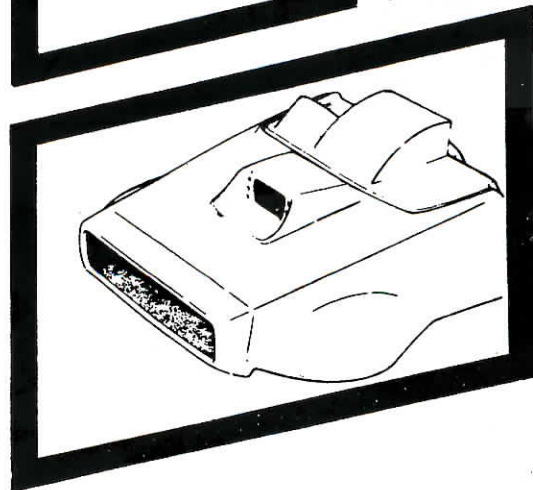
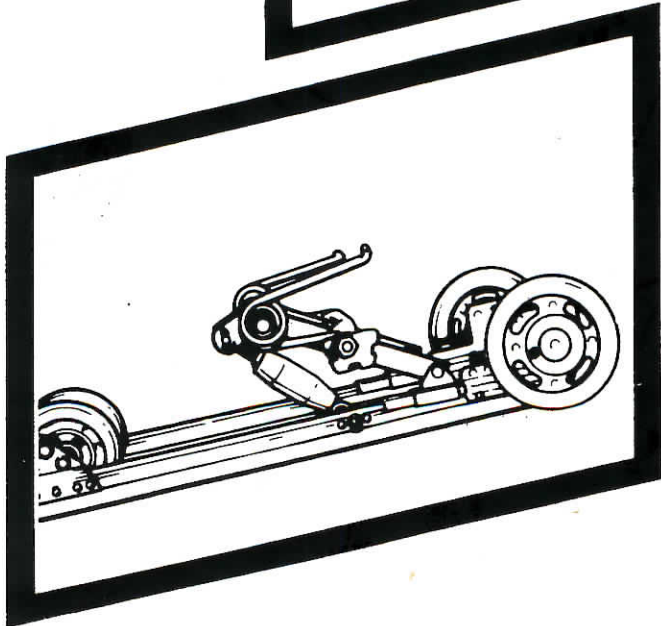
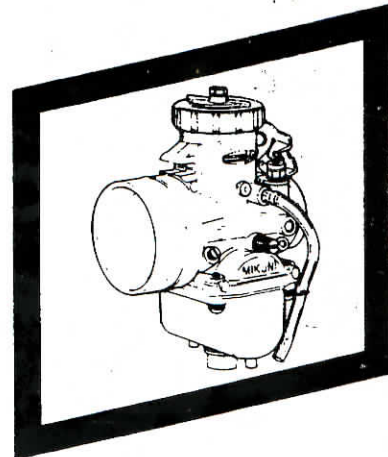
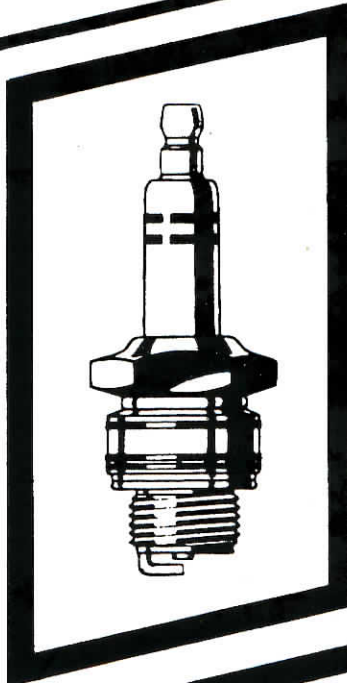
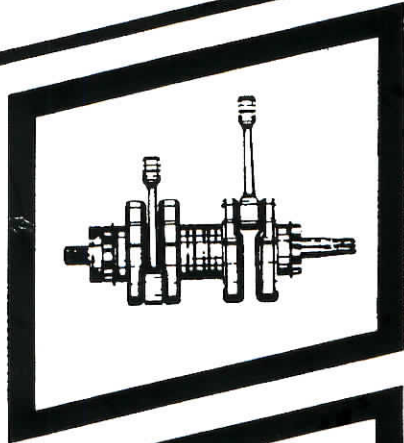


1974 / 75 / 76 / 77



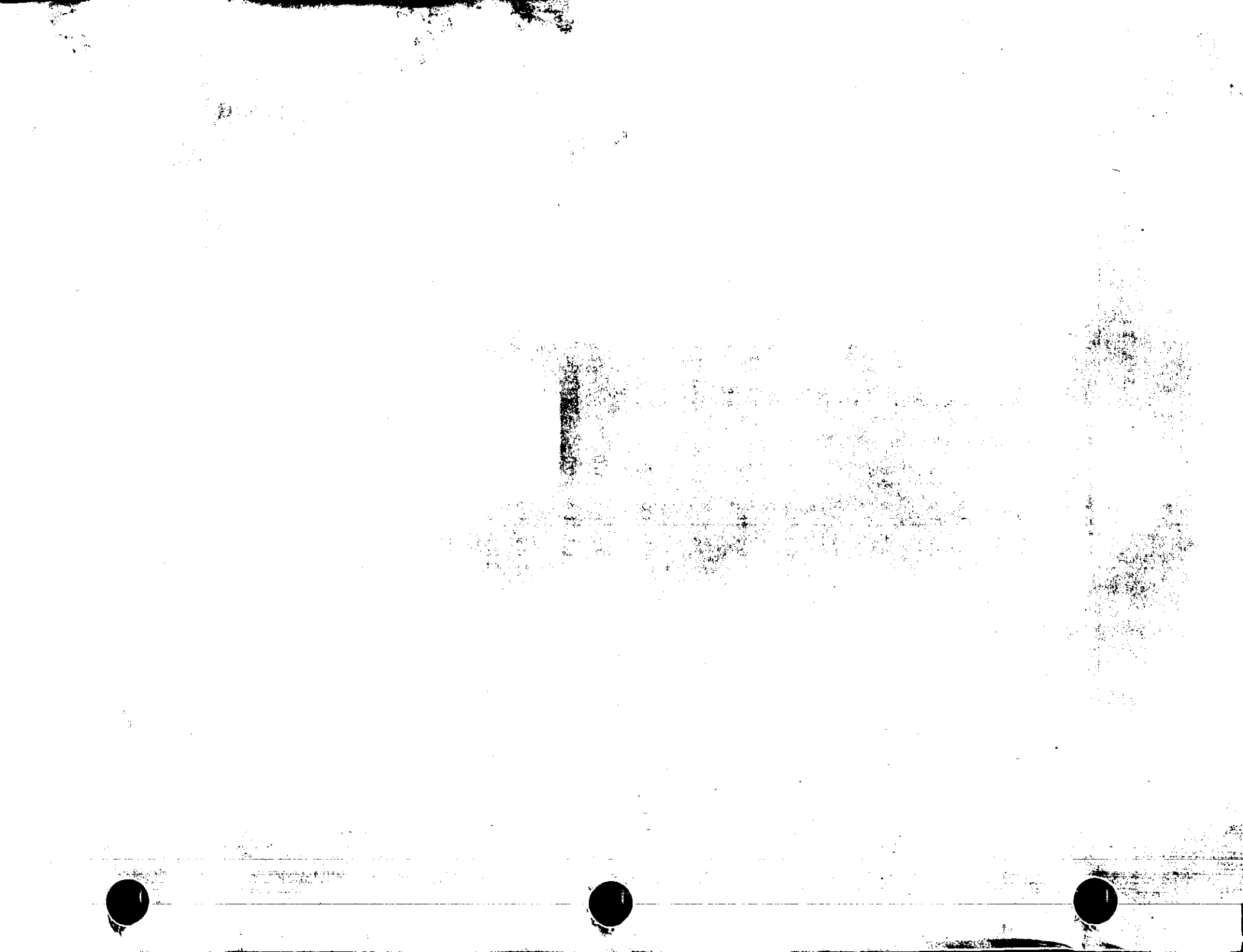
TECHNICAL DATA MANUAL





I N D E X

DESCRIPTION	PAGE	DESCRIPTION	PAGE
MODEL IDENTIFICATION	1 - 2	TRACK TENSION SPECIFICATIONS	207 to 208
ENGINE TOLERANCES MEASUREMENTS	3 to 7	TRACK SPECIFICATIONS	209 to 211
LIST OF ENGINE SECTIONS	8	DRIVE BELT NUMBER	212
247, 302 ENGINE TYPE	9 to 20	DRIVE PULLEY SPECIFICATIONS	213 to 216
248, 294 ENGINE TYPE	21 to 28	DRIVE PULLEY WEAR PADS	217
248 ENGINE TYPE (FROM 1975)	29 to 40	DRIVE PULLEY SPRING TENSION	218
245 ENGINE TYPE (UP TO SERIAL NO 2762 210)	41 to 54	PULLEY ALIGNMENT SPECIFICATIONS	219 to 220
245, 345 ENGINE TYPE (FROM 1976)	55 to 66	SPROCKET AND CHAIN SPECIFICATIONS	221 to 224
305, 338, 343, 401 ENGINE TYPE	67 to 74	STEERING SYSTEM	225 to 226
305, 343 ENGINE TYPE (FROM 1976)	75 to 88	SKI SYSTEM	227 to 228
346, 396, 436 ENGINE TYPE	89 to 92	ENGINE TECHNICAL DATA	229 to 232
346, 436 ENGINE TYPE (FROM 1977)	93 to 100	IGNITION TIMING SPECIFICATIONS	233 to 236
434 440 ENGINE TYPE	101 to 108	CARBURETOR SPECIFICATIONS	237 to 242
440 ENGINE TYPE (FROM 1976)	109 to 120	SPARK PLUG CHART	243 to 244
640 ENGINE TYPE	121 to 128	COIL RESISTANCE CHART	245 to 246
640 ENGINE TYPE (FROM 1976)	129 to 140		
IGNITION TIMING (TWO CYLINDER ENGINE)	141 to 144		
IGNITION TIMING (ONE BYLINDER ENGINE)	145 to 146		
IGNITION TIMING (C.D. IGNITION)	147 to 148		
ELECTRICAL CHARTS	149 to 186		
BOMBARDIER IGNITION TESTER	187 to 196		
TOOLS	197 to 206		



SKI-DOO 1977	MODEL
Elan 250 M	3017
Elan 250 T	3018
Elan (Europe) 250 M	3019
Elan (Europe) 250 T	3020
Elan Stretch	
(Europe) 250 M	3021
Elan Stretch 250 M	3022
Olympique 300 M	3131
Olympique 300 T	3132
Olympique 340	3133
Olympique 340 E	3134
Olympique (Europe) 340	3137
Olympique 440	3138
Everest 440	3434
Everest 440 E	3435
Everest 340	3442
Everest 340 E	3443
Everest 444 L/C	3444
Everest (Europe) 340	3445
Everest (Europe) 440	3446
T'NT FA 340	3439
T'NT FA 440	3440
RV 340	3441
T'NT FC 440	3447
Cross Country 340 LC	3559
Blizzard 440 LC	3560
Blizzard X 254	3560-01
Blizzard X 354	3560-02
Blizzard X 454	3560-03
Alpine 640 ER	3313
Alpine (Europe) 640 ER	3314
Alpine (White) 640 ER	3315

SKI-DOO 1976	MODEL
Elan 250	3013
Elan 250 T	3014
Elan 250 M	3015
Elan Europe 250 M	3016
Olympique 300	3122
Olympique 300 T	3123
Olympique 300 T E	3124
Olympique 340	3125
Olympique 340 E	3126
Olympique 440	3127
Olympique Europe 300	3128
Olympique Europe 300 T	3129
Olympique Europe 340	3130
T'NT FC 340	3428
T'NT FC 340 E	3429
Everest 440	3430
Everest 440 E	3431
Everest LC	3436
RV 250	3432
RV 340	3433
Alpine 640 ER	3311
Alpine Europe 640 ER	3312

SKI-DOO 1975 MODEL

Elan 250 3010
Elan 250 T 3011
Elan 300 3012

Olympique 300 3112
Olympique 300E 3113
Olympique 340 3119
Olympique 340E 3120

TNT F.C. 340 3418
TNT F.C. 340E 3419
TNT F.C. 440 3420
TNT F.C. 440E 3421

Everest 440 3422
Everest 440E 3423

TNT F.A. 340 3426
TNT F.A. 440 3427

Alpine 640 ER
(1st run) 3307
Alpine 640 ER
(2nd run) 3308
Alpine 640 ER
(3rd run) 3309
Alpine 640 ER
(4th run) 3310

Stock Racer 245 3554

SKI-DOO 1974 MODEL

Elan 250 3005
Elan 250 E 3006
Elan 250 T 3007
Elan 250 Deluxe 3008
Elan 294 SS 3009

Olympique 300 4101
Olympique 340 3107-09
Olympique 340 S 3117
Olympique 340 E 3108
Olympique 340 ES 3118
Olympique 400 3104-10
Olympique 400 S 3114
Olympique 400 E 3105
Olympique 400 ES 3115
Olympique 440 3106
Olympique 440 S 3116

TNT 295 3409
TNT 340 3404
TNT 340 E 3405
TNT 440 3406
TNT 440 E 3407
TNT 440 Everest 3408

TNT F.A. 340 3414
TNT F.A. 400 3415
TNT F.A. 440 3416

Nordic 640 ER 3205

Alpine 440 ER 3304
Alpine 640 ER 3305

Elite 440 ER 3701

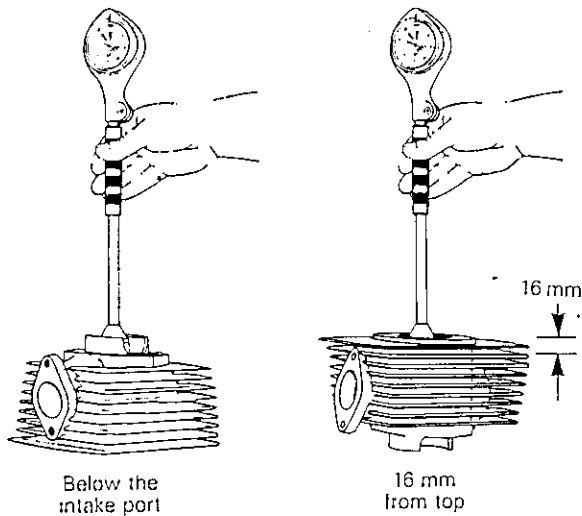
ENGINE TOLERANCES MEASUREMENT

CYLINDER TAPER

Maximum: 0.08 mm (.003")

Compare cylinder diameter 16 mm (5/8") from top of cylinder with down to just below the intake port.

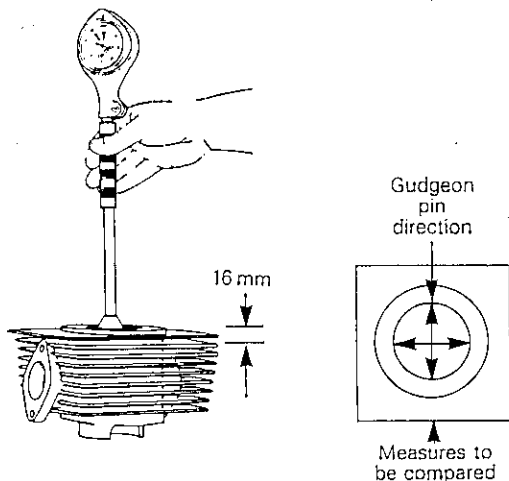
On rotary valve engines, measure just below auxiliary transfer port, facing exhaust port. If the difference exceeds 0.08 mm (.003") the cylinder should be rebored and honed or should be replaced.



CYLINDER OUT OF ROUND

Maximum: 0.05 mm (.002")

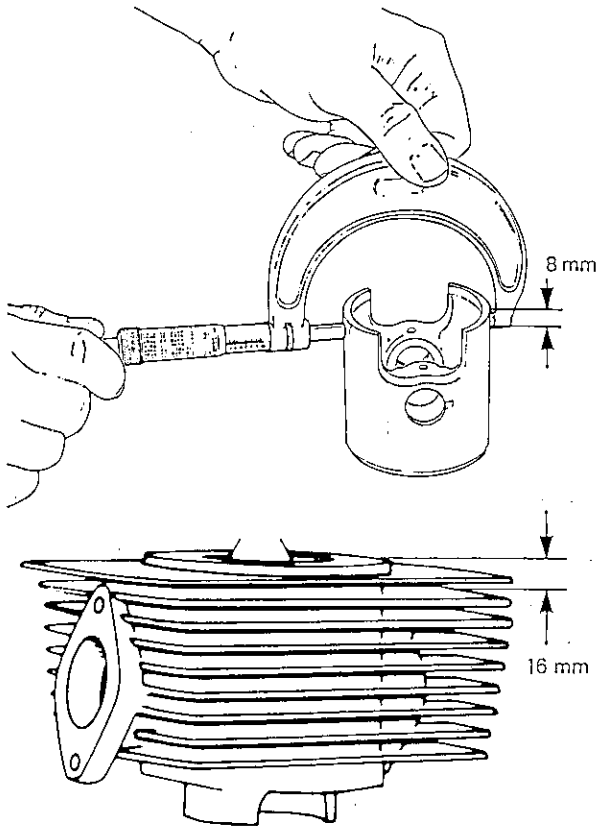
Measuring 16 mm (5/8") from top of cylinder with a cylinder gauge, check if the cylinder out of round is more than 0.05 mm (.002"). If larger, cylinder should be rebored and honed or should be replaced.



SECTION 04
SUB-SECTION 01 (ENGINE TOLERANCES MEASUREMENT)

Accurate measurement

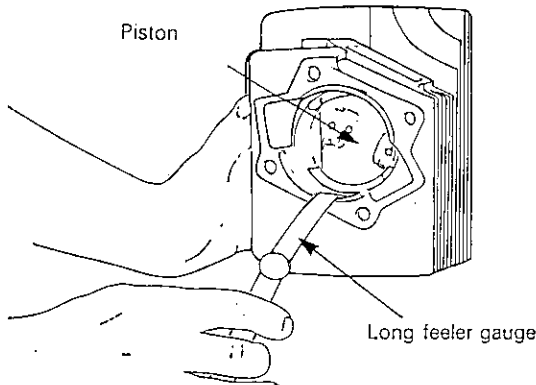
To determine piston to wall clearance, the piston should be measured 8 mm (5/16") above its bottom edge and the cylinder should be measured 16 mm (5/8") below its top edge.



