mark each cylinder head, cylinder, and piston and keep together as an assembly. Mark the MAG cylinder components #1 and the PTO cylinder components #2.**



AP136

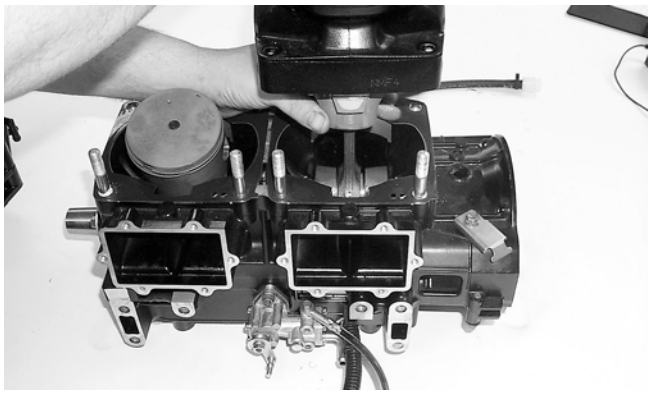
■**NOTE: If servicing the intake flanges, remove them at this time.**

15. Remove the four cylinder base nuts and four flange cap screws securing the cylinders to the crankcase. Account for four flat washers and lock washers. Using a rubber hammer, gently tap on the side of each cylinder to free it from the crankcase.



AP137

16. Slowly lift each cylinder straight up and free of the studs. Grasp the connecting rod and piston as the cylinder clears the piston to prevent the rod from dropping against the crankcase. Remove and save the cylinder base gaskets.



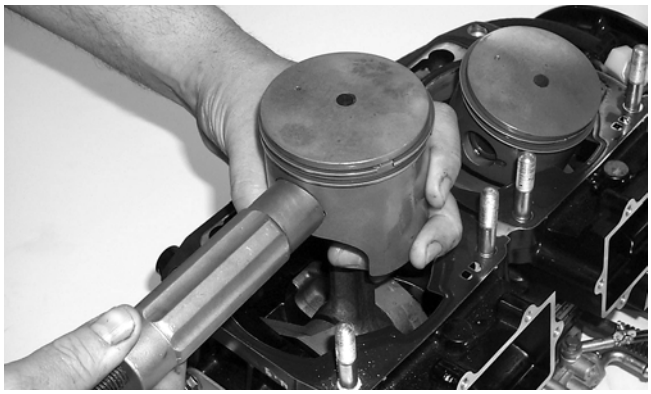
AP138

17. Remove the PTO-side piston-pin circlip from the PTO-side piston; remove the MAG-side piston-pin circlip from the MAG-side piston.



AP140

18. Using the Piston Pin Puller (p/n 0644-328), remove the piston pins from both pistons.



AP141

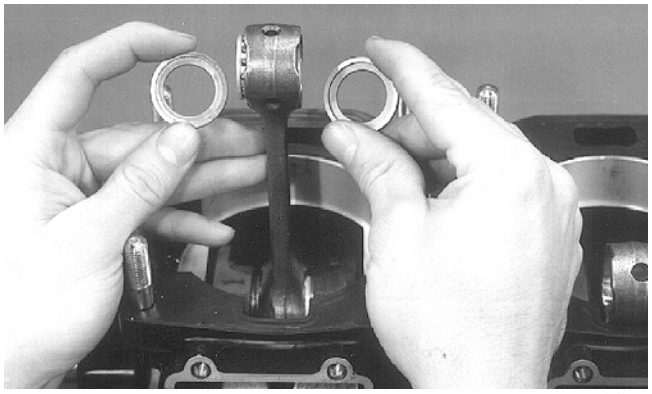
■**NOTE: For proper assembly, keep all MAG-side components and all PTO-side components separated. Assemble them on their proper sides.**

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⚠ CAUTION

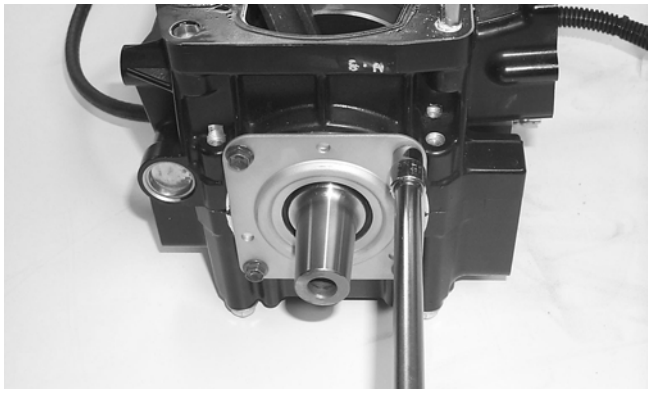
DO NOT use any type of punch to drive the pin free of the piston; damage may result. Use a piston-pin puller only.

19. Lift the pistons clear of the connecting rods and account for two washers. Remove the small-end connecting-rod bearings; then remove the piston rings. Keep each piston with its rings; keep each piston, pin, and bearing together as a set.



AQ059

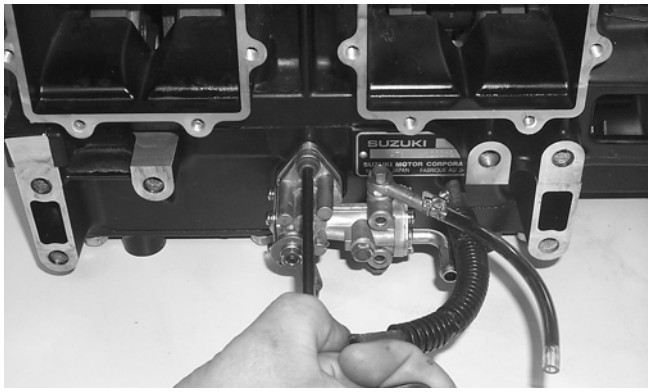
20. Remove the four cap screws securing the PTO-end plate to the crankcase; then remove the plate.



AP142

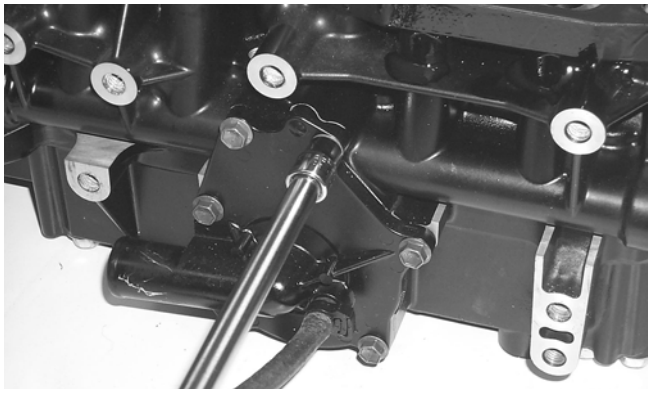
21. Remove the intake manifold and reed block assemblies.

22. Remove either lower union bolt securing the lower check valve assembly; then remove the two cap screws securing the oil-injection pump to the crankcase. Remove the pump, retainer, and two O-rings.



AP143

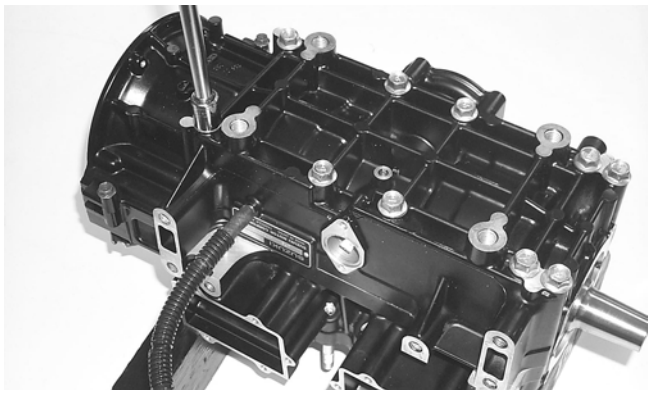
23. Remove the six cap screws securing the water pump cover to the crankcase. Remove the cover and O-ring seal. Account for two dowel pins.



AP145

■NOTE: Do not remove the water pump impeller or the impeller shaft unless necessary. Only remove impeller and shaft if there are signs of coolant leakage from the small hole located in the bottom of the crankcase directly behind the water pump housing.

24. Lay the engine on its side and remove the cap screws securing the crankcase halves. Note the position of the different-sizes cap screws for assembling.



AP146

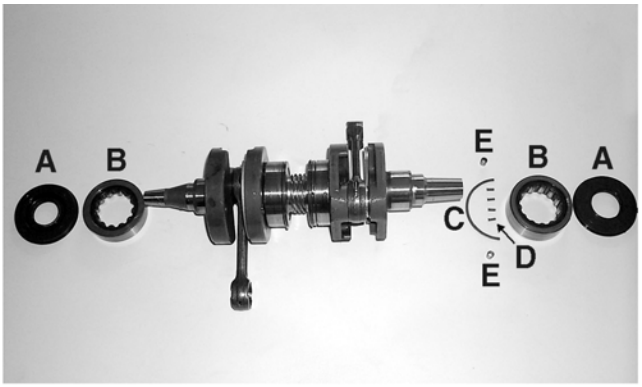
■NOTE: On EFI models, the magneto case must be removed prior to separating the crankcase halves.

25. Separate the crankcase halves by installing two crankcase cap screws in opposite corners leaving the heads approximately 6 mm (1/4 in.) out. Using a plastic tipped hammer, tap on each cap screw head until the case halves separate; then remove the two cap screws. Lift the top half of the crankcase off the bottom half. Grasp the connecting rods as the top half of the crankcase is removed. Do not allow them to drop onto the sealing surface of the bottom case half.

⚠ CAUTION

DO NOT drive any tool between halves to separate the crankcase. Damage to the sealing surfaces will result.

26. Lift the crankshaft free from the crankcase half and slide the crankshaft oil seals off the ends of the crankshaft. Account for the C-ring. Slide the bearings off the crankshaft. Remove and account for the four bearing retaining pins and the two crankcase dowel pins from the crankcase.