The difference between these two measurements should be within specified tolerance.

Quick measurement

Place cylinder upside down on a work-bench and press a feeler gauge against the cylinder wall (intake side) while trying to insert the piston without any ring in its usual position.



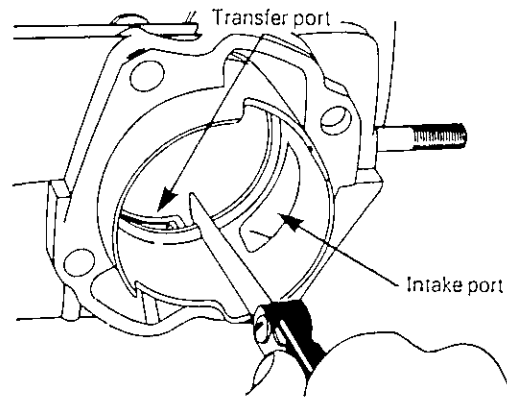
The thickest possible to use feeler gauge will determine the piston to wall clearance.

RING END GAP

Position ring half way between transfer ports and intake port. On rotary valve engines, position ring just below transfer ports.

NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

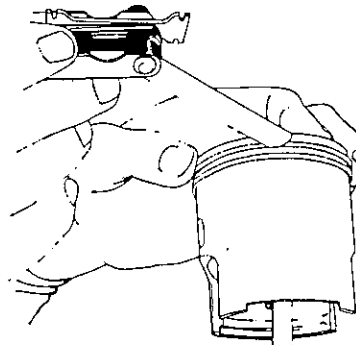
Using a feeler gauge, check ring end gap. If gap exceeds specified tolerance the ring should be replaced.



PISTON RING/GROOVE CLEARANCE

Maximum: 0.20 mm (.008")

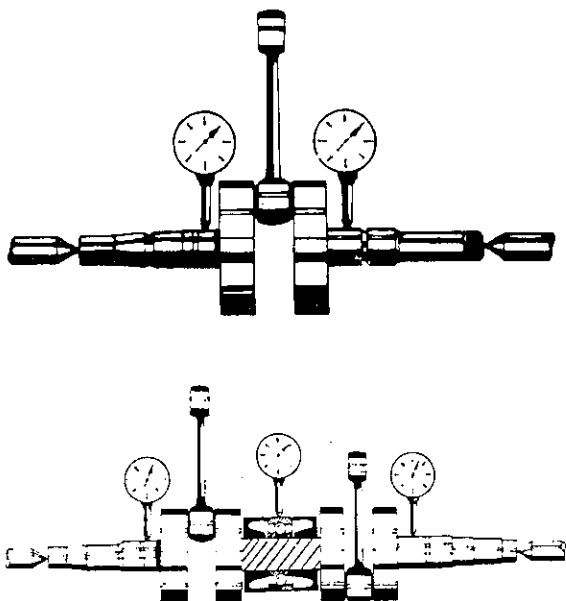
Using a feeler gauge check clearance between rectangular ring and groove. If clearance exceeds 0.20 mm (.008"), replace piston.



CRANKSHAFT DEFLECTION

Maximum: 0.06 mm (.0024")

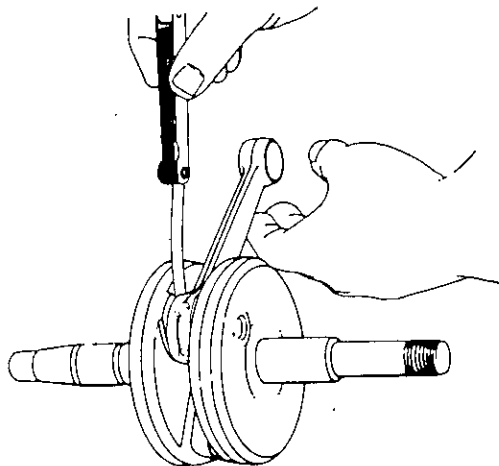
With the crankshaft positioned between a center lathe, install a dial indicator as close as possible to crankshaft blade then measure deflection on each side. If deflection exceeds 0.06 mm (.0024") the crankshaft should be repaired by a specialized shop or it should be replaced.



CONNECTING ROD BIG END AXIAL PLAY

Maximum: 0.5 mm (.020")

Using a feeler gauge measure distance between connecting rod and thrust washer. If axial play exceeds 0.5 mm (.020"), the crankshaft should be replaced.



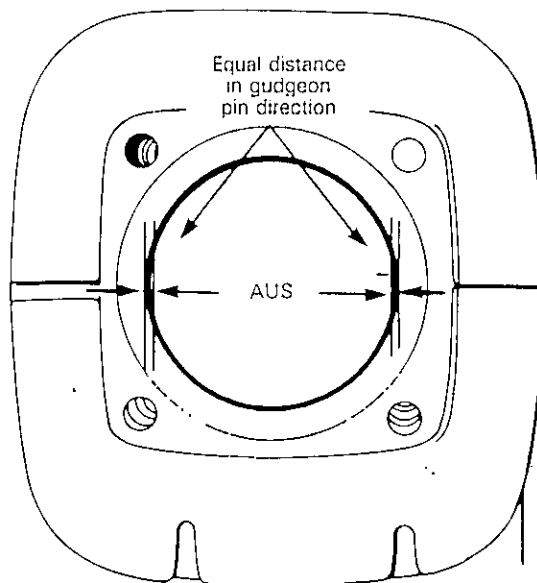
CONNECTING ROD ALIGNMENT

Check if connecting rod is bent as follows:

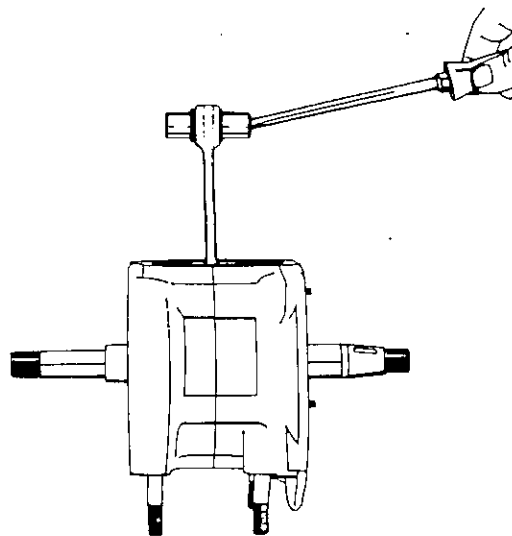
- Once engine crankcase is assembled with the piston mounted on connecting rod without its piston rings, position cylinder on piston.

○ NOTE: The cylinder/crankcase gasket must not be installed.

- Rotate crankshaft slowly and at the same time observe piston movement within the cylinder. If piston bear against one side (PTO or mag. side), the connecting rod is bent.



- To correct, position needle bearing and gudgeon pin on connecting rod then pry connecting rod as illustrated.



SECTION 04

SUB-SECTION 01 (ENGINE TOLERANCES | MEASUREMENT)

CRANKSHAFT END-PLAY

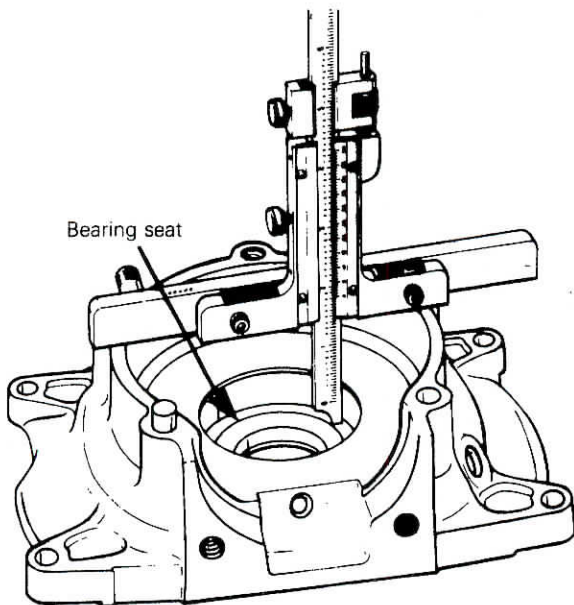
Maximum: 0.10 mm (.004")

○ NOTE: Crankshaft end-play is adjusted only when crankshaft and/or crankcase is replaced.

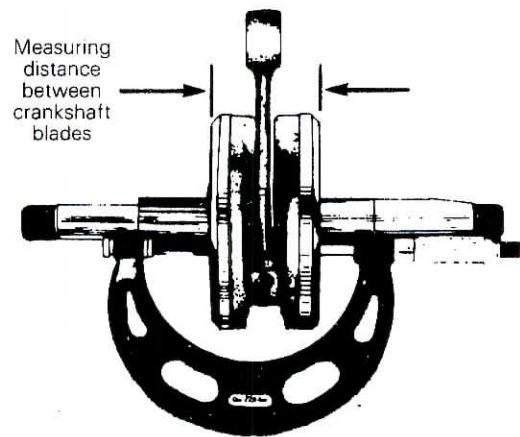
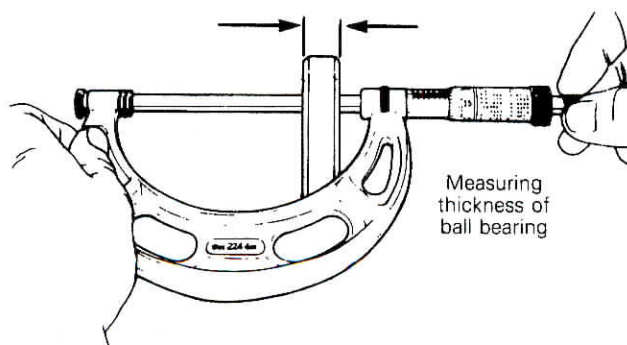
One cylinder engine (247)

Maximum crankshaft end-play should be 0.10 mm (.004"). To determine necessary correction:

- a) Measure crankcase. To do this first measure each half from mating surface to bottom of bearing seat. Add measurements of both halves then add 0.15 mm (.006") for gasket displacement. **Equals A.**



- b) Measure thickness of each ball bearing. Measure distance between crankshaft blades. Add measurements. **Total equals B.**



- c) **Subtract measurement B from measurement A** minus tolerance of 0.10 mm (.004") maximum. Total balance is distance to be shimmed. Shim(s) must be located between magneto side bearing and crankshaft blade.

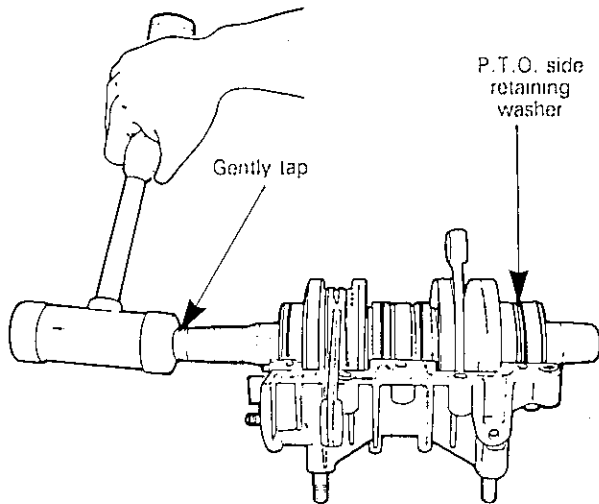
Crankshaft end-play (0.1 mm (.004") maximum) is adjusted with a shim(s) located between crankshaft and magneto side bearing. To determine correct amount of shims, proceed as follows.

Remove magneto side bearing(s) and existing shim(s). Slide the appropriate bearing simulator and retaining washers onto the crankshaft.

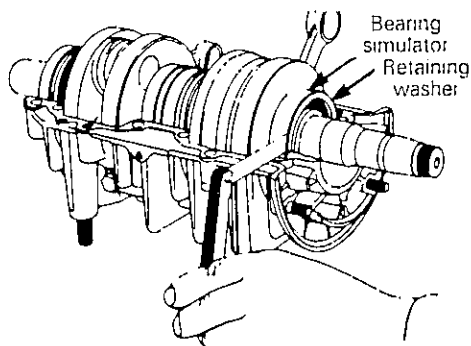
SECTION 04
SUB-SECTION 01 (ENGINE TOLERANCES MEASUREMENT)

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

Gently tap crankshaft mag. side blade until P.T.O. side bearing bears against retaining washer.



Any free-play between the bearing simulator and mag-neto side retaining washer, minus 0.1 mm (.004") maximum end-play is the distance to be covered by shim(s). Shims are available in variable thickness according to engine type.



LIST OF ENGINE SECTIONS

247, 302

248, 294

248 (FROM 1975)

245 (UP TO SERIAL NO. 2 762 210)

245, 345 (FROM 1976)

305, 338, 343 401

305, 343 (FROM 1976)

346, 396, 436

346, 436 (FROM 1977)

434, 440

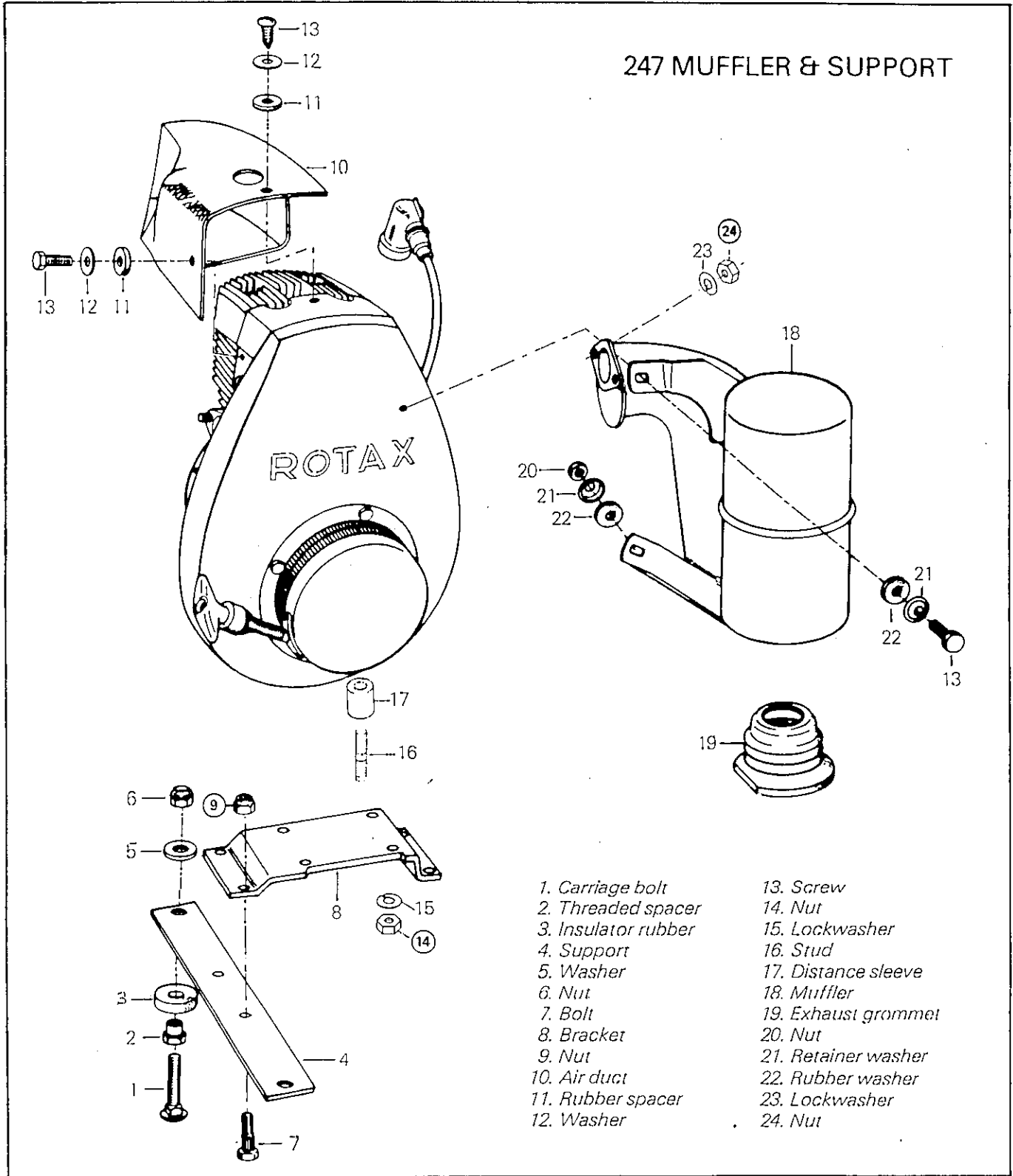
440 (FROM 1976)

640

640 (FROM 1976)

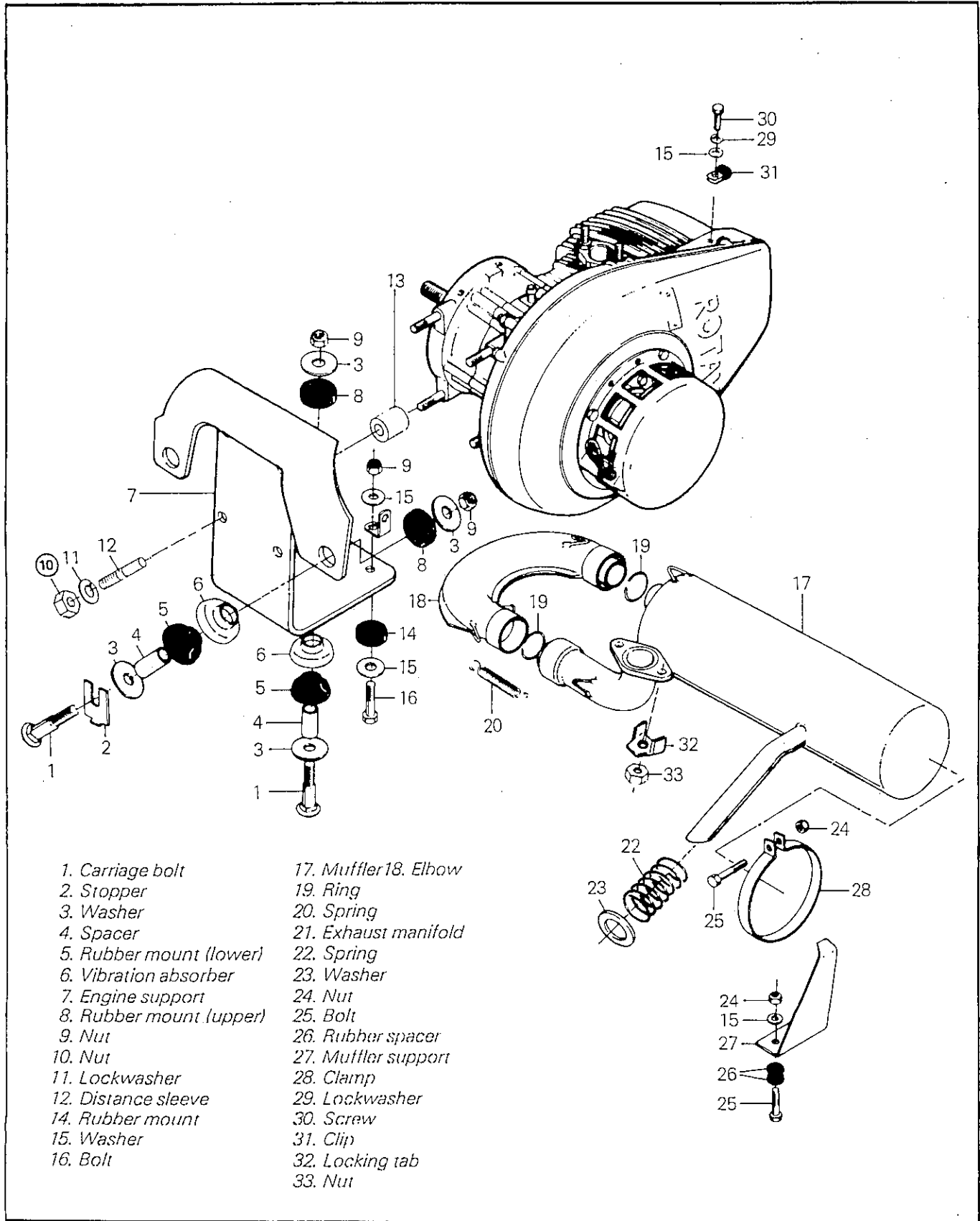
247, 302 ENGINE TYPE

247 MUFFLER & SUPPORT



- | | |
|---------------------|---------------------|
| 1. Carriage bolt | 13. Screw |
| 2. Threaded spacer | 14. Nut |
| 3. Insulator rubber | 15. Lockwasher |
| 4. Support | 16. Stud |
| 5. Washer | 17. Distance sleeve |
| 6. Nut | 18. Muffler |
| 7. Bolt | 19. Exhaust grommet |
| 8. Bracket | 20. Nut |
| 9. Nut | 21. Retainer washer |
| 10. Air duct | 22. Rubber washer |
| 11. Rubber spacer | 23. Lockwasher |
| 12. Washer | 24. Nut |

SECTION 04
SUB-SECTION 01 (ONE CYLINDER ENGINE)



- | | |
|-------------------------|----------------------|
| 1. Carriage bolt | 17. Muffler |
| 2. Stopper | 18. Elbow |
| 3. Washer | 19. Ring |
| 4. Spacer | 20. Spring |
| 5. Rubber mount (lower) | 21. Exhaust manifold |
| 6. Vibration absorber | 22. Spring |
| 7. Engine support | 23. Washer |
| 8. Rubber mount (upper) | 24. Nut |
| 9. Nut | 25. Bolt |
| 10. Nut | 26. Rubber spacer |
| 11. Lockwasher | 27. Muffler support |
| 12. Distance sleeve | 28. Clamp |
| 14. Rubber mount | 29. Lockwasher |
| 15. Washer | 30. Screw |
| 16. Bolt | 31. Clip |
| | 32. Locking tab |
| | 33. Nut |


MUFFLER & SUPPORT

247 TYPE

REMOVAL FROM VEHICLE

Remove or disconnect the following then lift engine from vehicle.

- Pulley guard.
- Drive belt.
- Muffler.
- Choke knob.
- Decompressor (if applicable).
- Throttle cable.
- Fuel lines.
- Electrical connector.

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

- Separate steering column support at upper column.
- Engine mount nuts.

DISASSEMBLY & ASSEMBLY

- ⑨ Torque to 3.2 kg-m (23 ft-lbs).
- ⑭ Torque to 3.6 kg-m (26 ft-lbs).
- ⑳ Torque to 2.2 kg-m (16 ft-lbs).

INSTALLATION ON VEHICLE

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

- Check ignition timing prior to installation in vehicle.
- Check tightness of engine mount nuts, and drive pulley bolt.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.

302 TYPE

REMOVAL FROM VEHICLE

Remove or disconnect the following then lift engine from vehicle.

- Pulley guard.
- Drive belt.
- Air silencer box.
- Throttle cable.
- Fuel lines.
- Muffler.
- Electrical connector.
- Engine mount nuts.

DISASSEMBLY & ASSEMBLY

- ⑩ Torque to 3.6 kg-m (26 ft-lbs).
- ⑳ Torque to 2.2 kg-m (16 ft-lbs).

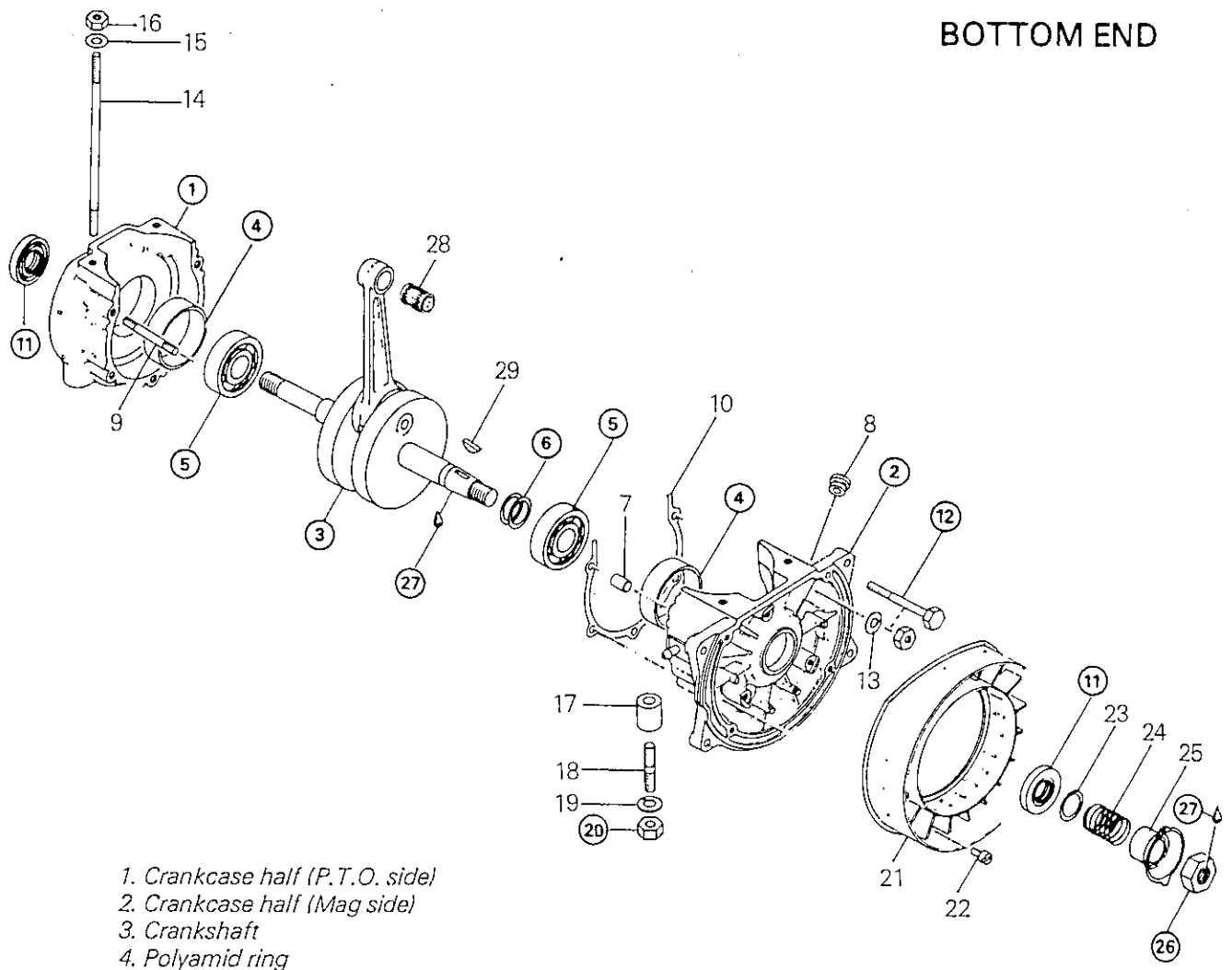
INSTALLATION

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

- Check ignition timing prior to installation in vehicle.
- Check tightness of engine mount nuts, and drive pulley bolt.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.

SECTION 04
 SUB-SECTION 01 (ONE CYLINDER ENGINE)

BOTTOM END



- 1. Crankcase half (P.T.O. side)
- 2. Crankcase half (Mag side)
- 3. Crankshaft
- 4. Polyamid ring
- 5. Bearing
- 6. Shim
- 7. Dowel tube
- 8. Wires grommet
- 9. Stud
- 10. Gasket
- 11. Oil seal
- 12. Bolt or nut
- 13. Lockwasher
- 14. Stud (cylinder)
- 15. Washer (head)
- 16. Nut (head)
- 17. Distance sleeve
- 18. Stud
- 19. Lockwasher
- 20. Nut
- 21. Labyrinth ring (fan)
- 22. Screw
- 23. Shim
- 24. Spring
- 25. Breaker point cam
- 26. Nut
- 27. Loctite Lock'n Seal (no 242)
- 28. Needle bearing
- 29. Woodruff key

BOTTOM END

CLEANING

Discard all oil seals and gaskets.

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

DISASSEMBLY & ASSEMBLY

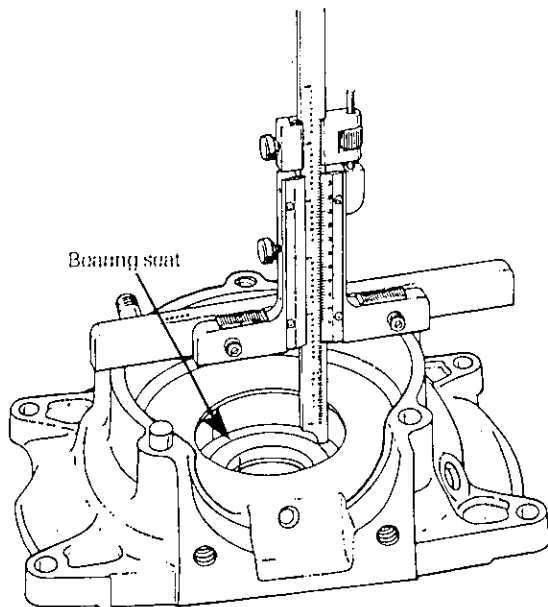
General

Refer to Technical Data Section for component fitted tolerance and wear limit. If necessary, refer to Drive Pulley Section to remove drive pulley.

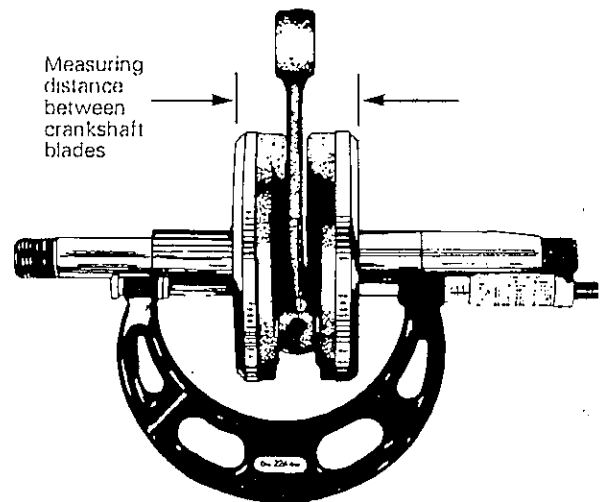
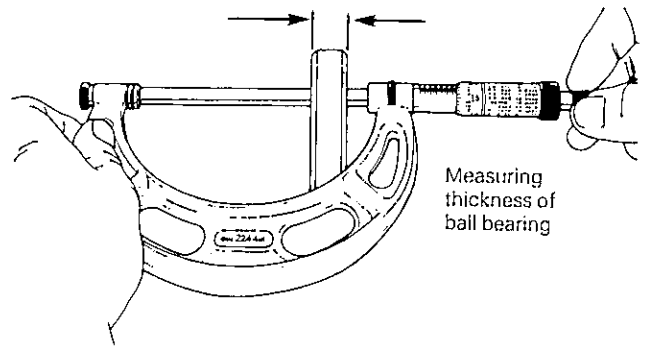
①② When disassembling / assembling crankcase halves, do not use heat the crankcase. If heat is necessary, temperature must not exceed 55° C (130° F).

③⑥ Crankshaft end-play should be between 0.10-0.40 mm (.004-.016"). To determine necessary correction:

a) Measure crankcase. To do this first measure each half from mating surface to bottom of bearing seat. Add measurements of both halves then add 0.15 mm (.006") for gasket displacement. Equals A.



b) Measure thickness of each ball bearing. Measure distance between crankshaft blades. Add measurements. Total equals B.



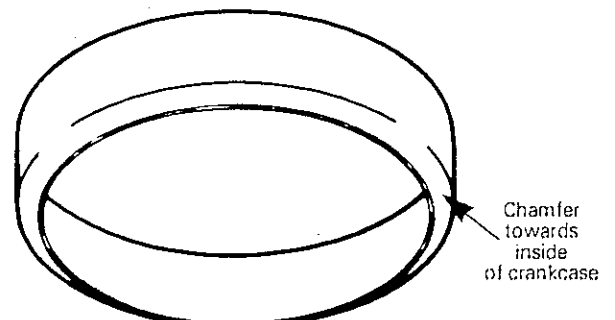
c) Subtract measurement B from measurement A minus tolerance of 0.10-0.40 mm (.004"-.016"). Total balance is distance to be shimmed. Shim(s) must be located between magneto side bearing and crankshaft blade.

○ NOTE: Crankshaft end-play is adjusted only when crankshaft and / or crankcase is replaced.

④ Do not remove unless necessary.

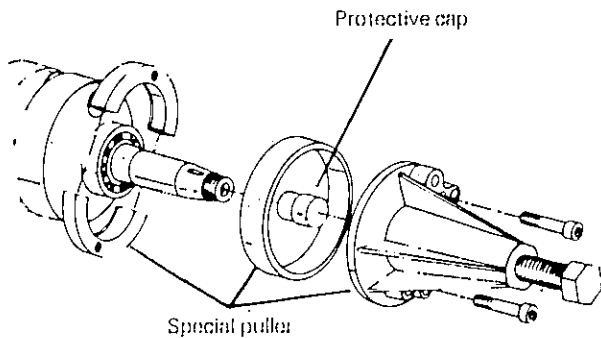
To remove, heat slightly with a butane torch then pry out using a screwdriver.

To install, apply oil on outside diameter then use a suitable pusher.



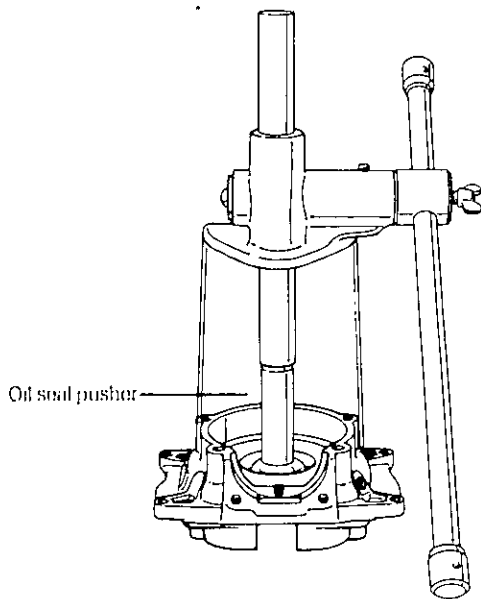
SECTION 04
SUB-SECTION 01 (ONE CYLINDER ENGINE)

⑤ To remove bearing from crankshaft use a protective cap and special puller as illustrated. (See Tool Section).



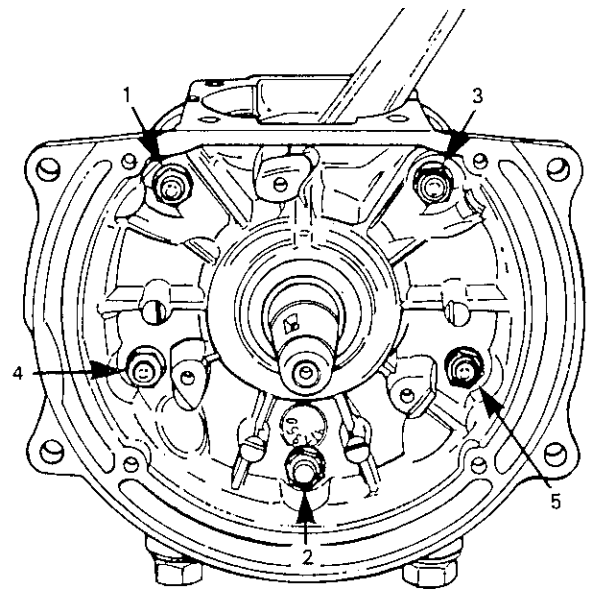
○ NOTE: Prior to magneto side bearing installation, install required shim(s) (crankshaft end play) on crankshaft extension. At assembly, place bearings into an oil container and heat the oil to 100° C (210° F) for 5 to 10 min. This will expand the bearings and permit them to slide easily on the shaft.

⑪ To remove or install new seal into crankcase use an appropriate oil seal pusher as illustrated. (See Tool Section).



Also, prior to crankcase adjoining, install a protector sleeve on each crankshaft extension to prevent oil seal damage (See Tool Section). Apply a light coat of lithium grease on seal lip. Seal outer surface should be flush with crankcase.