KEY= AP148A

A. Oil Seal	D. Bearing Retaining Pins
B. Bearing	E. Dowel Pins
C. C-Ring	

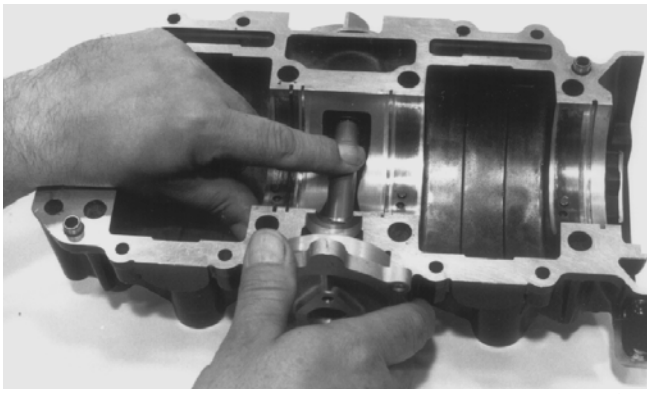
AP148A

⚠ CAUTION

DO NOT remove the water pump impeller or shaft unless necessary. The shaft and impeller should only be removed from the lower crankcase half when there is a coolant leakage problem or a rough inner bearing. To inspect for either condition, follow steps A through D.

A. Remove the O-ring from the oil-injection pump retainer. Slide the retainer into position on the shaft in the lower half of the crankcase.

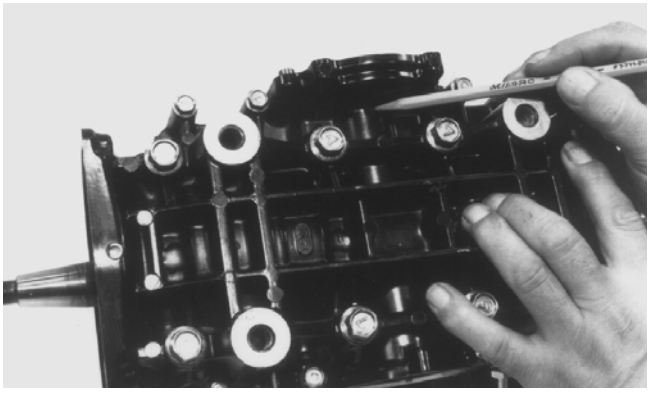
B. While holding the retainer tight against the crankcase, rotate the shaft. Bearing rotation must feel smooth.



AJ044

C. If any roughness is felt, remove the retainer and inspect its bearing by turning it several revolutions. If it is smooth, the shaft must then be removed and the inner bearing inspected. Turn inner bearing by hand. If any roughness is felt, replace the inner bearing.

D. Check the bottom of the water pump housing for any signs of coolant leakage. The small hole, located on the bottom of the crankcase directly behind the water pump housing, will show coolant stains if the seal has any leakage problems. If stains or any signs of leakage are present, remove impeller and shaft and replace seals.

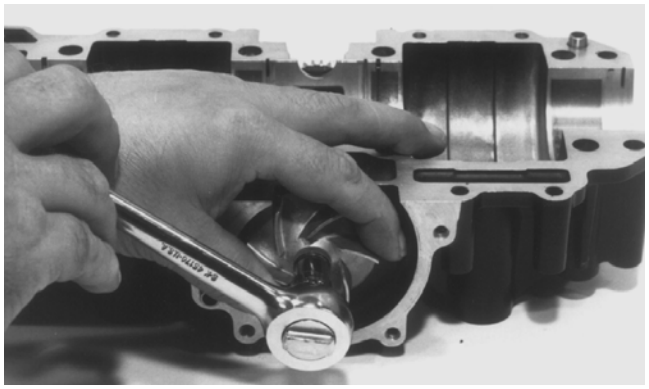


AJ045

■NOTE: For instructions on bearing and seal replacement, see the appropriate Assembling Engine sub-section of this manual. Complete steps 27-32 only if there is a bad seal or shaft bearing.

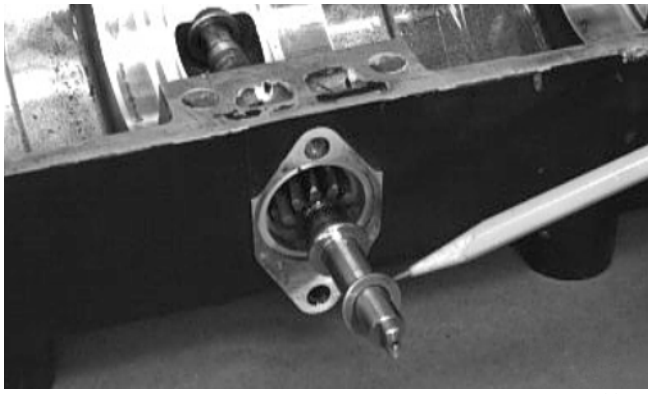
27. Remove the cap screw securing the impeller to the shaft.

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AJ046

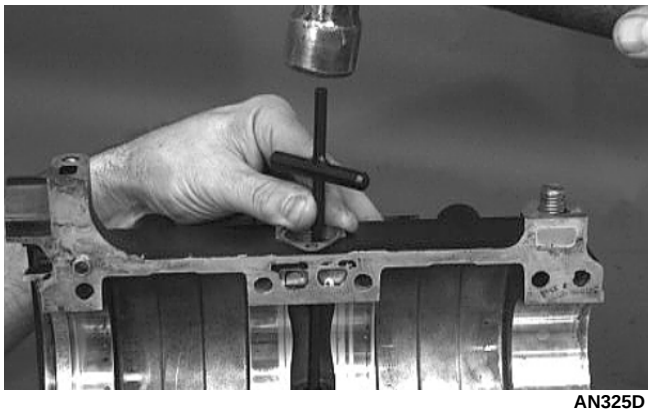
28. Remove the oil-injection pump/water pump driveshaft from the lower crankcase half. Account for the thrust washer on the outer end of the shaft.



AN324D

■**NOTE: Do not replace the inner seals unless the water pump shows signs of leaking coolant out of the small bleed hole in the bottom half of the crankcase. If a water pump seal is to be replaced, use the Water Pump Bearing and Seal Kit (p/n 0644-084).**

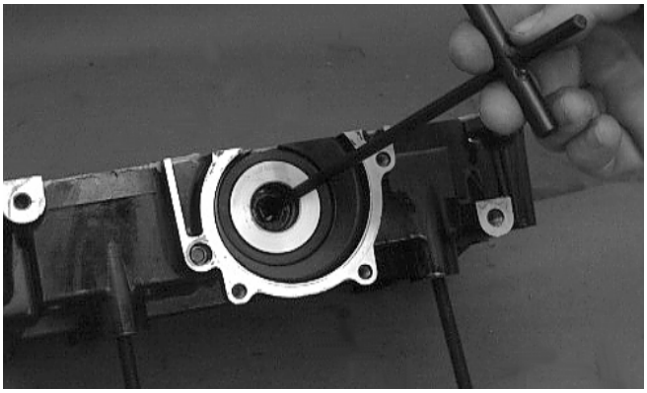
29. Place the crankcase on the bench with the water pump side down. Using the long seal driver, drive the mechanical water pump seal from the crankcase.



AN325D

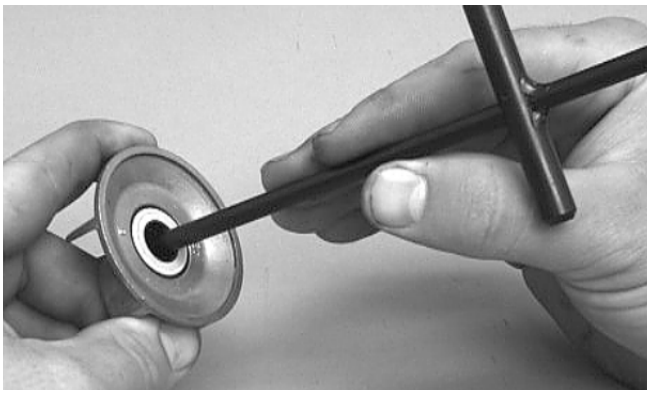
30. Using a pair of snap ring pliers, remove the snap ring securing the inner seal in the crankcase.

31. Using the hooked end of the tool, pull the inner seal free of the crankcase.



AN326D

32. Using the hooked end of the tool, pry the seal ring from the backside of the water pump impeller.



AN327D

Disassembling Engine
(600 cc Triple Model)

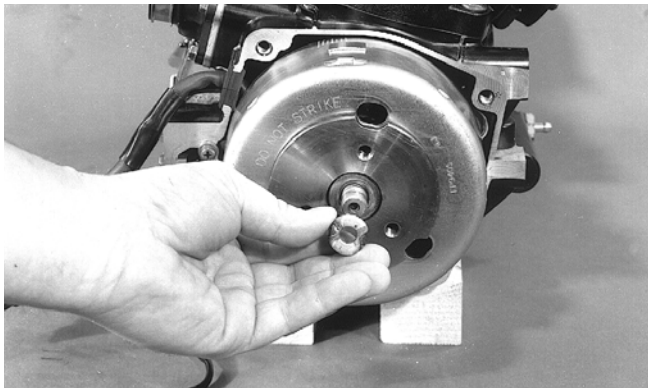
■**NOTE: If servicing the exhaust manifolds, remove them at this time.**

1. Using an impact driver or a 6-mm hex wrench, remove the four cap screws securing the magneto case to the crankcase.

2. Using a spanner wrench to secure the crankshaft, remove the cap screw, lock washer, and large flat washer securing the flywheel.

3. Remove the three cap screws securing the starter pulley to the flywheel.

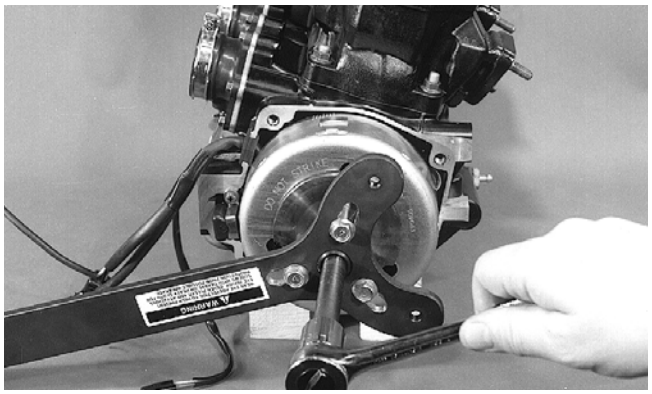
4. To prevent damaging the crankshaft threads during the flywheel removal procedure, install a Crankshaft Protector Cap (p/n 0644-234) onto the end of the crankshaft.



AN162

5. Attach the flywheel puller to the flywheel using three 8-mm cap screws approximately 2 3/4 in. long. Thread each of the three cap screws evenly into the flywheel 1/2 in.