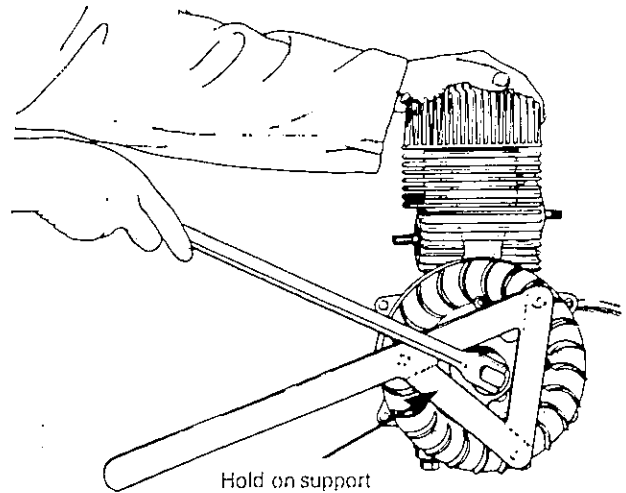
⑫ At assembly, torque to 2.2 kg-m (16 ft-lbs) following illustrated sequence.



⑭ Torque to 3.6 kg-m (26 ft-lbs).

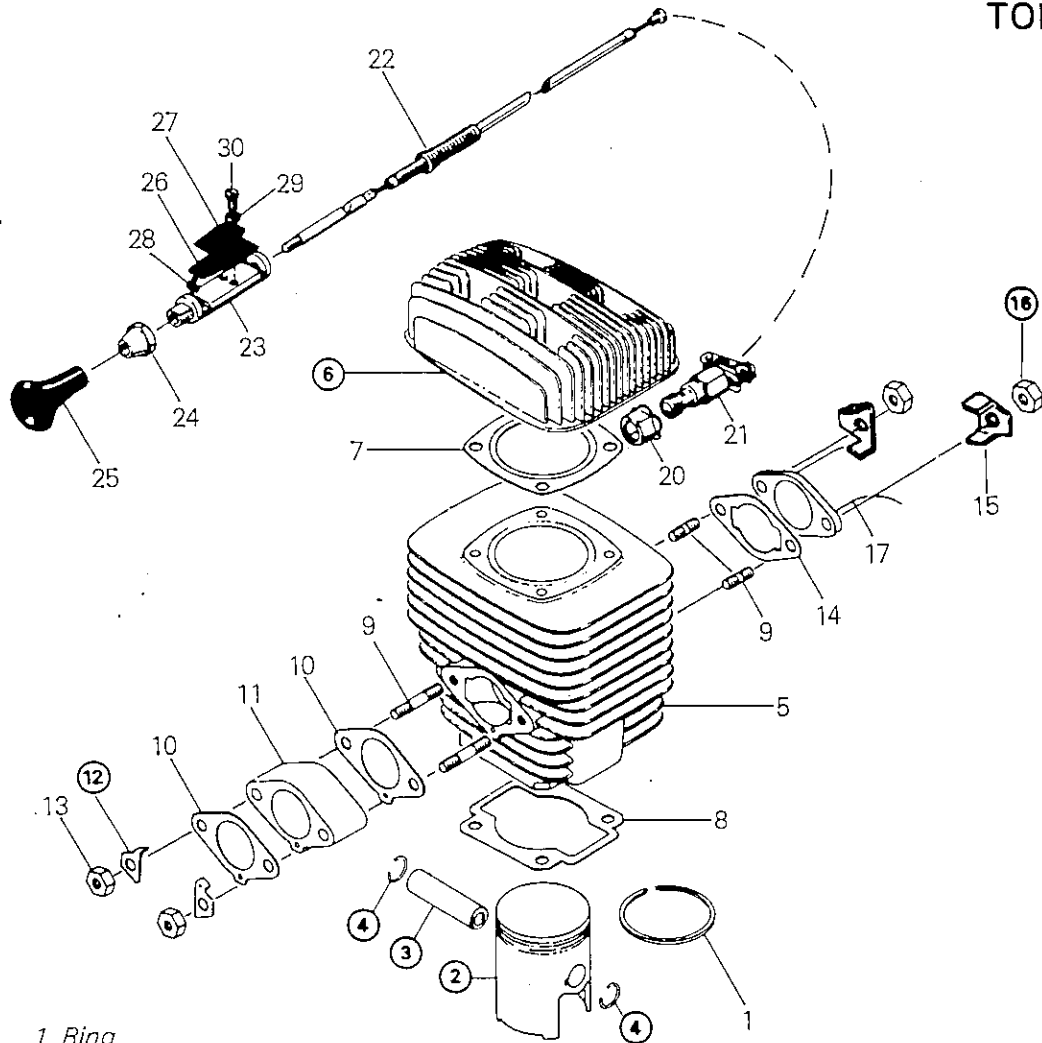
⑮ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support. (See Tool Section).

At assembly apply Loctite Lock'n Seal 242 on threads then torque retaining nut to 7.5 kg-m (54 ft-lbs).



⑰ Clean thoroughly then apply Loctite Lock'n Seal no. 242 or equivalent.

TOP END



- 1. Ring
- 2. Piston
- 3. Gudgeon pin
- 4. Circlip
- 5. Cylinder
- 6. Cylinder head
- 7. Gasket (head / cylinder)
- 8. Gasket (cylinder / crankcase)
- 9. Stud
- 10. Gasket
- 11. Isolating flange
- 12. Locking tab
- 13. Nut
- 14. Exhaust gasket
- 15. Locking tab (Olympique)
- 16. Nut
- 17. Muffer
- 18. Flat washer
- 19. Nut (head)

247
ONLY

- 20. Locking sleeve
- 21. Decompressor
- 22. Cable
- 23. Switch housing
- 24. Cap nut
- 25. Knob
- 26. Spring plate
- 27. Spring plate reinforcement
- 28. Spring lock
- 29. Lockwasher
- 30. Screw

SECTION 04
SUB-SECTION 01 (ONE CYLINDER ENGINE)

TOP END

CLEANING

Discard all gaskets.

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

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

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

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

DISASSEMBLY & ASSEMBLY

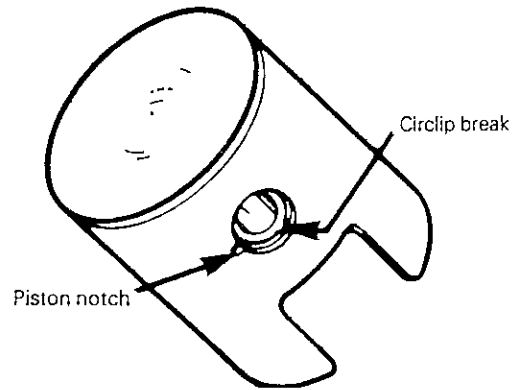
NOTE: Refer to Technical Data for component fitted tolerance and wear limit.

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

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

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

NOTE: Once the circlips are installed turn each circlip so the circlip break is not directly on piston notch.

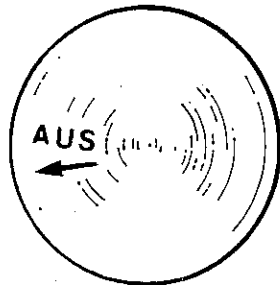


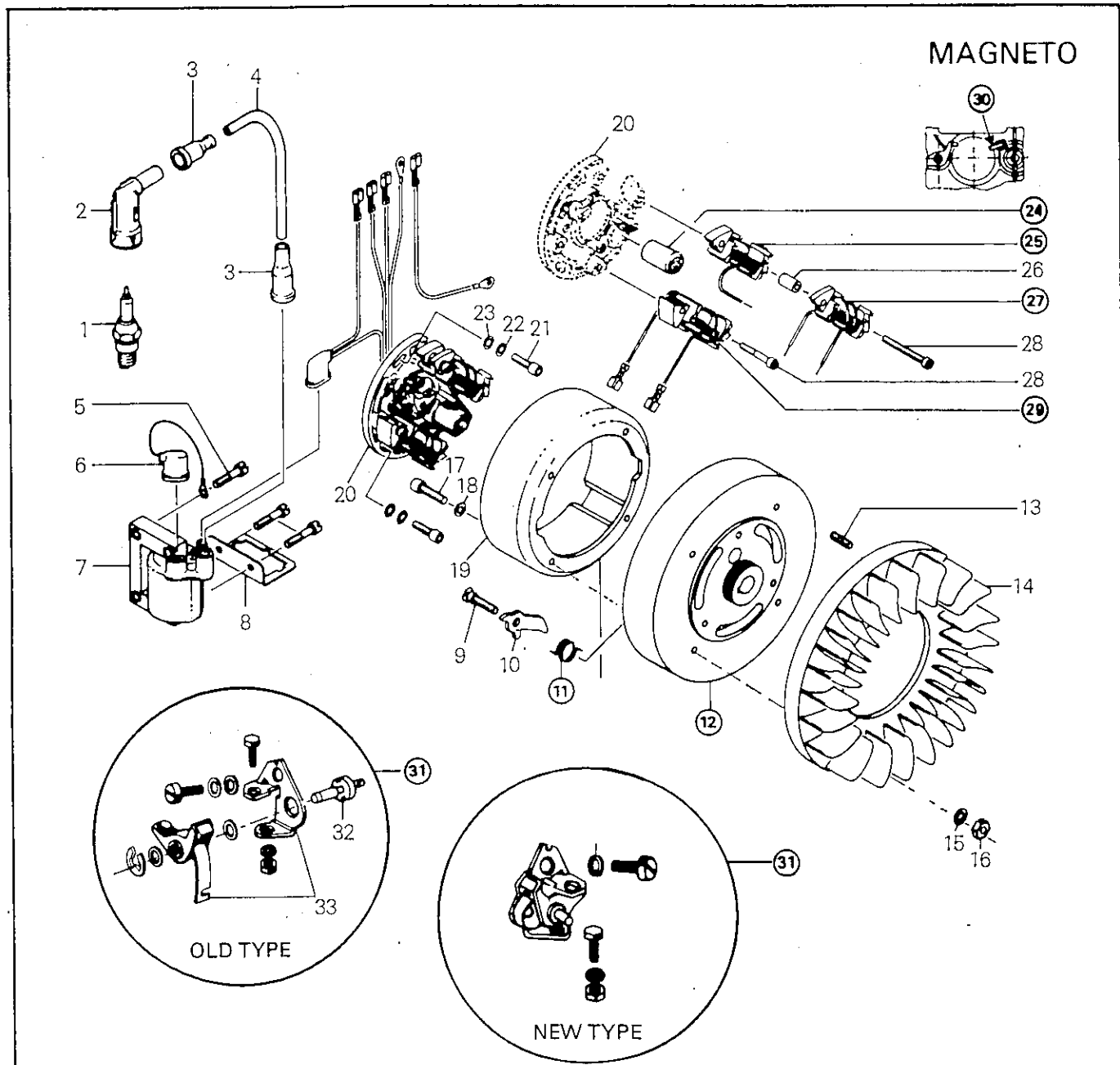
Position cylinder head on cylinder with fins in line with crankshaft center line. Cross torque retaining nut to 1.9-2.2 kg-m (14-16 ft-lbs.)

Tab washer should be replaced if bent more than three (3) times. If in doubt, replace.

At assembly, torque to 2.2 kg-m (16 ft-lbs).

EXHAUST





- 1. Spark plug
- 2. Protector
- 3. Protection cap
- 4. H.T. cable
- 5. Screw
- 6. Ground connector
- 7. Ignition coil
- 8. Junction block bracket
- 9. Screw
- 10. Centrifugal weight
- 11. Return spring

- 12. Magneto housing
- 13. Stud
- 14. Fan
- 15. Lockwasher
- 16. Nut
- 17. Screw
- 18. Lockwasher
- 19. Magneto ring
- 20. Armature plate
- 21. Screw
- 22. Lockwasher

- 23. Flat washer
- 24. Condenser
- 25. Ignition generator coil
- 26. Distance sleeve
- 27. Brake light coil
- 28. Screw
- 29. Lighting coil
- 30. Lubricating wick
- 31. Breaker point set ass'y
- 32. Pivot pin
- 33. Breaker point set

SECTION 04
SUB-SECTION 01 (ONE CYLINDER ENGINE)

MAGNETO

CLEANING

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

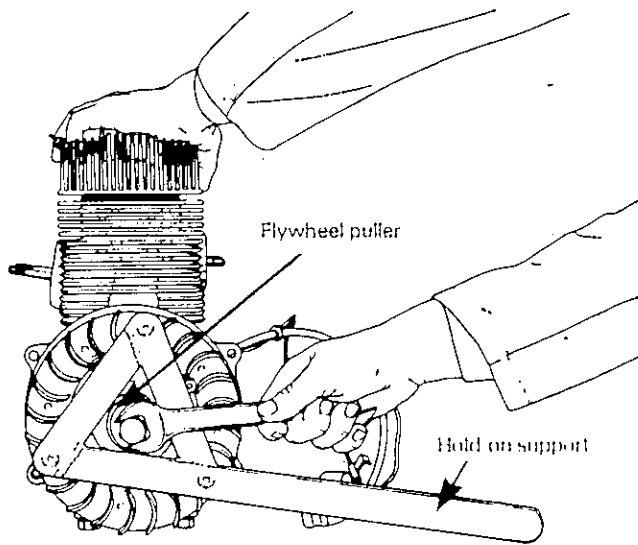
▼ CAUTION: Clean armature using only a clean cloth.

DISASSEMBLY & ASSEMBLY

① At assembly, apply a small amount of grease into spring seating.

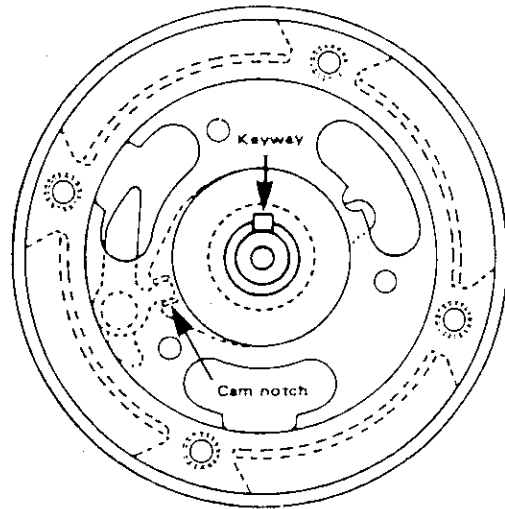
② With magneto retaining nut removed and hold-on support in place, install special puller onto hub.

Tighten puller nut at same time, tap on nut head using a hammer to release magneto from its taper.



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

Apply Loctite Lock'n Seal 242 on threads of retaining nut then torque to 7.5 kg m (54 ft-lbs).

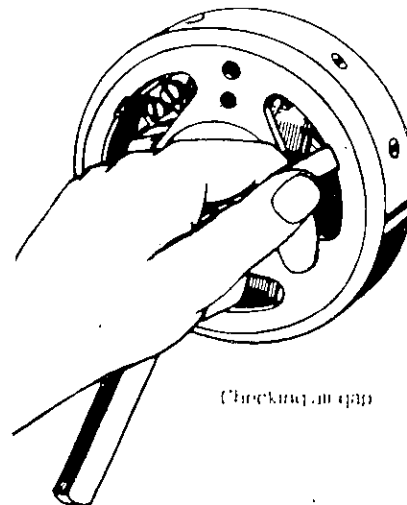


⑦ Apply Loctite Lock'n Seal 242 on threads.

④ To replace a capacitor, it is first necessary to disconnect the two (2) black leads using a soldering iron. The capacitor can then be driven out of the armature plate using a suitable drift. To reinstall, inverse procedure.

⑤ ⑦ ⑨ Whenever a coil is replaced, the air gap (distance between magnet and coil end) must be adjusted.

To check air gap, insert a feeler gauge of 0.25-0.38 mm (.010"-.015") between magnet and coil ends. If necessary to adjust, slacken retaining screws and relocate coil.

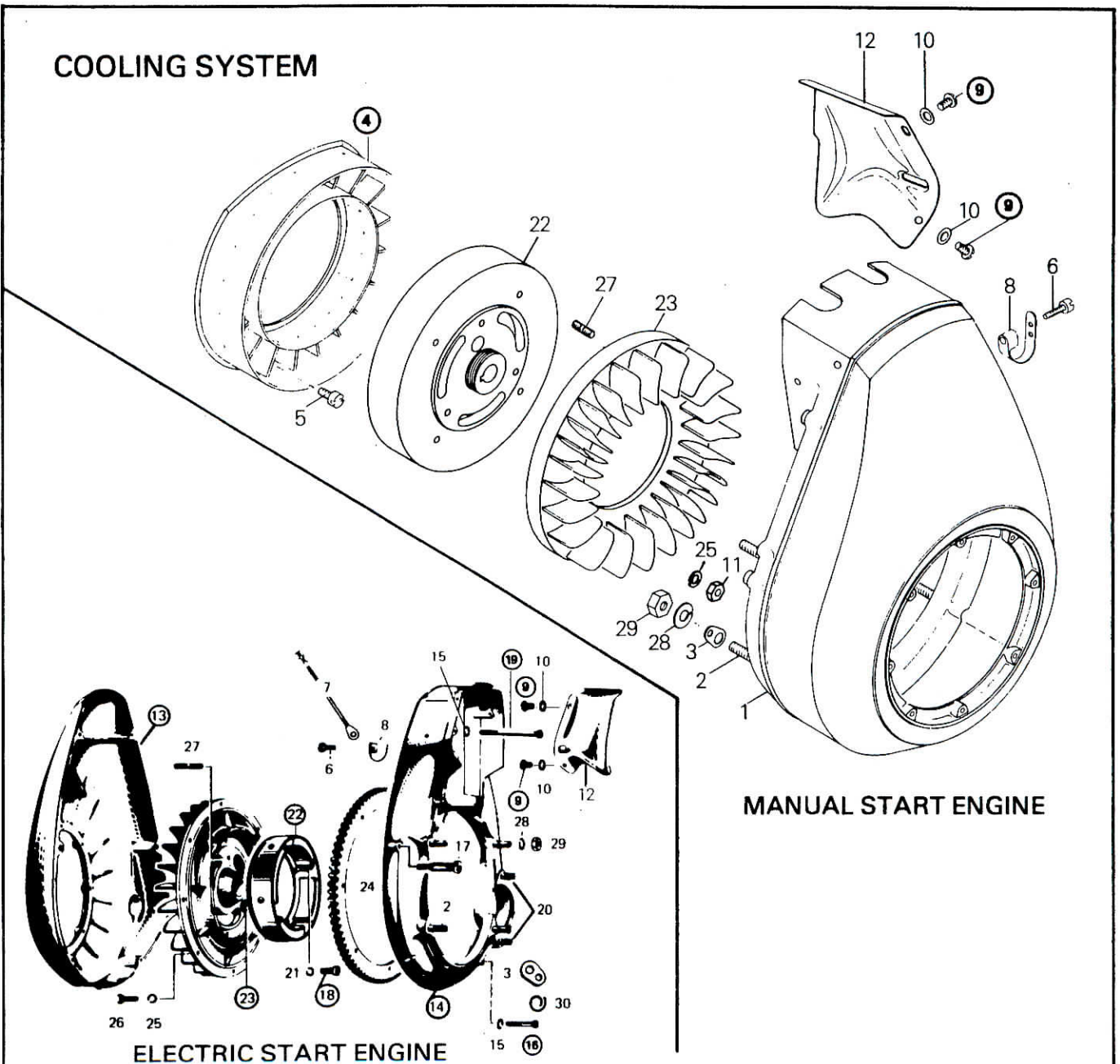


⑩ When replacing breaker point set, apply a light coat of grease on lubricating wick.