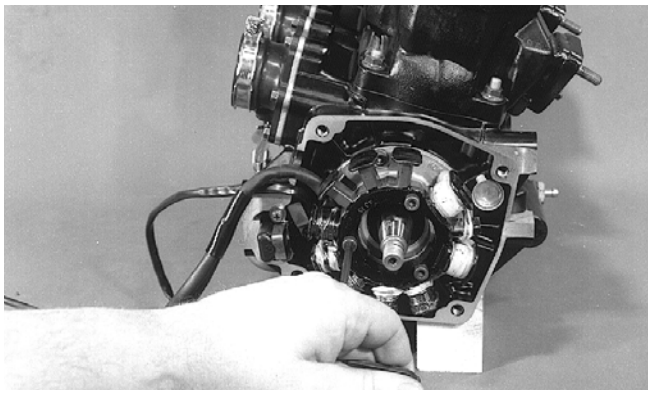
6. Tighten the center puller bolt against the crankshaft protector on the end of the crankshaft. Continue to tighten the puller bolt until the flywheel snaps free of the crankshaft taper. Remove the puller from the flywheel and place the flywheel, open side up, on a clean work bench. Account for the flywheel key.



AN161

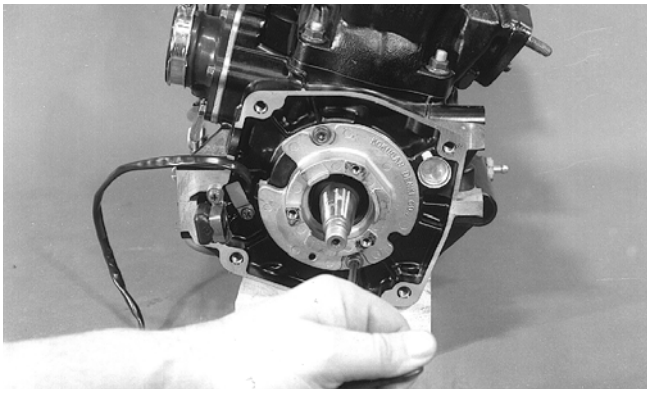
7. Remove the three Allen-head cap screws securing the stator to the stator plate.

8. Remove the rubber grommet from the crankcase and slide the stator free of the crankshaft.



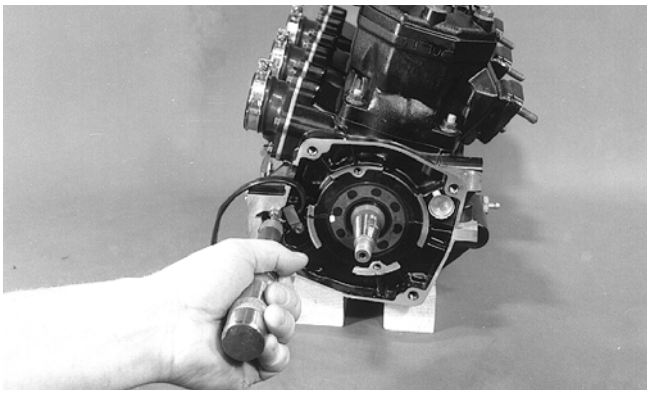
AN160

9. Remove the two Allen-head cap screws securing the stator backing plate to the crankcase.



AN158

10. Remove the two screws securing the timing sensor; then loosen the screw securing the wiring harness retainer tab. Remove the timing sensor from the crankcase.



AN157

11. Remove the nuts securing the APV covers to the cylinders; then slide the covers back to expose the valves.



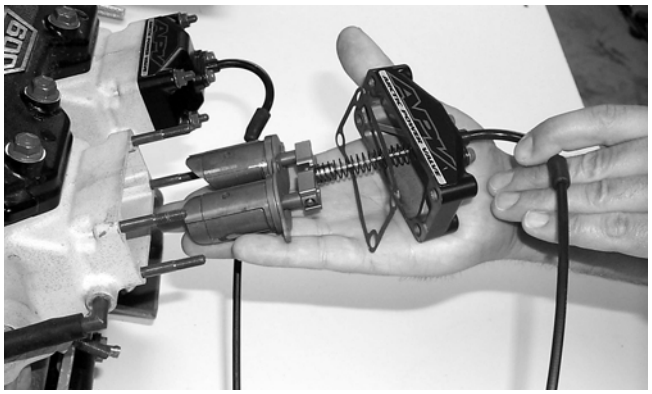
AP134

12. Remove the cap screws securing the valves to the cylinders; then remove the APV assemblies and set them aside.

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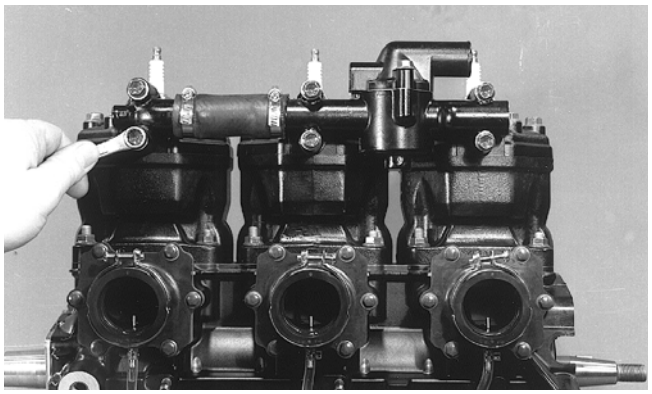
AP153



AP154

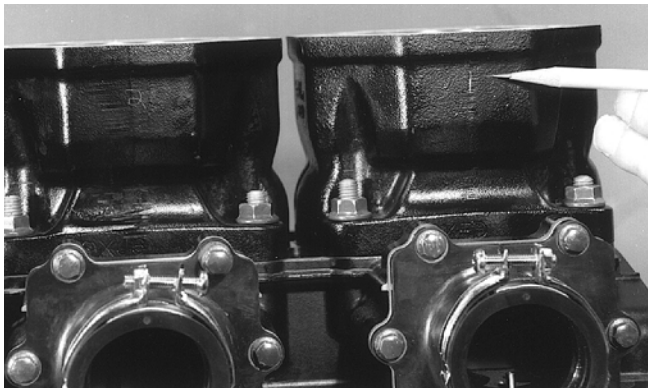
13. Remove the thermostat cover; then remove the thermostat from the water manifold. Remove the water manifold assembly.

■NOTE: The thermostat is designed to open at 50°C (122°F). It should be checked for proper operation before installing (see Section 3).



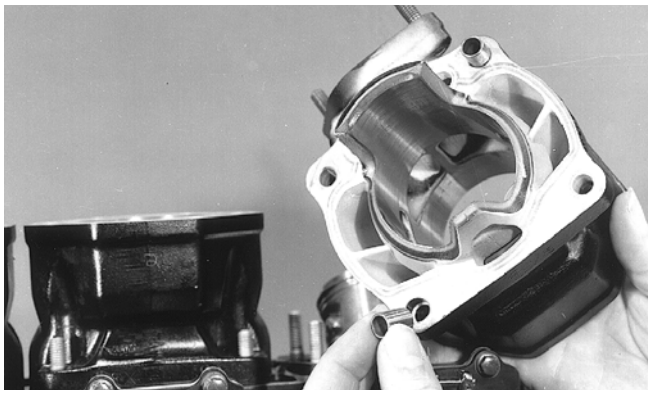
AN156

14. Remove each cylinder head; then account for the two O-rings under each head. For assembly purposes, number the three heads and cylinders using a marker. Start from the MAG-side.



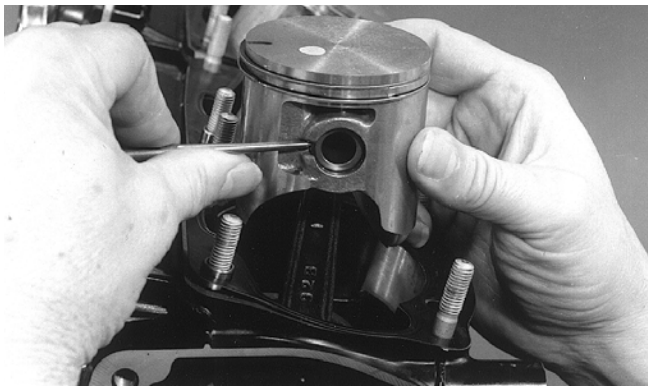
AN209

15. Remove the four nuts securing each cylinder to the crankcase; then carefully lift each cylinder straight up and free of the piston. Support the piston as the cylinder clears the piston to prevent the connecting rod from dropping against the crankcase and causing damage to the crankcase sealing surface. Account for two alignment dowel pins per cylinder.



AN207

16. For assembly purposes, number the dome of each piston starting from the MAG-side; then remove the MAG-side circlip from each piston.



AN242

17. Using Piston Pin Puller (p/n 0644-328), remove the piston pin from each piston. Remove the piston, piston pin bearing, and the two shim washers. Keep each piston, piston pin, and bearing together as a set.

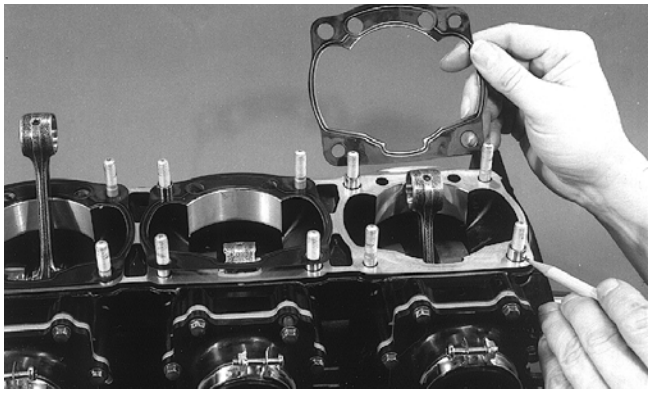
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AN241

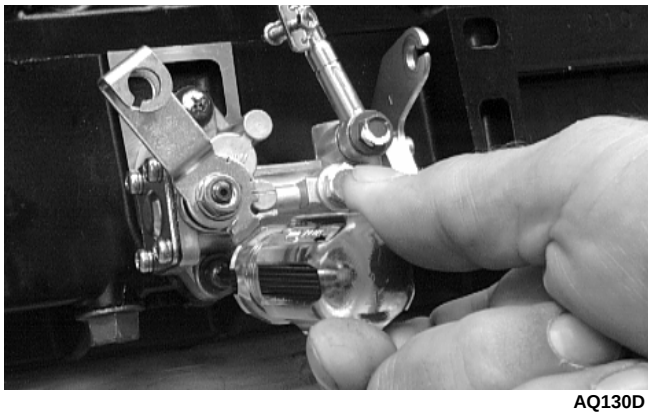
18. Remove the cylinder base gaskets from the crankcase. Note that the cylinder base gaskets are aligned with the same dowel pins which align the cylinders on the crankcase.