⑪ Do not remove pivot pin unless replacement is needed, if removed reinstall with Loctite Lock'n Seal on threads.

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

COOLING SYSTEM



MANUAL START ENGINE

ELECTRIC START ENGINE

- 1. Fan cowl ass'y
- 2. Fan cowl stud (4)
- 3. Spring bracket
- 4. Labyrinth ring (manual start only)
- 5. Screw (4)
- 6. Screw
- 7. Ground cable
- 8. Cable clamp
- 9. Flat head screw
- 10. Spring washer

- 11. Nut
- 12. Air deflector
- 13. Fan cowl cover
- 14. Fan cowl
- 15. Lock washer
- 16. Cylindrical head screw (2)
- 17. Dowel screw (2)
- 18. Allen screw (4)
- 19. Cylindrical head screw (long)
- 20. Starter stud

- 21. Lock washer (4)
- 22. Magneto ring
- 23. Fan ass'y
- 24. Starter ring gear
- 25. Lock washer (8)
- 26. Hex. cap screw (8)
- 27. Stud
- 28. Lock washer (4)
- 29. Nut (4)
- 30. Spring retainer

COOLING SYSTEM

CLEANING

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

▼ CAUTION: Clean armature using only a clean cloth.

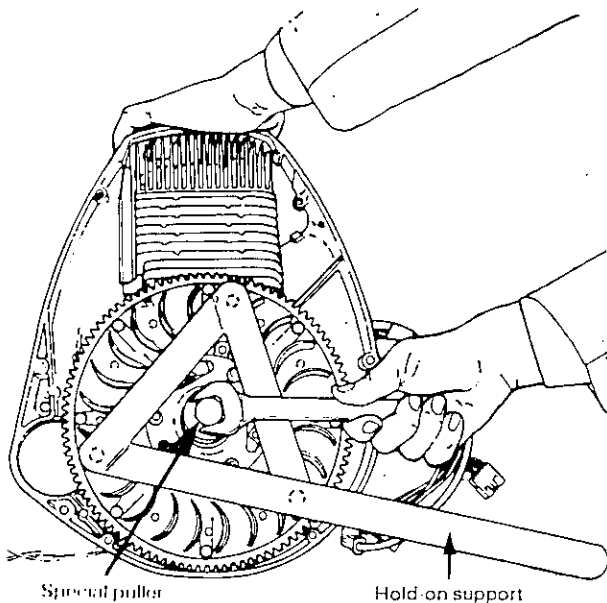
DISASSEMBLY & ASSEMBLY

④ At assembly, position labyrinth ring with bevelled side on top.

⑬ ⑭ ⑳ ㉑ To remove fan cowl ass'y and / or magneto from electric start engine, it is first necessary to separate fan cowl cover from fan cowl.

To remove magneto ring / fan ass'y from engine, lock crankshaft in position with special hold-on support. Remove magneto retaining nut, then install special puller onto hub (See Tool Section).

Tighten puller nut and at same time, tap on nut head with a hammer to release magneto from its taper. At assembly, torque retaining nut to 7.5 kg-m (54 ft-lbs.)



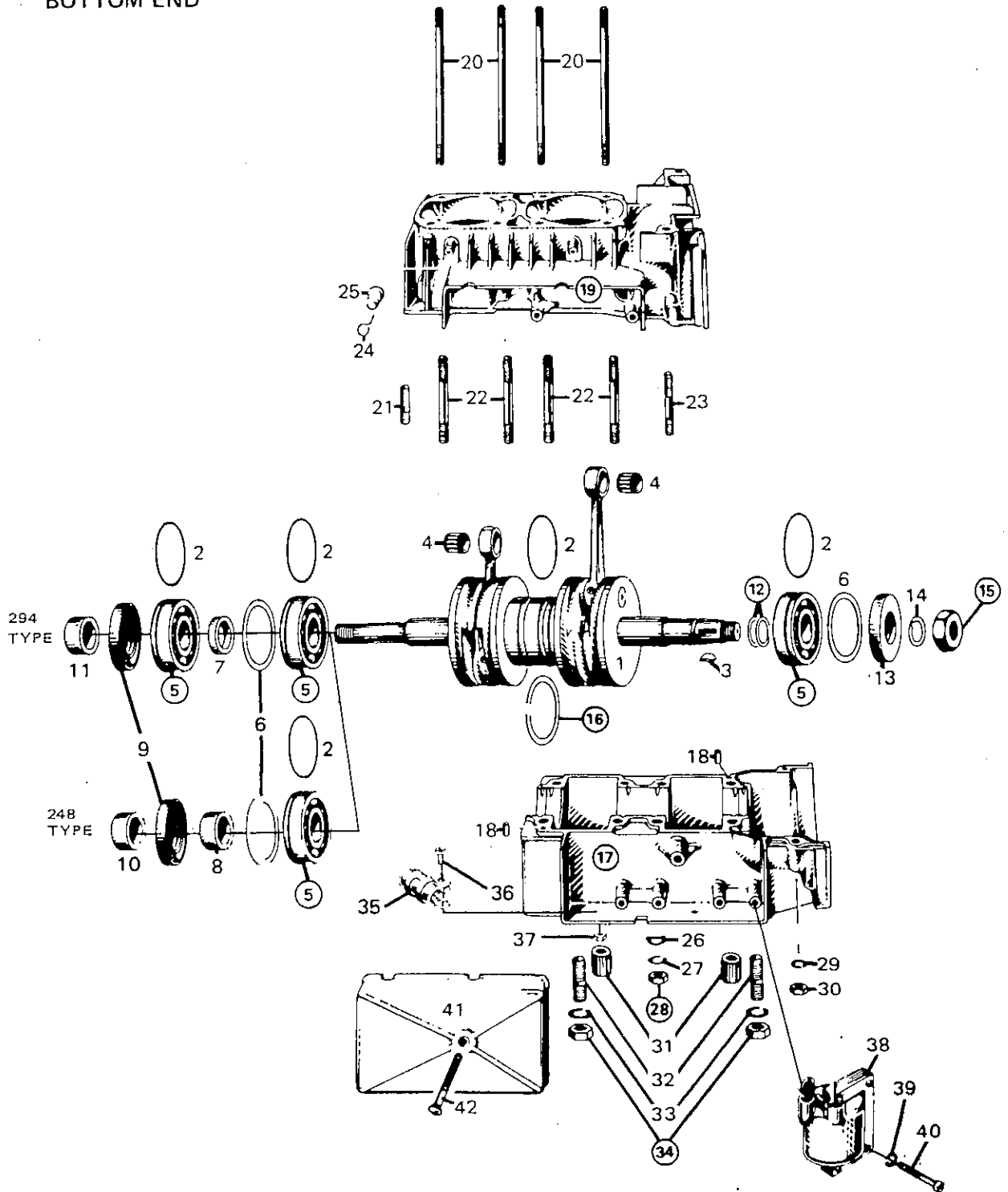
⑨ ⑩ ⑪ ⑫ At assembly, apply Loctite "Lock'n Seal 242" on screws threads.

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

SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

248, 294 ENGINE TYPE

BOTTOM END

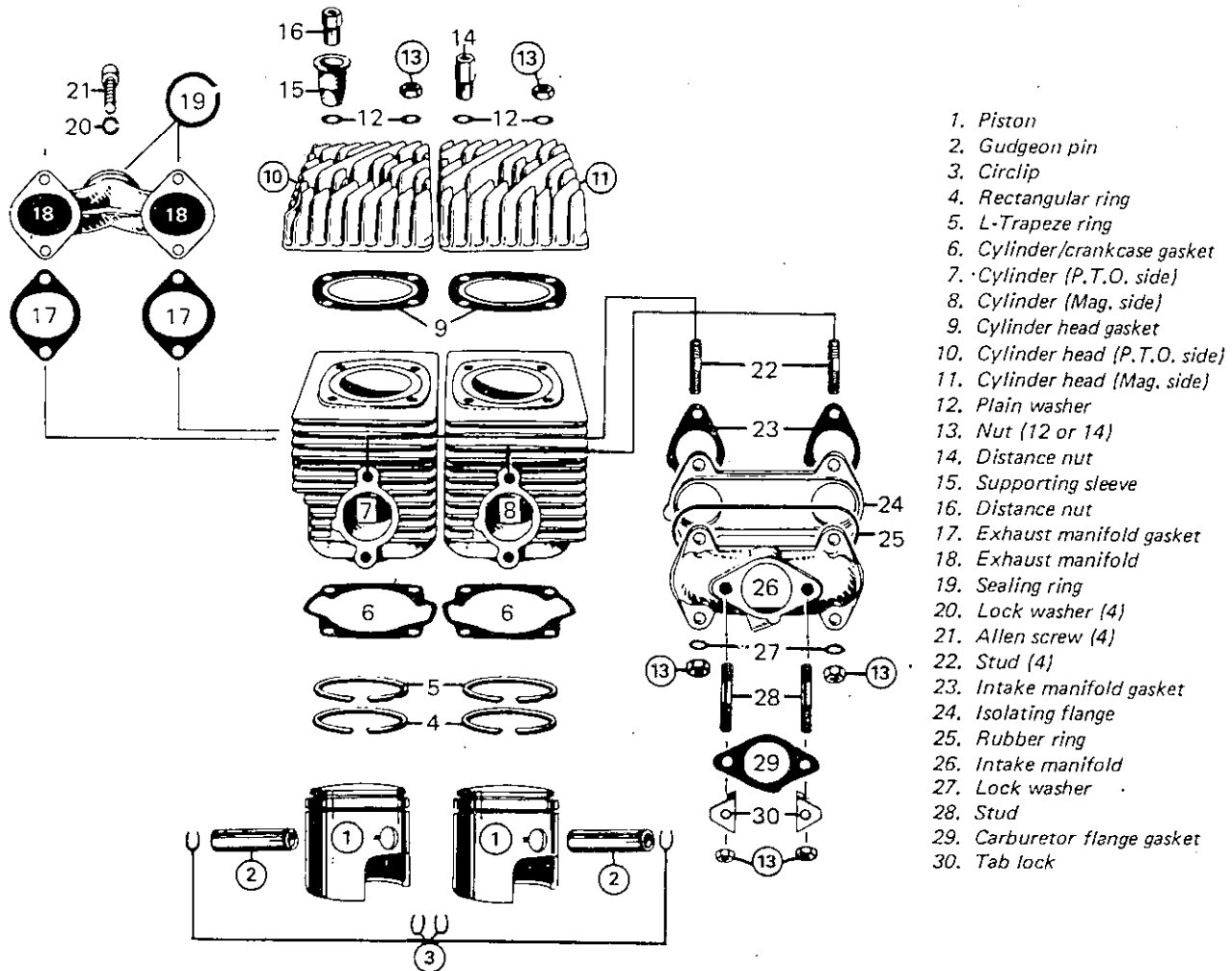


SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

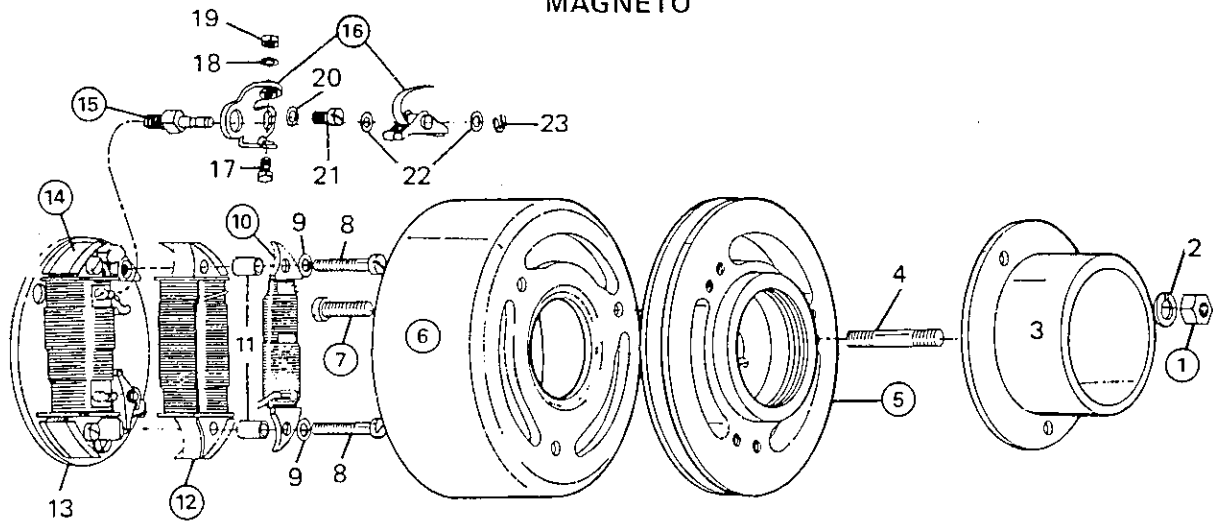
BOTTOM END

- | | | |
|---------------------------------------|-----------------------------------|-------------------------------|
| 1. Crankshaft | 15. Magneto retaining nut | 29. Lock washer (2) |
| 2. "O" ring (4 or 6) | 16. Labyrinth sealing ring | 30. Nut (2) |
| 3. Woodruff key | 17. Crankcase lower half | 31. Spacer (4, if applicable) |
| 4. Needle bearing | 18. Dowel pin | 32. Stud (4) |
| 5. Ball bearing (2 or 3) | 19. Crankcase upper half | 33. Lock washer (4) |
| 6. Retaining disc | 20. Cylinder stud | 34. Nut (4) |
| 7. Distance sleeve (6 mm - .232") | 21. Crankcase stud (294 only) (2) | 35. Capacitor (2) |
| 8. Distance sleeve (12 mm - .472") | 22. Crankcase stud (8) | 36. Screw (2) |
| 9. Oil seal (P.T.O.) | 23. Crankcase stud (2) | 37. Nut (2) |
| 10. Distance sleeve (17.7 mm - .697") | 24. Clamp | 38. Ignition coil |
| 11. Distance sleeve (9.7 mm - .382") | 25. Cap | 39. Lock washer (6) |
| 12. Shim(s) | 26. Spring washer (8 or 10) | 40. Screw (6) |
| 13. Oil seal (Mag) | 27. Lock washer (8 or 10) | 41. Ignition box cover |
| 14. Lock washer | 28. Nut (8 or 10) | 42. Screw |

TOP END

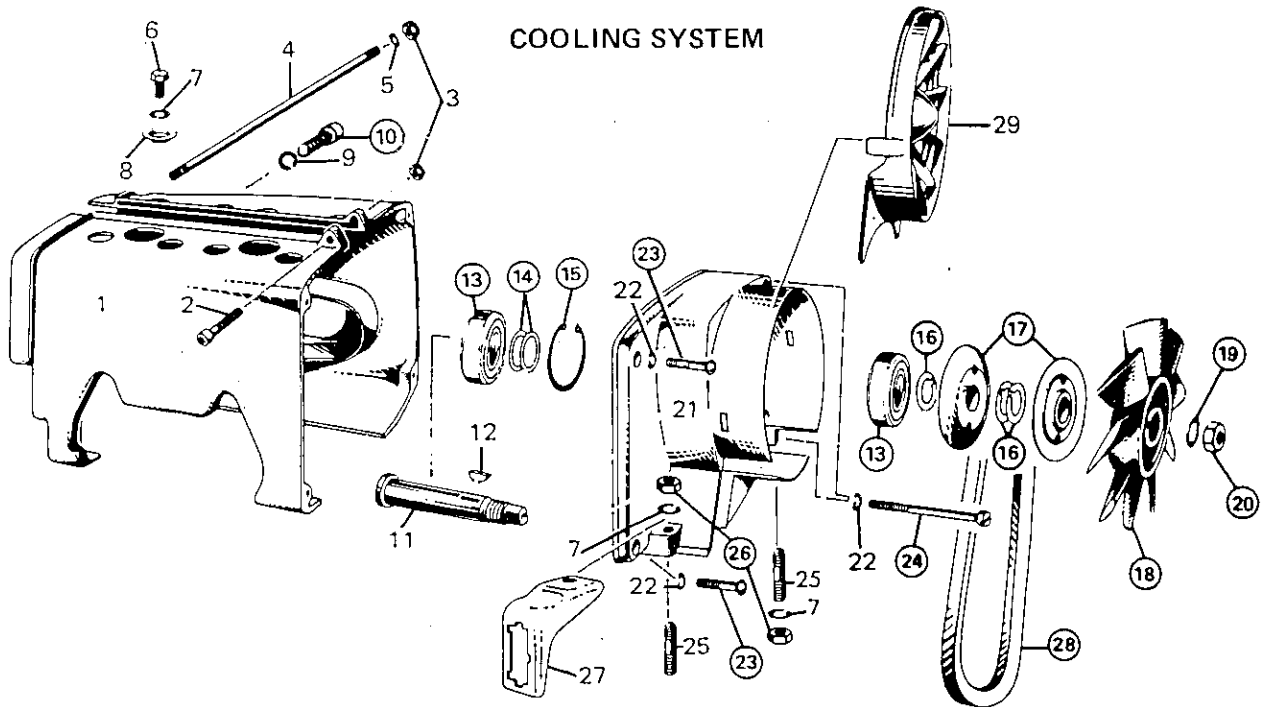


MAGNETO



- | | | | | |
|--------------------|----------------------|-----------------------------|-----------------------|--------------------|
| 1. Nut (3) | 6. Magneto ring | 11. Spacer | 15. Pivot pin | 20. Washer |
| 2. Lock washer (3) | 7. Screw (3) | 12. Ignition generator coil | 16. Breaker point set | 21. Screw |
| 3. Starting pulley | 8. Screw (4) | 13. Armature plate | 17. Bolt | 22. Washer |
| 4. Stud (3) | 9. Spring washer (4) | 14. Lighting coil | 18. Lock washer | 23. Retaining clip |
| 5. Magneto housing | 10. Brake light coil | | 19. Nut | |

COOLING SYSTEM



- | | | | | |
|-------------------------|-------------------------|------------------------|---------------------|----------------------------|
| 1. Cylinder cowl | 7. Lock washer | 13. Ball bearing | 19. Lock washer | 25. Stud |
| 2. Allen screw | 8. Cowl retainer washer | 14. Shim (1 mm/.040") | 20. Fan nut | 26. Nut |
| 3. Elastic stop nut (3) | 9. Spring washer | 15. Locking ring | 21. Fan housing | 27. Junction block bracket |
| 4. Stud (2) | 10. Allen screw | 16. Shim (as required) | 22. Lock washer (4) | 28. Fan belt |
| 5. Washer (2) | 11. Fan shaft | 17. Pulley half | 23. Screw | 29. Fan cover |
| 6. Bolt | 12. Woodruff key | 18. Fan | 24. Screw (2) | |

SECTION 04 SUB-SECTION 02 (TWO CYLINDER ENGINE)

REMOVAL

Remove or disconnect the following, then lift engine from vehicle.