■ **NOTE: If the cylinder base gaskets are not damaged, they can be reused.**



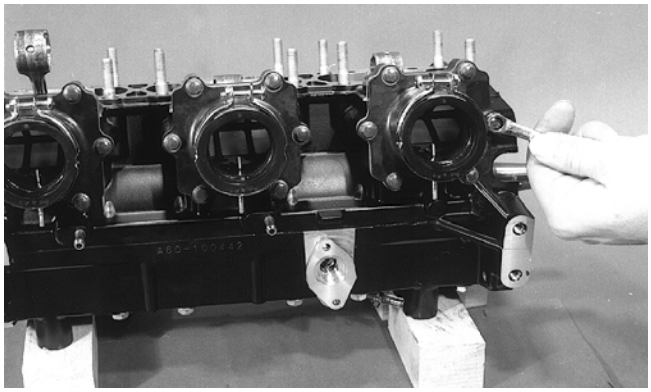
AN239

19. Remove the two screws securing the oil-injection pump to the crankcase. Slide the pump free of the crankcase. Account for the O-ring located around the pump inner flange.



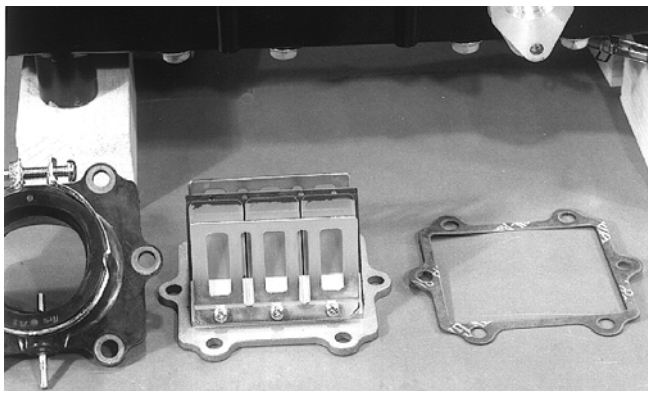
AQ130D

20. Remove the six cap screws securing the intake flanges and reed valve assemblies to the crankcase.



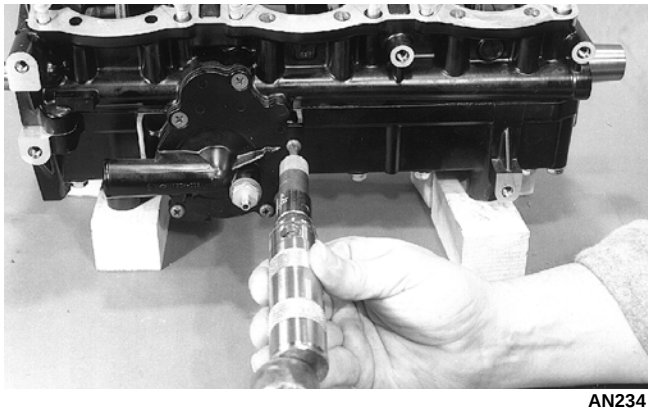
AN237

21. Remove each intake flange and reed valve assembly. Be very careful not to damage the reed valve stops. Place the assembly on its flat side. Remove and discard and reed valve assembly gasket.



AN236

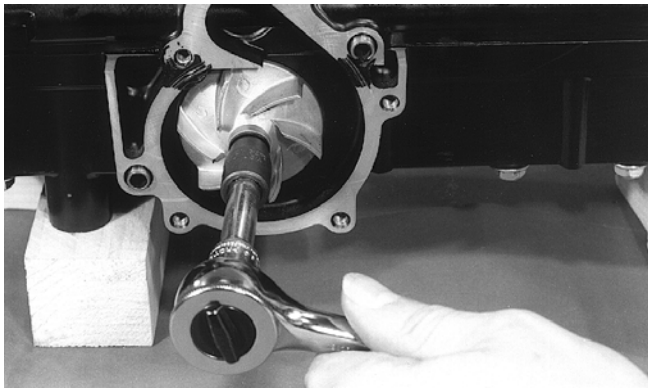
22. Using an impact driver, remove the five screws securing the water pump cover to the crankcase and remove the cover. Account for the O-ring gasket.



AN234

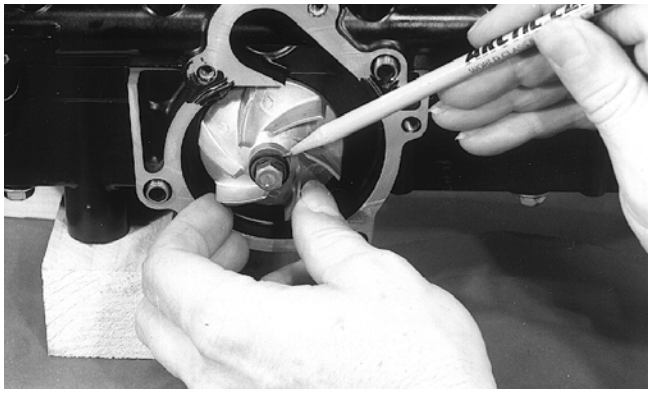
23. Loosen the cap screw securing the water pump impeller until there is a 1/4-in. space between the cap screw flange and impeller.

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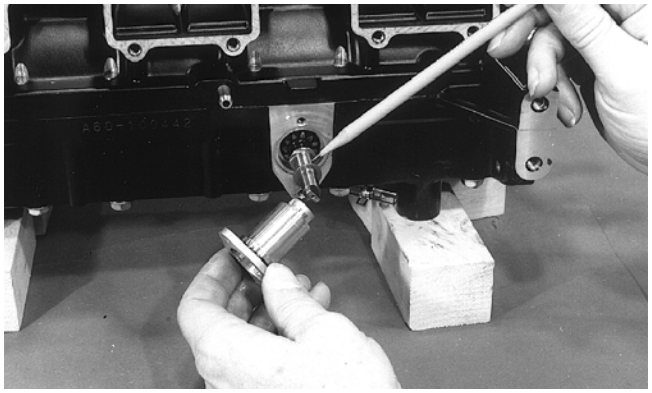
AN233

24. Using a plastic hammer, gently tap on the head of the cap screw until the impeller is free of the shaft. Remove the cap screw and impeller.



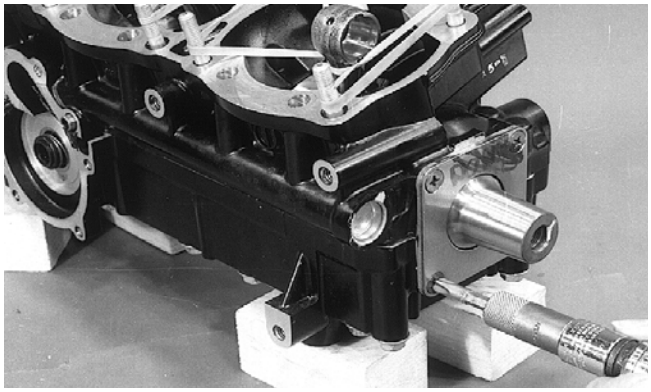
AN232

25. From the opposite side of the crankcase, remove the oil pump retainer and shaft. Account for the shaft thrust washer located between the retainer and shaft flange.



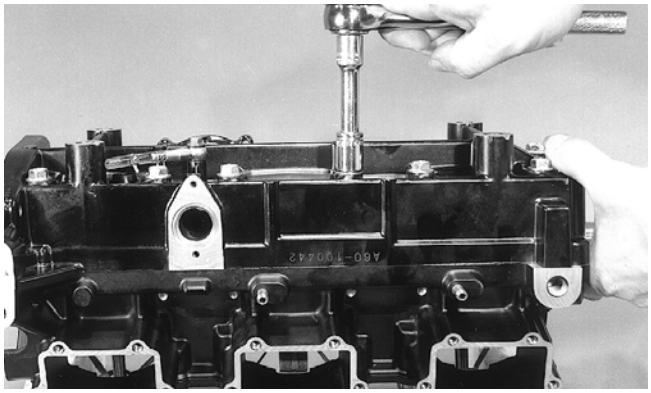
AN231

26. Using an impact driver, remove the four screws securing the seal protector plate to the end of the crankcase; then slide the plate free of the crankshaft.



AN230

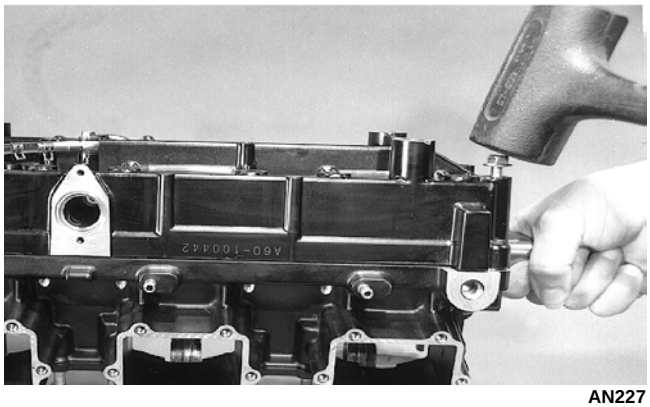
27. Remove the 14 cap screws securing the two crankcase halves together.



AN229

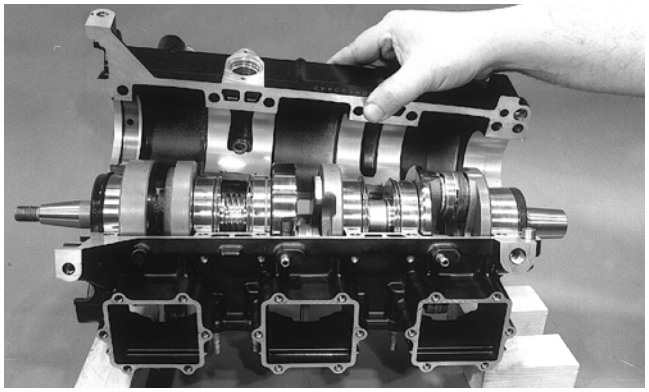
28. To separate the crankcase halves, start two of the crankcase cap screws into the crankcase at opposite corners. Thread the cap screws into the crankcase until a 6.4 mm (1/4 in.) space remains between the cap screw flange and the crankcase surface.

29. Set the crankcase on its side with the flat reed surfaces resting on the work bench. Using a hammer, strike the heads of the two cap screws alternately driving the two case halves apart.



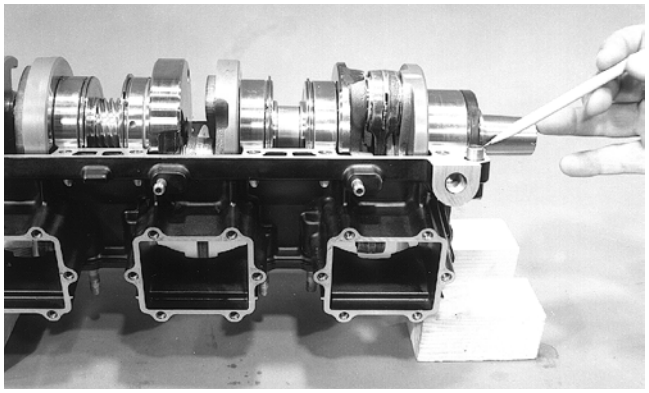
AN227

30. Once there is a 6.4 mm (1/4 in.) space between the two case halves, set the crankcase down on the work bench with its bottom side up. Remove the cap screws; then lift the bottom of the crankcase free of the engine.



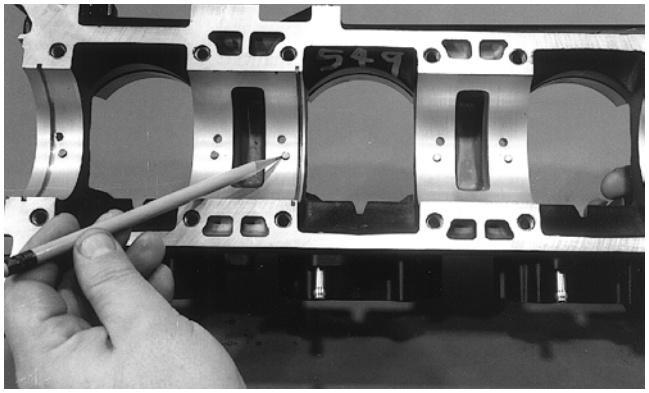
AN221

31. Grasp the crankshaft at either end and carefully lift it from the crankcase. Have a clean area ready to lay the crankshaft on once it has been removed. Account for the two crankcase dowel pins.



AN222

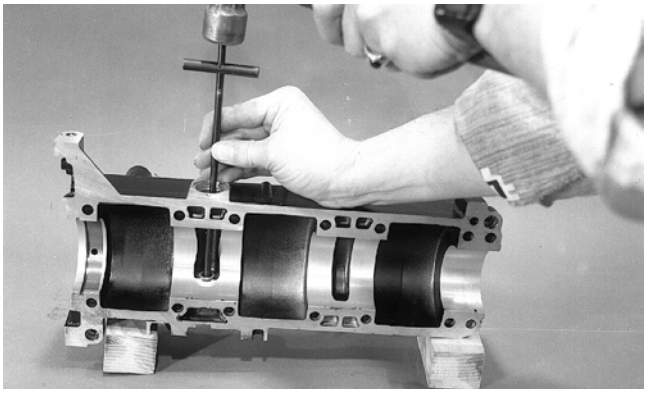
32. With the crankshaft removed from the top half of the crankcase, remove the seven bearing retaining pins and the C-ring.



AN223

■**NOTE: Do not replace the inner oil seal or mechanical seal unless the water pump shows signs of leaking coolant out of the small bleed hole in the bottom half of the crankcase. If a water pump seal is to be replaced, use the Water Pump Bearing and Seal Kit (p/n 0644-084).**

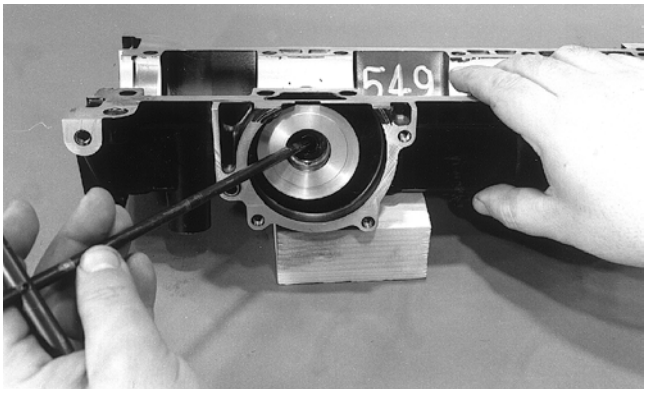
33. Place the crankcase on the bench with the water pump side down. Using the long seal driver, drive the water pump seal from the crankcase.



AN226

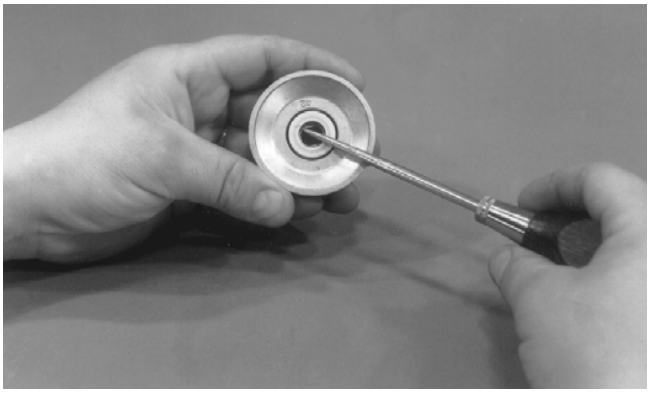
34. Using a pair of snap ring pliers, remove the snap ring securing the inner seal in the crankcase.

35. Using the hooked end of the seal driver, pull the inner seal free of the crankcase.



AN224

36. Using a sharp-pointed tool, pry the seal ring from the backside of the water pump impeller.



AN051

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Disassembling Engine
(1000 cc Models)

■**NOTE: If servicing the exhaust manifolds, remove them at this time.**

1. Using an impact driver or a 6-mm hex wrench, remove the four cap screws securing the magneto case to the crankcase. Account for the dowel pins.

2. Using an impact driver, remove the five screws securing the water pump cover. Remove the cover and account for the O-ring seal and two dowel pins.



AQ005

3. Secure the crankshaft using a spanner wrench; then remove the cap screw securing the water pump impeller.

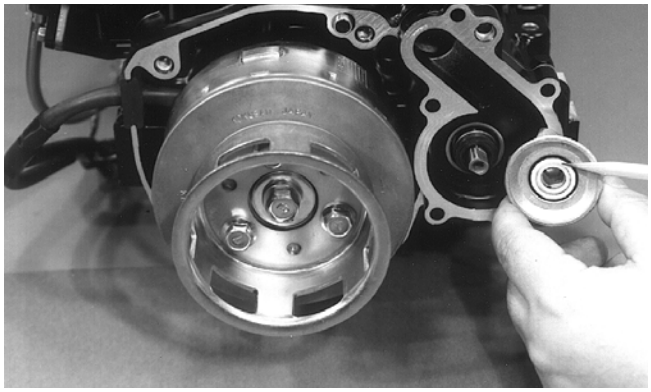


AQ006

4. Remove the water pump impeller from the counterbalance shaft.

5. With the impeller removed, check the condition of the seal on the back side. It must be free of any cracks, chips, or rough areas.

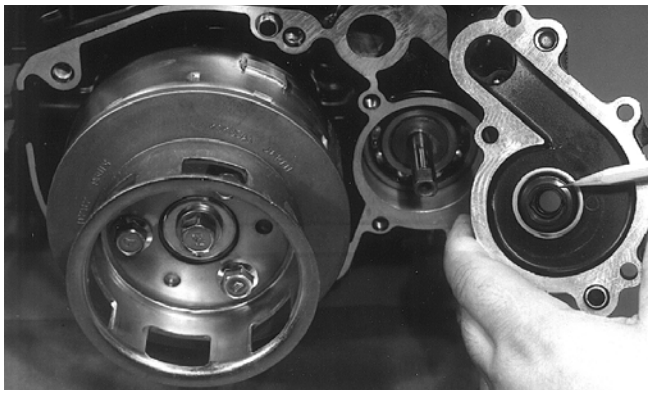
■**NOTE: If any rough areas are found, the seal ring can be removed using a small screwdriver. Simply pry the seal ring upward; then remove the rubber cup from beneath the seal ring.**



AQ008

6. Remove the remaining water pump center and back section from the counterbalance shaft.

7. Inspect the front mechanical seal and rear seal surface for any rough areas. If the seals need replacement, see the appropriate Repairing Water Pump in Section 3.

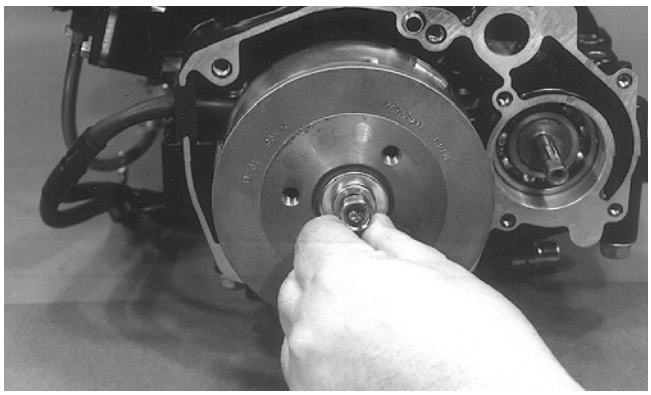


AQ010

8. Using a spanner wrench to secure the crankshaft, remove the cap screw, lock washer, and large flat washer securing the flywheel.

9. Remove the three cap screws securing the starter pulley to the flywheel.

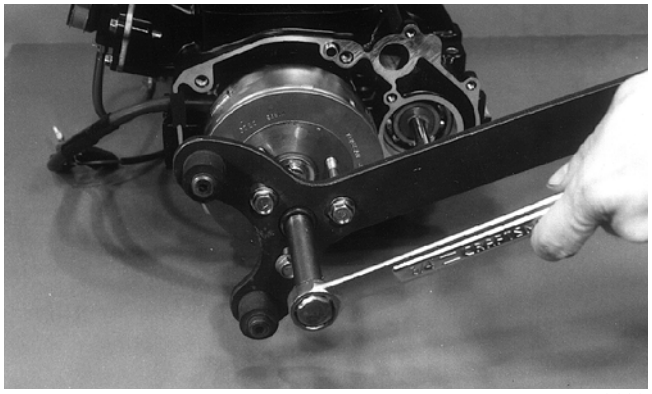
10. To prevent damaging the crankshaft threads during the flywheel removal procedure, use the Puller Insert (p/n 0644-179) on the end of the crankshaft.