Front - mounted engine

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

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

- Electrical connector
- Engine mount nuts

Center mounted engine

- Drive belt
- Muffler
- Choke knob
- Throttle cable
- Fuel lines
- Electrical connectors
- Steering column support at upper column
- Engine mount nuts

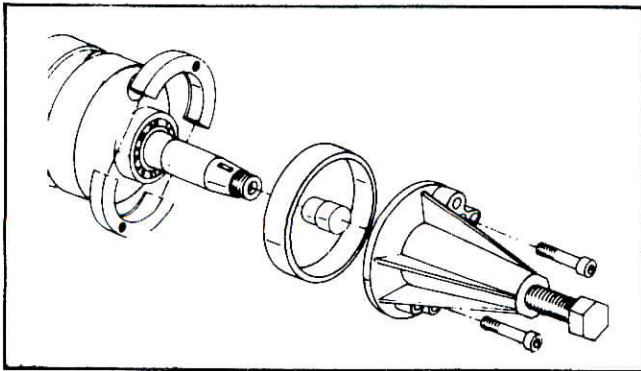
DISASSEMBLY & ASSEMBLY

If necessary, remove drive pulley as described in drive pulley section.

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

Bottom end

⑤ To remove bearing from crankshaft use a protective cap and special puller as illustrated. (See Tool Section).



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

At assembly, place bearings into an oil container and heat the oil to 200° F. for 5 to 10 min. This will expand the bearings and permit them to slide easily on the shaft. Install bearings with groove outward.

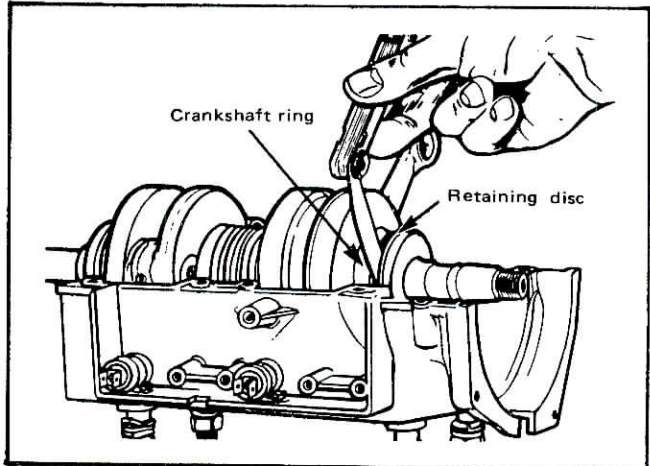
⑫ Crankshaft end-play is adjusted with a shim(s) located between crankshaft and magneto side bearing. To determine correct amount of shim, proceed as follows.

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

Position crankshaft assembly into crankcase lower half, making sure that retaining discs are correctly seated into the grooves.

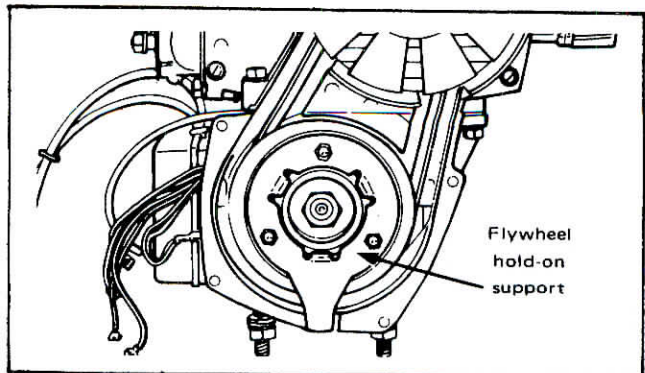
Gently tap crankshaft until P.T.O. side bearing bears against retaining disc.

Any free-play between the crankshaft ring and magneto side retaining disc, minus recommended end-play, is the distance to be covered by shim(s). Shims are available in thickness of 0.1 mm/.004", 0.2 mm/.008", 0.3 mm/.012", 0.5 mm/.020", 1 mm/.039".



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

⑮ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tool Section).



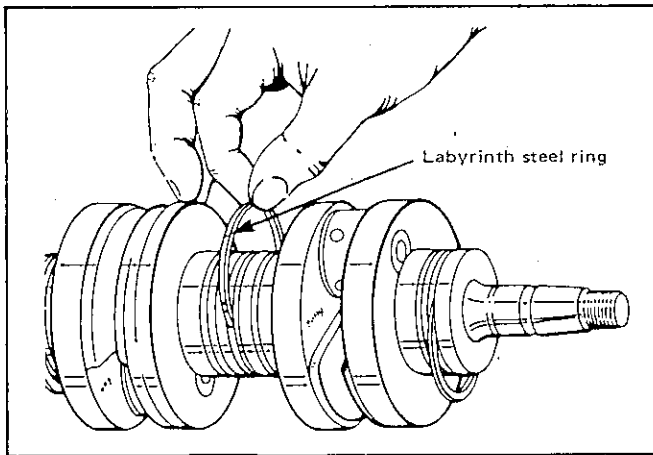
SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

At assembly torque retaining nut to 42-50 ft-lb.

⑩ To increase sealing between left and right crankcase halves, on engine equipped with an external labyrinth seal, a steel ring is available, (part no. 414-2072).

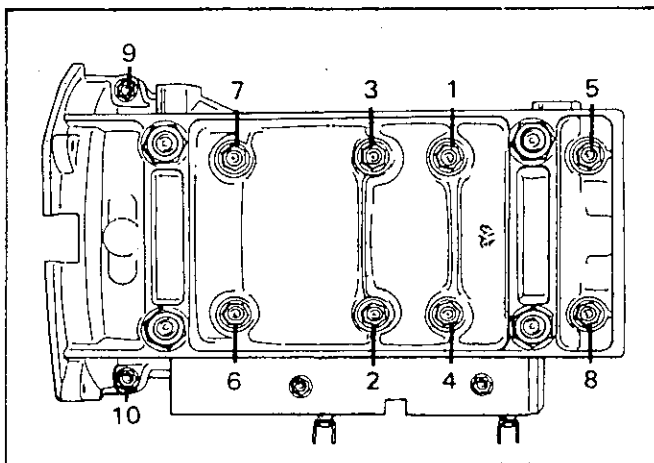
Prior to installation, the steel ring must be stretched open. To do this, slide the ring onto the neck of a soft drink bottle (2 1/2" outside diameter).

Install steel ring on crankshaft labyrinth as illustrated.



⑪ ⑫ ⑬ Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves.

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



Note: Torque the two smaller nuts on magneto side to 9 ft-lb.

⑭ At assembly torque crankcase/support nut to 23-29 ft-lb.

Top end

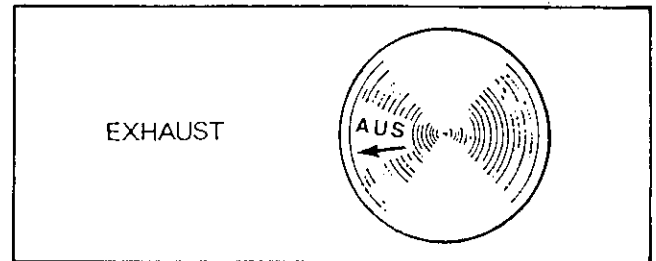
① ② ③ Place a clean cloth over crankcase to prevent circlip from falling into crankcase. Use a pointed tool to re-

move circlip from piston.

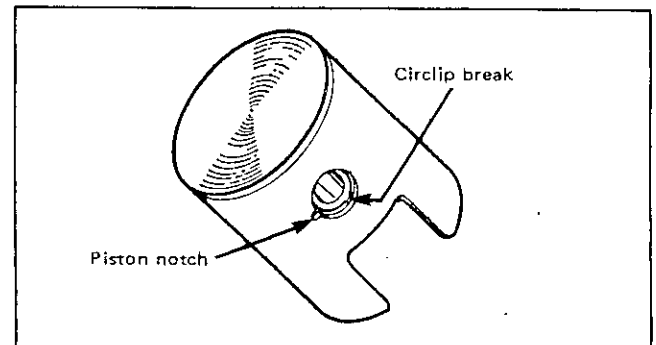
Drive the gudgeon pins in or out using a suitable drive punch and hammer.

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

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



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



⑭ ⑮ To insure correct cylinder alignment, install and secure intake and exhaust manifolds on cylinder prior to cylinder head tightening. Cross torque cylinder head nuts to 14-16 ft-lb.

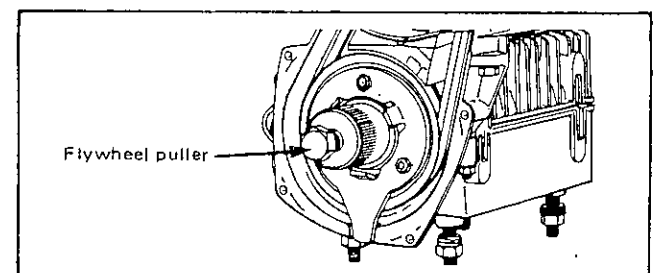
Note: Torque each head individually.

⑯ At assembly, torque to 14-16 ft-lb.

Magneto

① At assembly torque to 9 ft-lb.

⑤ ⑥ ⑦ With magneto retaining nut removed and hold-on



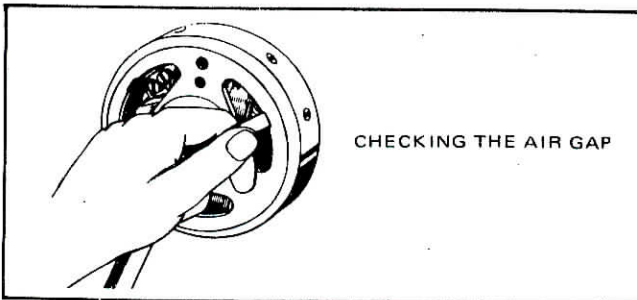
SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

support in place, install special puller onto hub. Tighten puller bolt and at same time, tap bolt head using a hammer to release magneto from its taper. (See Tool Section)

Note: Do not separate magneto housing from magneto ring unless necessary. At assembly, apply Loctite. "Lock'n Seal" on magneto housing hub where magneto ring center bore sits.

⑩ ⑫ ⑭ When a coil is replaced, the air gap between magnet and armature must be adjusted.

To check air gap insert a feeler of correct thickness (.025 mm/.010"-0.39 mm/.015") between magnet and each armature end.



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

⑮ Do not remove pivot pin unless replacement is needed. At assembly, apply Loctite "Lock'n Seal" on threads.

⑯ When replacing breaker point set, apply a light coat of grease on pivot pin and rubbing block. Recheck engine timing.

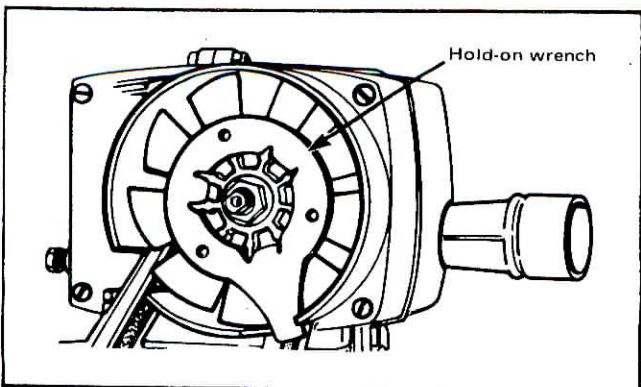
Cooling system

⑩ ⑲ ⑳ ㉑ ㉒ At assembly, apply Loctite "Lock'n Seal" on threads to prevent loosening through vibration.

Note: To correctly remove a "Loctite" locked screw, it is necessary to slightly tap on head of screwdriver to break bond.

⑬ ⑭ ⑮ To remove or install bearing, heat bearing housing to 140°-160°F.

⑯ ⑰ ⑱ ㉑ ㉒ To remove or install fan retaining nut, lock fan in position with fan holder wrench. (See Tool Section).



At assembly, torque retaining nut to 42-50 ft-lb. Make sure that belt is not squeezed between pulley halves.

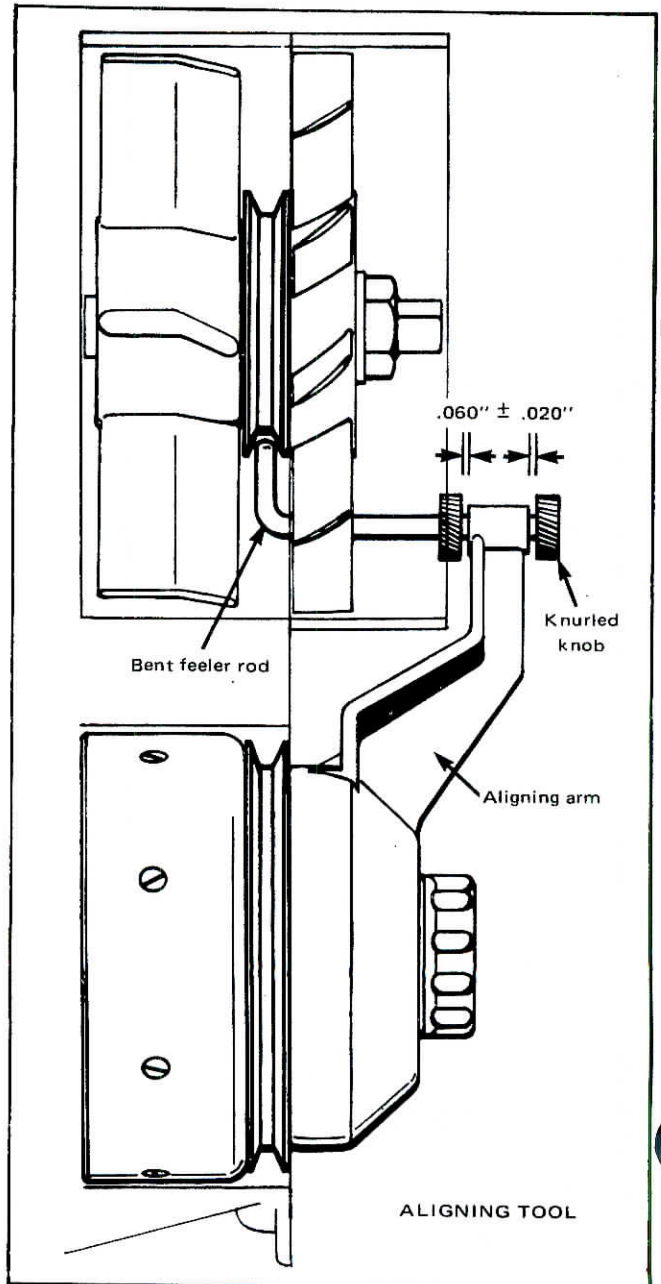
Correct fan belt free-play is 1/4". To adjust, add or remove shim(s) between inner and outer pulley halves. Excess shim(s) must be positioned between outer pulley half and fan.

Fan belt alignment

For reliable fan belt operation, the two fan belt pulleys must lie within .020" of either side of the pulley center line.

Prior to checking alignment, check fan belt free-play.

Position and secure aligning tool (See Tool Section) on magneto housing as illustrated.



Turn knurled knob to center bent feeler rod between pulley halves. Insert a .040" feeler gauge between tool arm and knurled knobs. If gauge fits between both sides of the arms, the setting lies within tolerance.

If clearance is smaller than .040" on one side, shim(s) must be added or removed between bearing and inner pulley half to bring both gaps within tolerance of .060" \pm .020".

Excess shim(s) should be stored between outer pulley half and fan.

CLEANING

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

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

Caution: Clean armature with a clean cloth only.