AQ019

11. Attach the flywheel puller to the flywheel using three 8-mm cap screws approximately 2 3/4 in. long. Thread each of the three cap screws evenly into the flywheel 1/2 in.

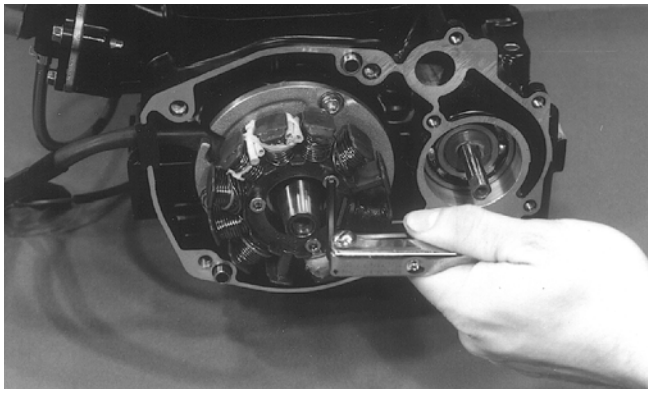
12. Tighten the center puller bolt against the insert on the crankshaft. Continue to tighten the puller bolt until the flywheel snaps free of the crankshaft taper. Remove the puller from the flywheel and place the flywheel, open side up, on a clean work bench. Account for the flywheel key.



AQ020

13. Remove the Allen-head cap screws securing the stator to the stator plate.

14. Remove the rubber grommet from the crankcase and slide the stator free of the crankshaft.



AQ021

15. Remove the three Allen-head cap screws securing the stator plate to the crankcase.

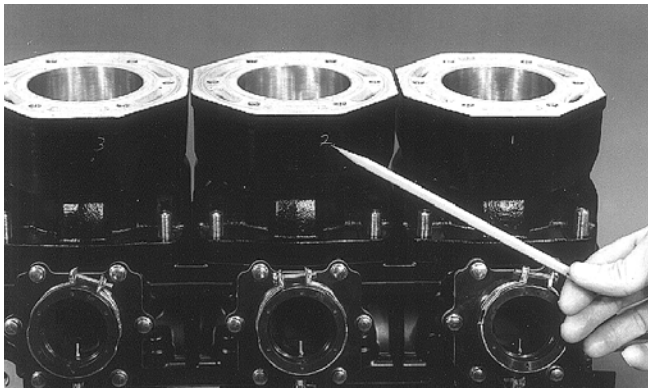
16. Remove the thermostat cover; then remove the thermostat from the water manifold.

■NOTE: The thermostat is designed to open at 50°C (122°F). It should be checked for proper operation before installing (see Section 3).

17. Remove the water manifold assembly.

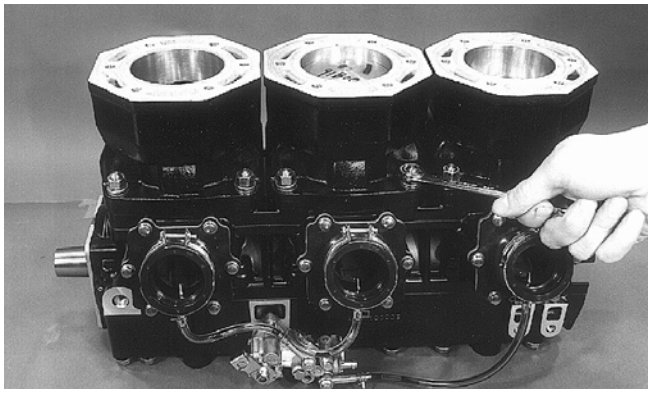
18. Remove the heads from the cylinders. Account for the two O-rings under each head.

19. For assembly purposes, number the three heads and cylinders. Start from the MAG-side.



AQ026

20. Remove the four nuts, lock washers, and flat washers securing each cylinder to the crankcase; then carefully lift each cylinder straight up and free of the piston. Support the piston as the cylinder clears the piston to prevent the connecting rod from dropping against the crankcase and causing damage to the crankcase sealing surface.



AQ027

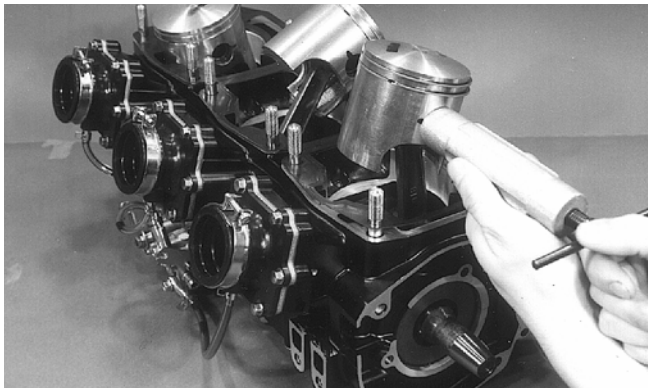
21. For assembly purposes, number the dome of each piston starting from the MAG-side; then remove the MAG-side circlip from each piston.



AQ028

22. Using Piston Pin Puller (p/n 0644-328), remove the piston pin from each piston. Remove the piston, piston pin bearing, and the two shim washers. Keep each piston, piston pin, and bearing together as a set.

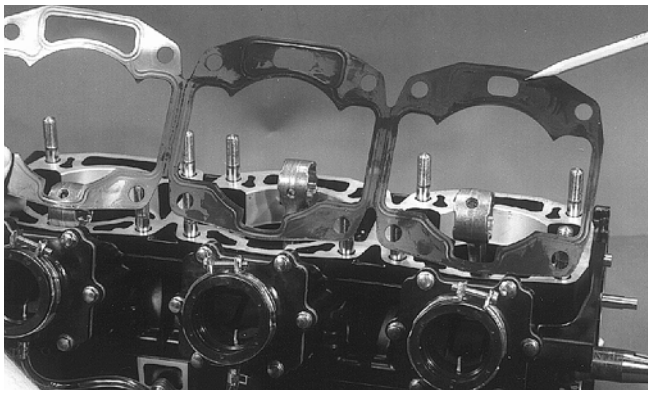
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AQ029

23. Before lifting the cylinder base gasket from the crankcase, note how it is installed. The smaller of the three water passage holes must be positioned to the MAG-side of the crankcase when installing. Lift the gasket free of the crankcase.

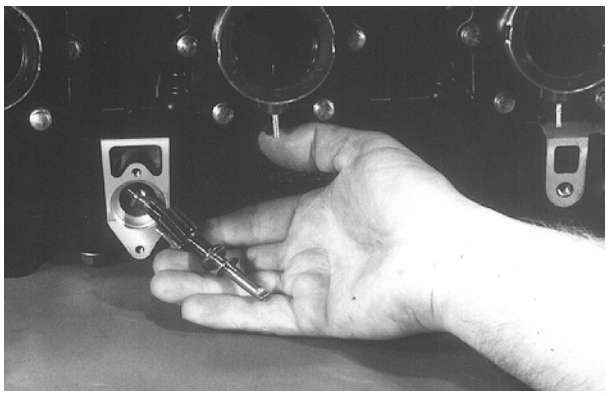
■**NOTE: If the cylinder base gasket is not damaged, it can be reused.**



AQ030

24. Remove the two screws securing the oil-injection pump to the crankcase. Slide the pump free of the crankcase. Account for the O-ring located around the pump inner flange.

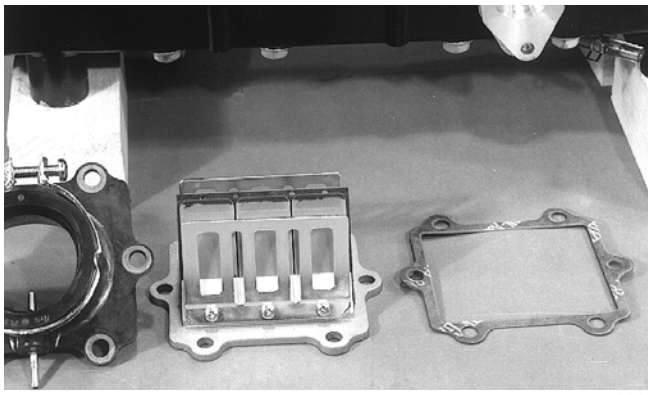
25. Remove the pump retainer and shaft. Account for the shaft thrust washer.



AQ119

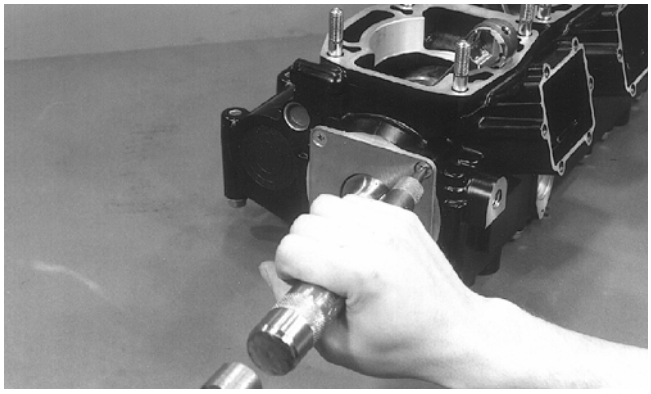
26. Remove the six cap screws securing the intake flanges and reed valve assembly to the crankcase.

27. Remove each intake flange and reed valve assembly. Be very careful not to damage the reed valve stops. Place the assembly on its flat side. Remove and discard the reed valve assembly gasket.



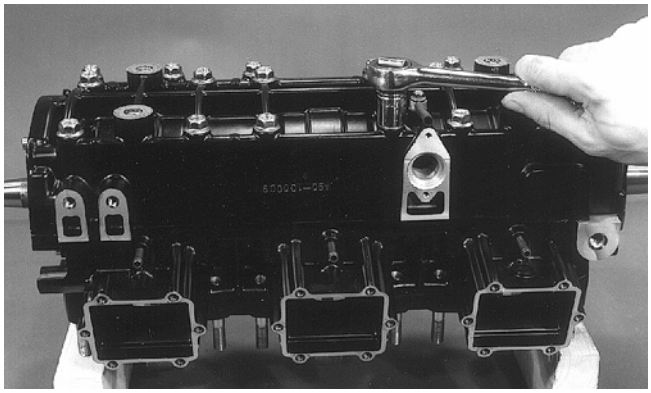
AN236

28. Using an impact driver, remove the four screws securing the PTO-end plate to the end of the crankcase; then slide the plate free of the crankshaft.



AQ034

29. Remove the twenty cap screws securing the two crankcase halves together.



AQ035

30. To separate the crankcase halves, start two of the crankcase cap screws into the crankcase at opposite corners. Thread the cap screws into the crankcase until a 6.4 mm (1/4 in.) space remains between the cap screw flange and the crankcase surface.