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

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

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

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

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

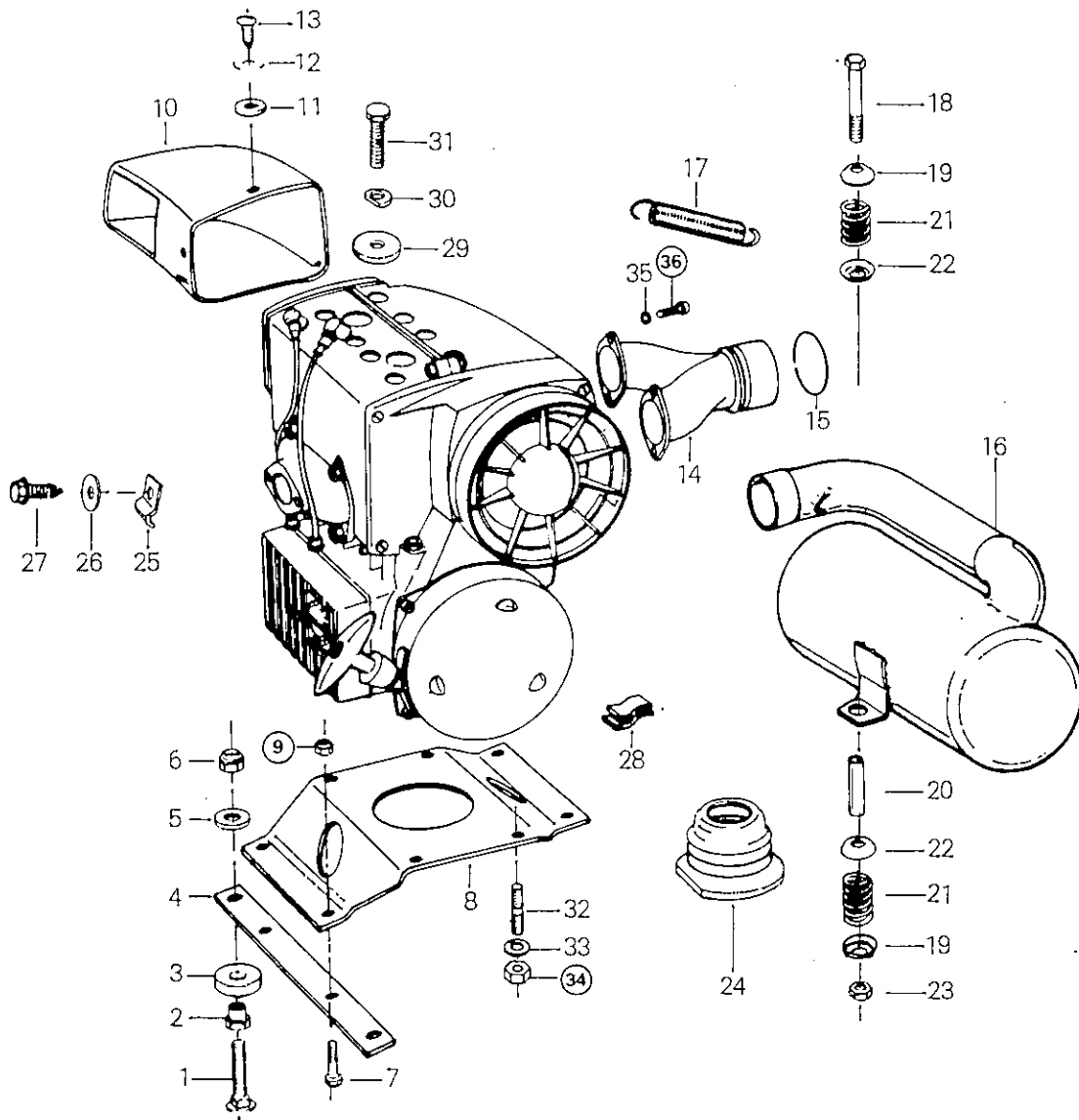
INSTALLATION

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

- Torque engine mount nuts to 18-23 ft-lb.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.
- Check ignition timing.

248 ENGINE TYPE (FROM 1975)

ENGINE SUPPORT & MUFFLER



- 1. Carriage bolt
- 2. Threaded spacer bushing
- 3. Rubber insulator
- 4. Engine support
- 5. Washer
- 6. Nut
- 7. Bolt
- 8. Engine bracket
- 9. Nut
- 10. Air duct
- 11. Rubber spacer
- 12. Washer

- 13. Screw
- 14. Exhaust manifold
- 15. Aluminum ring
- 16. Muffler
- 17. Spring
- 18. Bolt
- 19. Cup
- 20. Bushing
- 21. Spring
- 22. Cup
- 23. Nut
- 24. Exhaust grommet

- 25. Clip
- 26. Washer
- 27. Screw
- 28. Plug
- 29. Rubber washer
- 30. Washer
- 31. Screw
- 32. Stud
- 33. Lockwasher
- 34. Nut
- 35. Lockwasher
- 36. Screw

ENGINE SUPPORT & MUFFLER

REMOVAL FROM VEHICLE

Remove or disconnect the following, then lift engine from vehicle.

- Pulley guard
- Drive belt
- Muffler
- Choke knob
- Throttle cable
- Fuel lines
- Electrical connectors
- Steering column support at upper column
- Engine mount nuts

DISASSEMBLY & ASSEMBLY

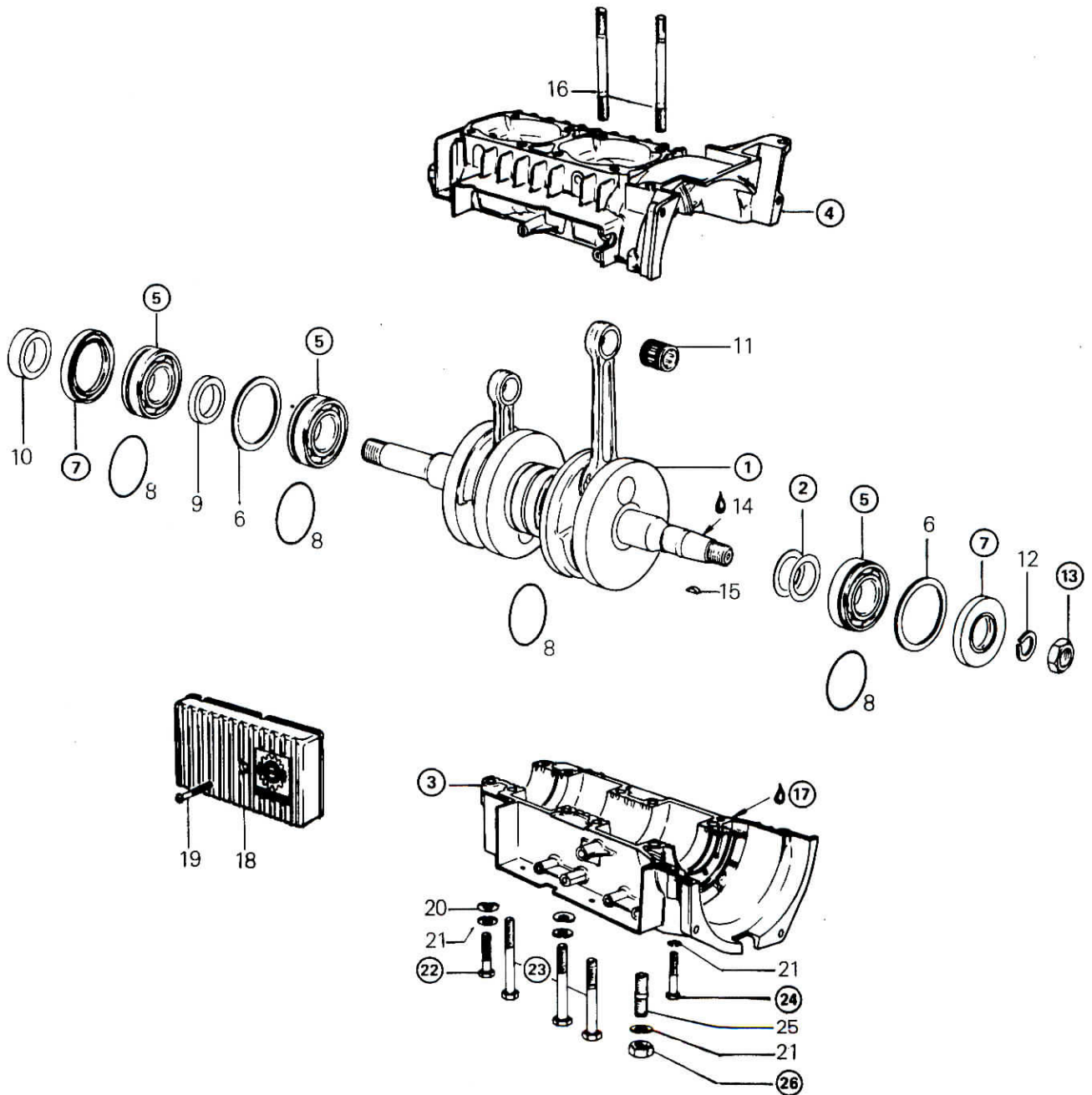
- ⑨ Torque to 3.2 kg-m (23 ft-lbs).
- ⑳ Torque to 3.6 kg-m (26 ft-lbs)
- ㉑ Torque to 2.2 kg-m (16 ft-lbs)

INSTALLATION

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

- Torque engine mount nuts to 2.7 kg-m (20 ft-lbs).
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.

BOTTOM END



- 1. Crankshaft
- 2. Shim
- 3. Crankcase lower half
- 4. Crankcase upper half
- 5. Bearing
- 6. Retaining washer
- 7. Oil seal
- 8. "O" ring
- 9. Distance ring 6 mm

- 10. Distance ring 9.7 mm
- 11. Needle cage bearing
- 12. Lockwasher
- 13. Magneto ring nut
- 14. Loctite 242
- 15. Woodruff key
- 16. Stud (cylinder)
- 17. Crankcase sealant
- 18. Ignition coil cover

- 19. Screw
- 20. Spring washer
- 21. Lockwasher
- 22. Bolt or stud with nut
- 23. Bolt or stud with nut
- 24. Bolt or stud with nut
- 25. Stud
- 26. Nut

BOTTOM END

CLEANING

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

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

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

DISASSEMBLY & ASSEMBLY

General

Refer to Technical Data Section for component fitted tolerance and wear limit. If necessary, refer to Drive Pulley Section to remove drive pulley.

①② Crankshaft end-play is adjusted with a shim(s) located between crankshaft and magneto side bearing. To determine correct amount of shim, proceed as follows.

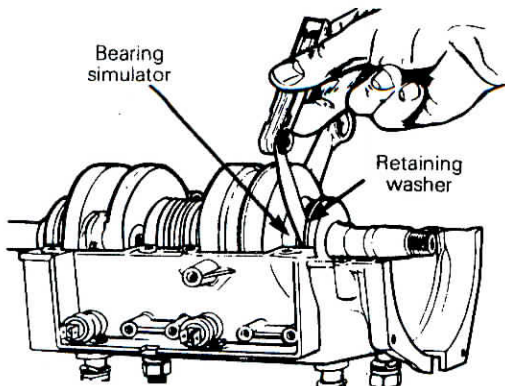
NOTE: Crankshaft end-play is adjusted only when crankshaft and / or crankcase is replaced.

Remove magneto side bearing and existing shim(s). Slide the appropriate bearing simulator and retaining washer onto the crankshaft. (See Tools Section).

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

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

Any free-play between the bearing simulator and magneto side retaining washer, minus recommended end-play, is the distance to be covered by shim(s). Shims are available in thickness of 0.1 mm (.004"), 0.2 mm (.008"), 0.3 mm (.012"), 0.5 mm (.020"), 1 mm (.039").

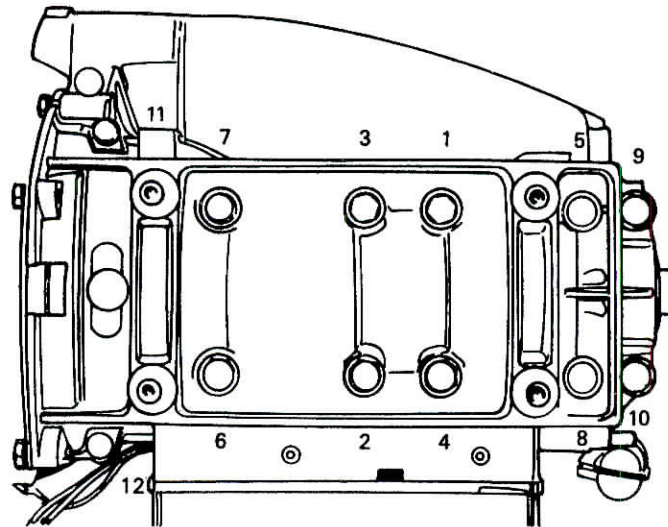


③④⑷ Crankcase halves are factory matched and therefore, are not interchangeable or available single halves.

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

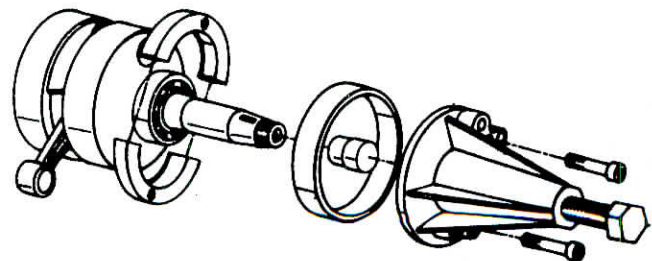
Position the crankcase halves together and tighten nuts (or bolts) by hand then install armature plate (tighten) on magneto side to correctly align the crankcase halves.

Torque nuts (or bolts) to 2.2 kg-m (15 ft-lbs) following illustrated sequence.



NOTE: Torque the two smaller nuts on magneto side (no. 11 and 12) to 1.2 kg-m (9 ft-lbs).

⑤ To remove bearing from crankshaft use a protective cap and special puller as illustrated. (See Tool Section).

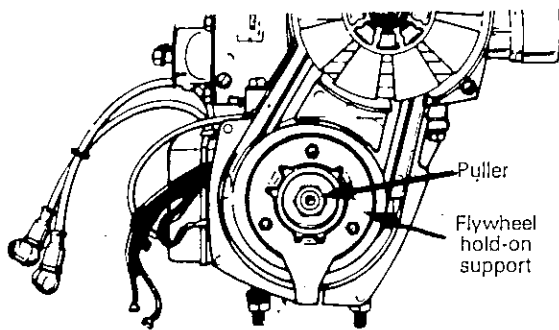


NOTE: Prior to magneto side bearing installation, determine crankshaft end-play and install required shim(s) on crankshaft extension.

At assembly, place bearings into an oil container and heat the oil to 100° C (210° F) for 5 to 10 min. This will expand the bearings and permit them to slide easily on the shaft. Install bearings with groove outward.

⑦ At assembly apply a light coat of lithium grease on seal lips then position oil seal with outer surface flush with crankcase.

⑬ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tool Section).



At assembly torque retaining nut to 6.4 kg-m (46 ft-lbs).

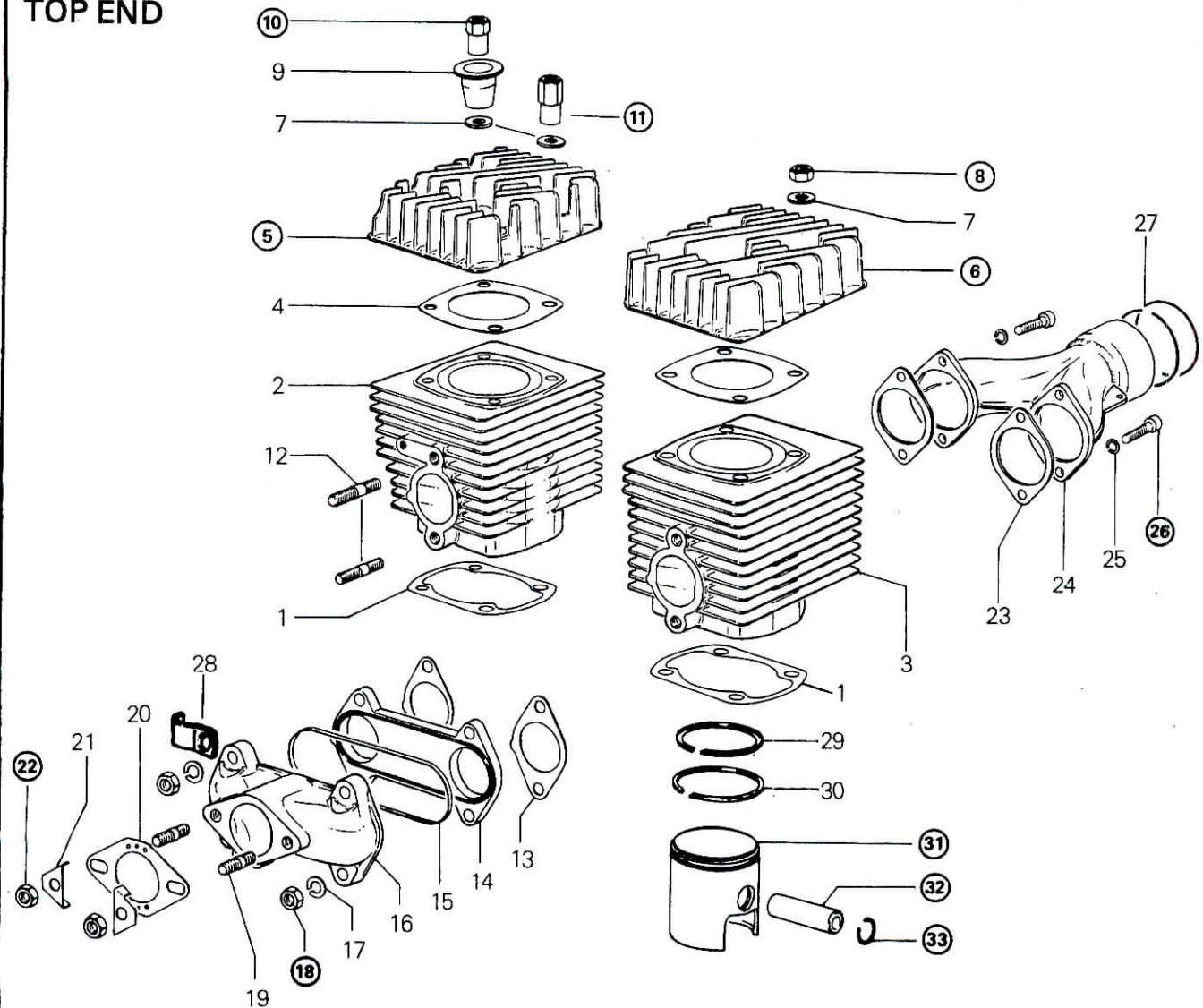
⑳ ㉓ Torque to 2.2 kg-m (16 ft-lbs).

㉔ Torque to 1.2 kg-m (9 ft-lbs).

㉘ Torque to 3.6 kg-m (26 ft-lbs).

SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

TOP END



- 1. Gasket (cylinder/crankcase)
- 2. Cylinder (P.T.O.)
- 3. Cylinder (MAG)
- 4. Cylinder head gasket
- 5. Cylinder head (PTO)
- 6. Cylinder head (MAG)
- 7. Flat washer
- 8. Nut (head)
- 9. Support sleeve
- 10. Distance nut
- 11. Distance nut

- 12. Stud
- 13. Gasket
- 14. Isolating flange
- 15. Rubber ring
- 16. Intake manifold
- 17. Lockwasher
- 18. Nut
- 19. Stud
- 20. Gasket
- 21. Locking tab
- 22. Nut

- 23. Exhaust gasket
- 24. Exhaust manifold
- 25. Lockwasher
- 26. Allen capscrew
- 27. Sealing ring
- 28. Clip
- 29. "L" ring
- 30. Rectangular ring
- 31. Piston
- 32. Gudgeon pin
- 33. Circlip

TOP END

CLEANING

Discard all gaskets.