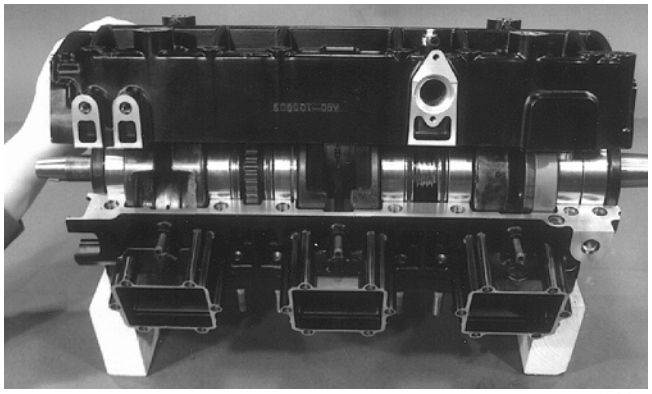
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AQ036

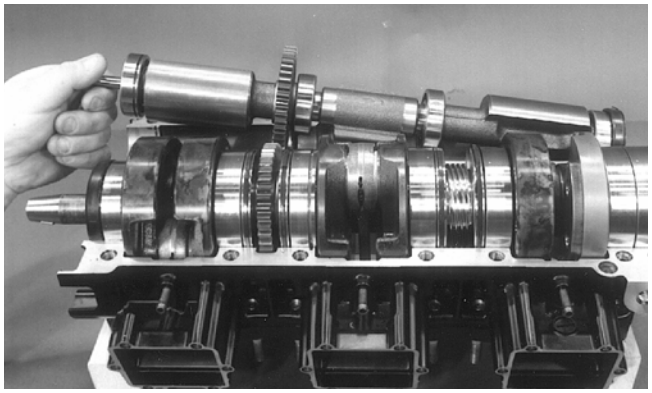
31. Set the crankcase on its side with the flat reed surfaces resting on the work bench. Using a plastic hammer, strike the heads of the two cap screws alternately driving the two case halves apart.

32. Once there is a 6.4 mm (1/4 in.) space between the two case halves, set the crankcase down on the work bench with its bottom side up. Remove the cap screws; then lift the bottom of the crankcase free of the engine. Account for the two dowel pins.



AQ037

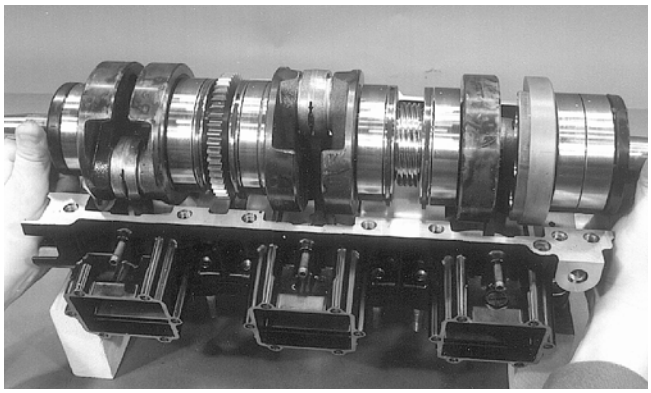
33. Remove the balancer shaft from the crankcase. Notice that it has a timing mark located on the side of the drive gear. This timing mark must be aligned with the crankshaft gear during assembly.



AQ038

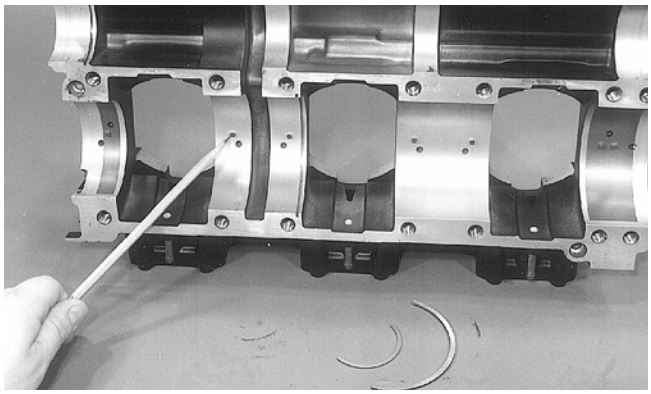
34. Remove the balancer shaft end seals from the crankcase.

35. Grasp the crankshaft at either end and carefully lift it from the crankcase. Have a clean area ready to lay the crankshaft on once it has been removed.



AQ039

36. With the crankshaft removed from the top half of the crankcase, remove the seven bearing retaining pins and the two C-rings.



AQ040

Servicing Components
(120 cc)

Thoroughly clean all non-electrical components in parts-cleaning solvent; then remove any carbon buildup from the cylinder head, piston dome, valves, and valve seats.

Visually inspect all engine components for wear or damage.

■ **NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.**

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CYLINDER HEAD/VALVE ASSEMBLY

■NOTE: Remove the valves by pressing down on the spring retainer and removing the valve keeper. Account for valve springs, spring retainers, and valve keepers.

When servicing valve assembly, inspect valve seats, valve stems, valve faces, and valve stem ends for pits, burn marks, or other signs of abnormal wear.

■NOTE: Discard any valve that fails the listed inspections. Do not grind the valves. If a valve is damaged, it must be replaced.

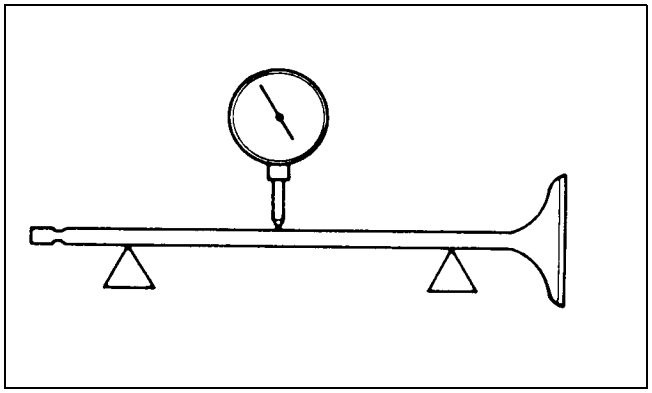
Measuring Cylinder Head Distortion

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chambers being careful not to nick, scrape, or damage the combustion chambers or the sealing surfaces.
2. Inspect the spark-plug holes for any damaged threads. Repair damaged threads using a heli-coil insert.
3. Inspect the cylinder head for flatness using a straightedge and a feeler gauge. Acceptable distortion must not exceed 0.03 mm (0.0012 in.).

■NOTE: If the distortion exceeds specification, replace the cylinder head.

Measuring Valve Stem Runout

1. Support each valve stem end with V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.

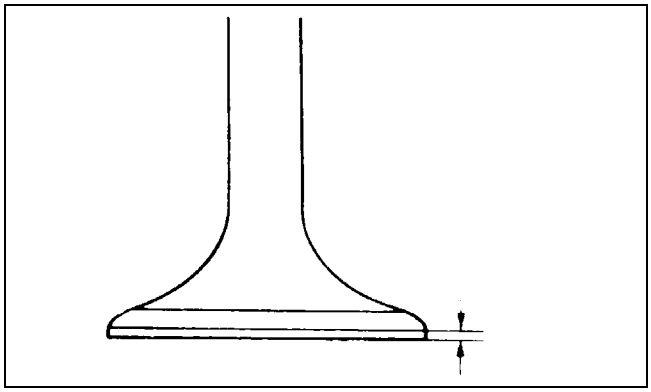


ATV-1082

2. Maximum runout is 0.05 mm (0.002 in.) for both valves.

Measuring Valve Face Width

1. Using a micrometer, measure the width of the valve face.

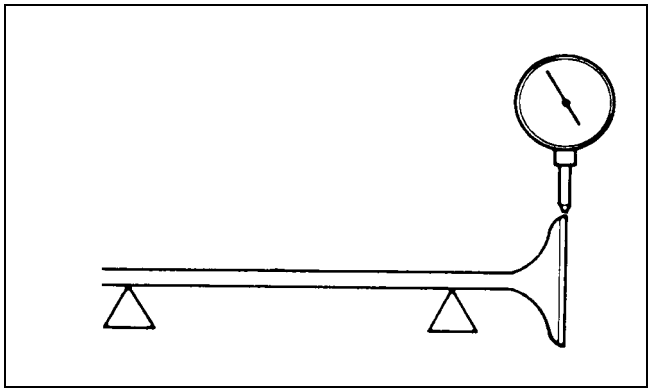


ATV-1004

2. Acceptable valve face width must be within a range of 0.8-1.0 mm (0.032-0.039 in.).

Measuring Valve Face Runout

1. Mount a dial indicator on a surface plate; then place the valve stem on a set of V blocks.
2. Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.



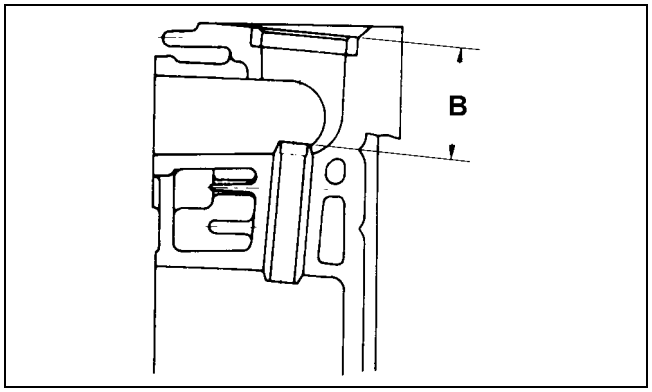
ATV1082A

3. Rotate the valve in the V blocks.
4. Maximum runout is 0.03 mm (0.0012 in.).

Replacing Valve Guide

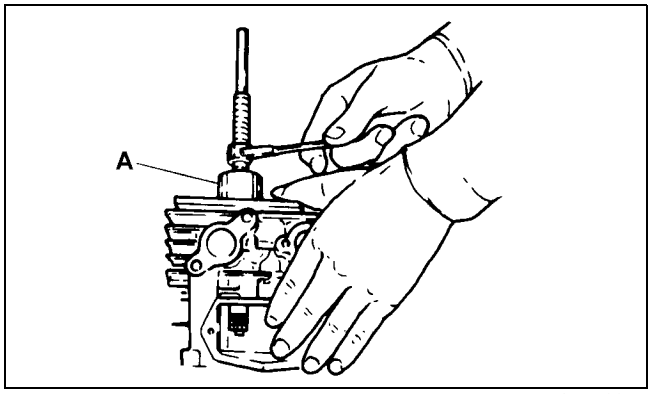
■NOTE: If a valve guide is worn or damaged, it must be replaced.

1. If a valve guide needs replacing, before removing the existing guide, measure the distance from the top of the valve seat to the top of the valve guide (B) for a reference depth when installing the new guide.



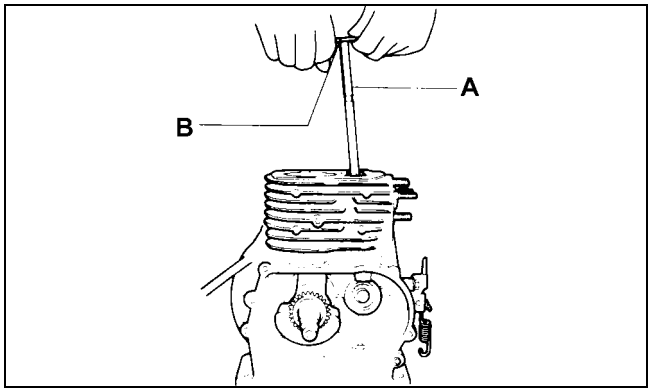
GEN-0021

2. To replace a valve guide, use a valve guide remover from the top side of the cylinder to gently pull the valve guide out of the cylinder.



GEN-0017

3. Using a valve guide reamer, remove any burrs or tight areas from the valve guide journals.

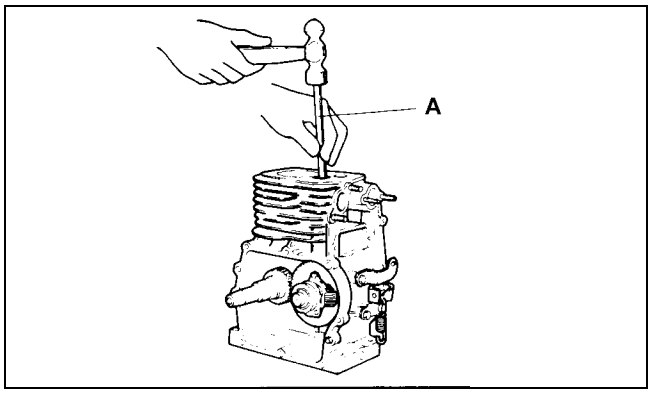


GEN-0018

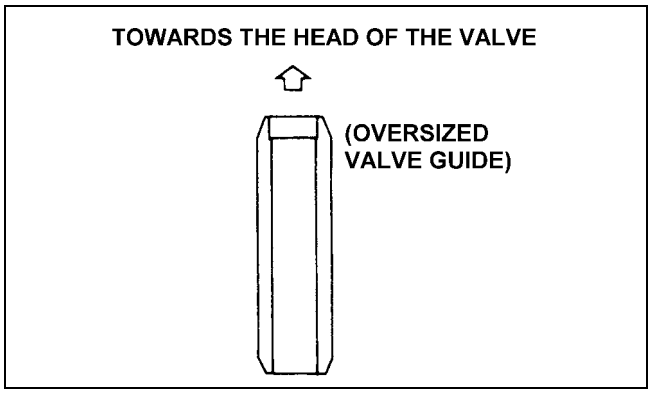
4. Valve guide hole diameter (after reaming) intake and exhaust must be within a range of 11.200-11.218 mm (0.4409-0.4416 in.).

5. To install an oversized valve guide at room temperature, use a valve guide installer and gently drive a valve guide into the bore from the top side until the guide is set to the distance noted before removal.

■ **NOTE: Install the valve guide so the stepped part on the guide wall faces the head of the valve.**

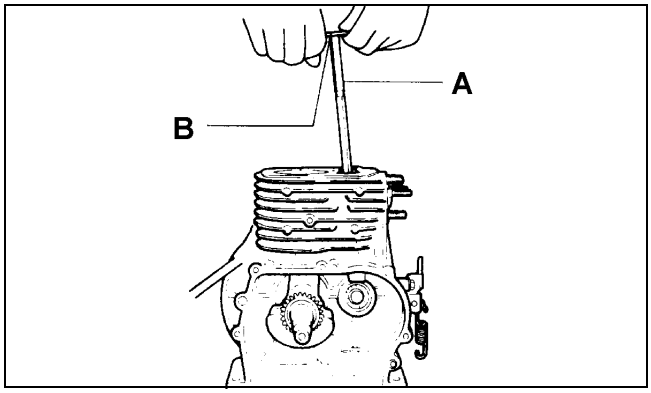


GEN-0019



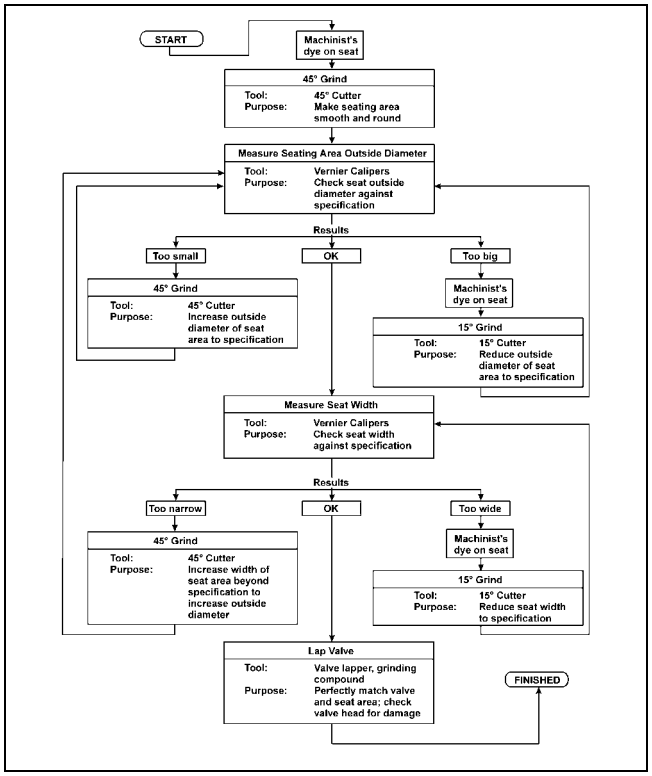
GEN-0020

6. After installing the guide, measure the inside diameter of the guide. The measurement must be within a range of 5.500-5.512 mm (0.2165-0.2170 in.). If the measurement does not fall within the specification or the valve does not move freely in the guide, use a standard valve guide reamer and handle to remove all burrs and tight areas that may remain in each valve guide.



GEN-0022

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ATV-0107

Measuring Valve Guide/Valve Stem Clearance

1. Using a micrometer and small bore gauge, take diameter readings on the valve stems and inside the guides.
2. Determine the stem clearance inside the guide.

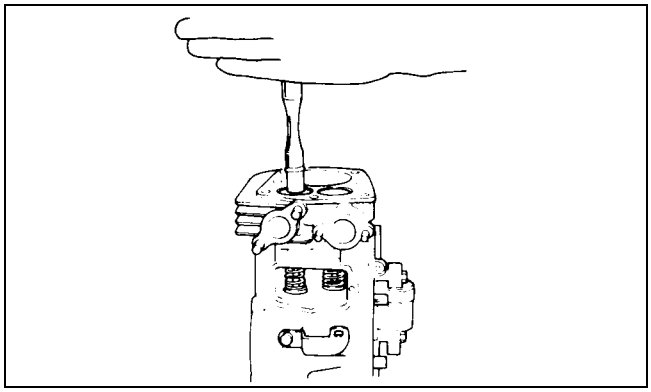
■ NOTE: Be sure to take readings at more than one place along the length of each stem and guide.

ITEM		SPECIFICATION
Valve Guide/Valve Stem Clearance	Intake (max)	0.080 mm (0.0031 in.)
	Exhaust (max)	0.100 mm (0.0039 in.)

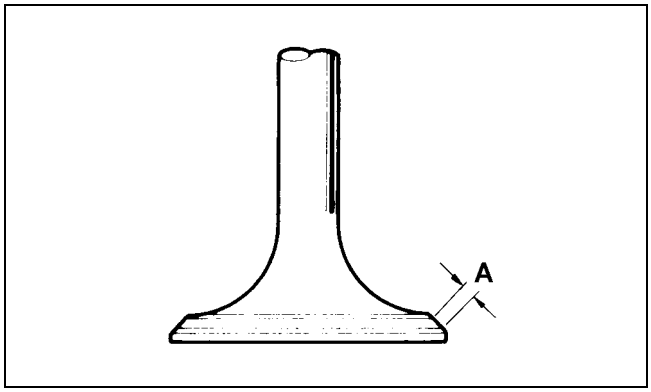
Lapping Valves

■ NOTE: Ensure that all carbon has been removed from the valves.

1. Using a valve lapper, produce a contact pattern on each valve face by applying a uniform coat of valve lapping compound to the valve seat and by rotating and tapping the valve head.
2. Acceptable width of valve seat contact width (measurement A) is within a range of 0.8-1.0 mm (0.032-0.039 in.).



GEN-0023



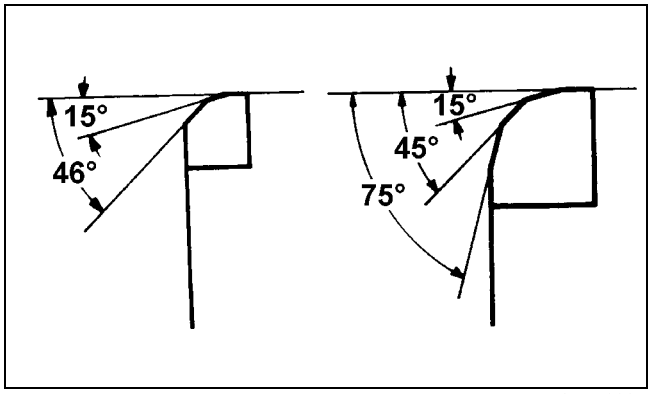
GEN-0024

■ NOTE: Do not grind the valves. If a valve is damaged, it must be replaced.

3. Lubricate each valve stem with lightweight oil; then apply a small amount of valve lapping compound to the entire seating face of each valve.
4. Attach the suction cup of a valve lapping tool to the head of the valve.
5. Rotate the valve until the valve and seat are evenly polished.
6. Clean all compound residue from the valve and seat.

Valve Seat Repair

■ NOTE: If the valve seat is beyond servicing, the cylinder must be replaced.



GEN-0025

Thank you very much for your reading.

Please Click Here Then Get More Information.