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

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

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

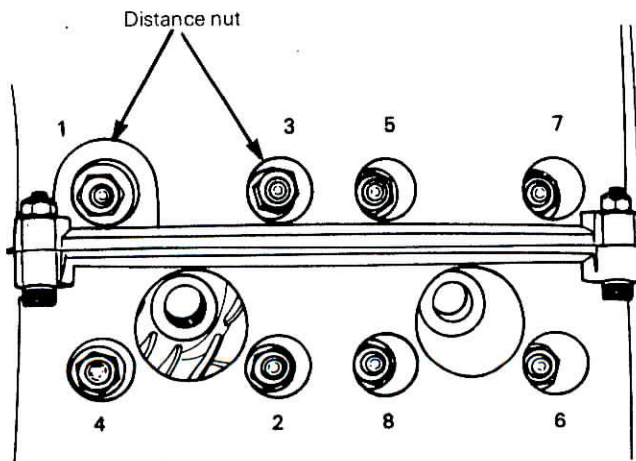
Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

DISASSEMBLY & ASSEMBLY

○ **NOTE:** Refer to Technical Data for components fitted tolerance and wear limit.

⑤ ⑧ To insure correct cylinder alignment, install and secure intake and exhaust manifolds on cylinder prior to cylinder head tightening. Cross torque cylinder head nuts to 2.1 kg-m (15 ft-lbs).

⑧ ⑩ ⑪ Torque nuts and distance nuts to 2.1 kg-m (15 ft-lbs). Correct position for distance nuts is as following illustration.



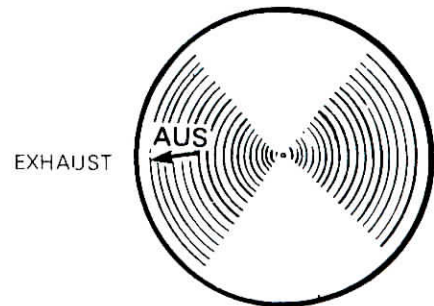
⑱ ⑳ ㉑ Torque to 2.1 kg-m (15 ft-lbs).

㉓ ㉔ ㉕ Place a clean cloth over crankcase to prevent circlip from falling into crankcase. Use a pointed tool to remove circlip from piston.

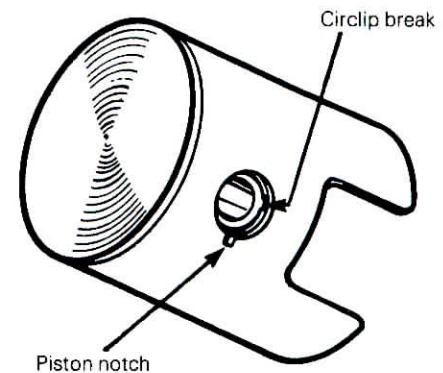
Drive the gudgeon pins in or out using a suitable drive punch and hammer.

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

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

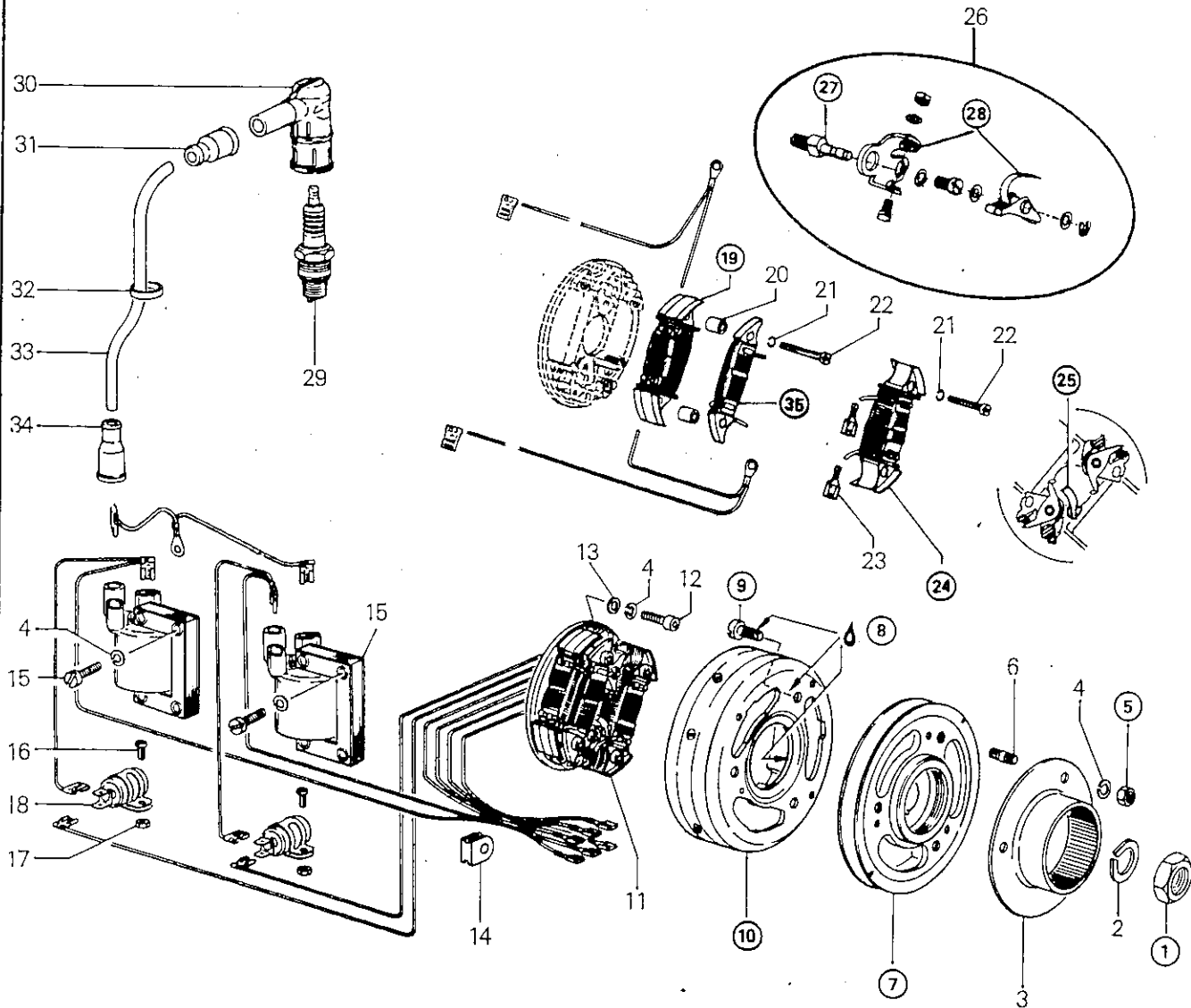


○ **NOTE:** Once circlips are installed, turn each circlip so that the circlip break is not directly on piston notch. Remove any burrs on piston caused through circlip installation with very fine emery cloth.



SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

MAGNETO



- 1. Nut
- 2. Lockwasher
- 3. Starting pulley
- 4. Lockwasher
- 5. Nut
- 6. Stud
- 7. Magneto housing
- 8. Loctite 242
- 9. Screw
- 10. Magneto ring
- 11. Armature plate ass'y
- 12. Allen capscrew

- 13. Flat washer
- 14. Wires grommet
- 15. Coil
- 16. Screw
- 17. Nut
- 18. Condenser with clamp
- 19. Lighting coil
- 20. Distance sleeve
- 21. Lockwasher
- 22. Screw
- 23. Female connector
- 24. Ignition generator coil

- 25. Lubricating wick
- 26. Breaker point set
- 27. Pivot pin
- 28. Breaker point
- 29. Spark plug
- 30. Protector
- 31. Protection cap
- 32. Rubber ring
- 33. H.T. Cable
- 34. Protection cap
- 35. Brake light coil

MAGNETO

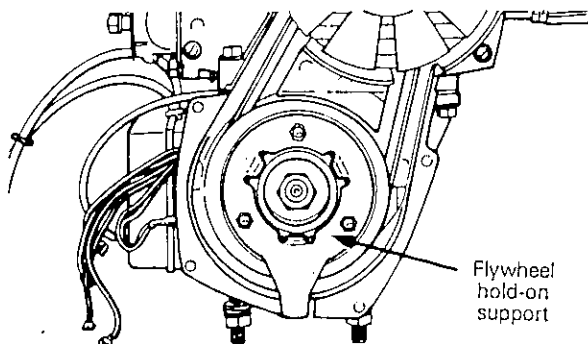
CLEANING

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

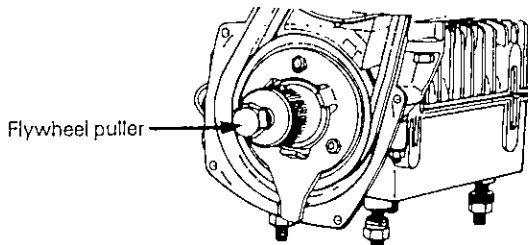
▼ **CAUTION:** Clean armature ass'y using only a clean cloth.

DISASSEMBLY & ASSEMBLY

- ① Torque to 6.4 kg-m (46 ft lbs).
- ⑤ Torque to 1.2 kg-m (9 ft-lbs)
- ⑦ ⑧ ⑨ ⑩ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support as illustrated. (See Tool Section).



With magneto retaining nut removed and hold-on support in place, install special puller onto hub. Tighten puller bolt and at same time, tap bolt head using a hammer to release magneto from its taper. (See Tool Section).

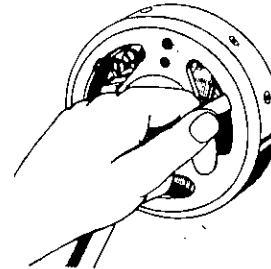


○ **NOTE:** Do not separate magneto housing from magneto ring unless necessary. At assembly, apply Loctite "Lock'n Seal" on magneto housing hub (where magneto ring center bore sits) and on retaining screws.

Prior to magneto installation, clean crankshaft extension (taper) then apply Loctite Lock'n Seal 242.

Install magneto retaining nut with lockwasher then torque to 6.4 kg-m (46 ft-lbs).

⑱ ⑲ ⑳ Whenever a coil is replaced, the air gap (distance between magnet and coil end) must be adjusted.



Checking the air gap

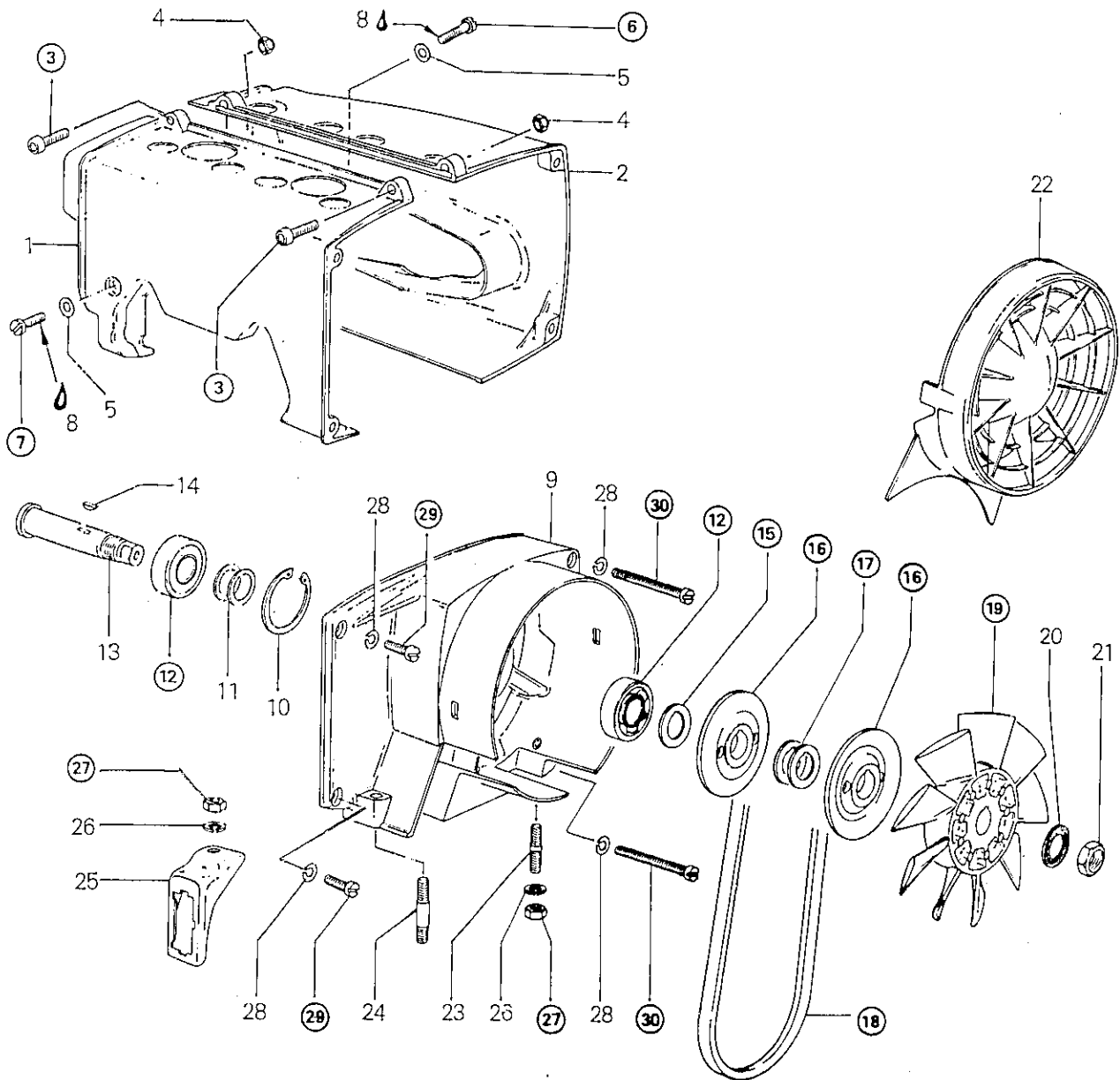
To check air gap, insert a feeler gauge of 0.25-0.39 mm (.010-.015") between magnet and coil ends. If necessary to adjust, slacken retaining screws and relocate coil.

㉗ Do not remove pivot pin unless replacement is needed. At assembly, apply Loctite "Lock'n Seal" on threads.

㉘ ㉙ When replacing breaker point set, apply a light coat of grease on pivot pin and lubricating wick.

SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

COOLING SYSTEM



- 1. Cylinder cowl (intake)
- 2. Cylinder cowl (exhaust)
- 3. Screw
- 4. Nut
- 5. Spring washer
- 6. Screw
- 7. Screw
- 8. Loctite no. 242
- 9. Fan housing
- 10. Circlip

- 11. Shim
- 12. Bearing
- 13. Fan shaft
- 14. Woodruff key
- 15. Shim
- 16. Pulley half
- 17. Shim
- 18. Belt
- 19. Fan
- 20. Locking washer

- 21. Nut
- 22. Fan cover
- 23. Stud
- 24. Stud
- 25. Junction block bracket
- 26. Lockwasher
- 27. Nut
- 28. Lockwasher
- 29. Screw
- 30. Screw

COOLING SYSTEM

CLEANING

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

DISASSEMBLY & ASSEMBLY

③ ⑥ ⑦ ⑲ ⑳ ㉓ At assembly, apply Loctite Lock'n seal or equivalent on threads to prevent loosening through vibration.

○ NOTE: To correctly remove a "Loctite" locked screw, it is necessary to slightly tap on head of screwdriver to break bond.

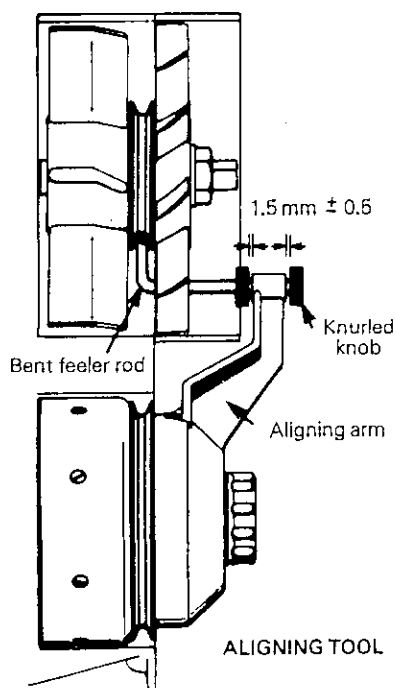
⑫ To remove or install bearing, heat bearing housing to 65° C (150° F).

⑮ Fan belt pulleys alignment

For reliable fan belt operation, the two fan belt pulleys must lie within 0.5 mm (.020") of either side of the pulley center line.

Prior to checking alignment, check fan belt free-play.

Position and secure aligning tool (See Tool Section) on magneto housing as illustrated.

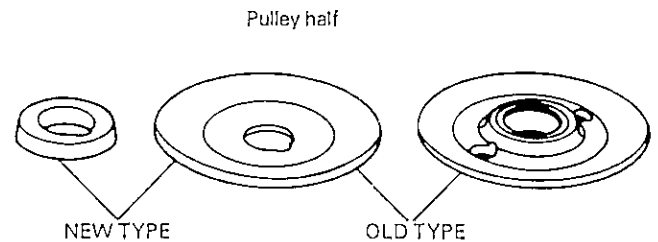


Turn knurled knob to center bent feeler rod between pulley halves. Insert a 1 mm (.040") feeler gauge between tool arm and knurled knobs. If gauge fits between both sides of the arms, the setting lies within tolerance. If clearance is smaller than 1 mm (.040") on one side, shim(s) must be added or removed between bearing and inner pulley half to bring both gaps within tolerance of 1.5 mm ± 0.5 (.060" ± .020").

Excess shim(s) should be stored between outer pulley half and fan.

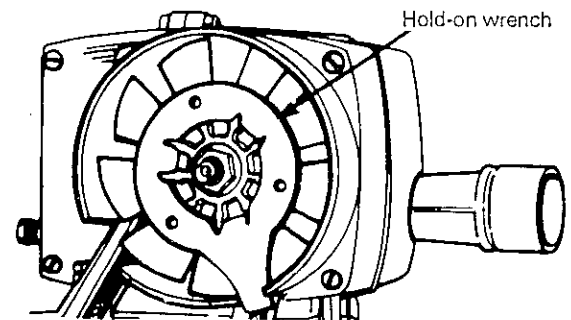
⑰ ⑱ Correct fan belt free-play is 6 mm (¼"). To adjust, add or remove shim(s) (no. 17) between inner and outer pulley halves. Excess shim(s) must be positioned between outer pulley half and fan.

⑲ ⑳ ㉑ Newer pulley half does not have a shoulder on its inner face so it is installed with a 6 mm (0.236") spacer.



There are two types of fan interchangeable. The first type utilizes two pulley halves and the second type utilizes one pulley half (the second half being part of the fan itself).

To remove or install fan retaining nut, lock fan in position with fan holder wrench. (See Tool Section).



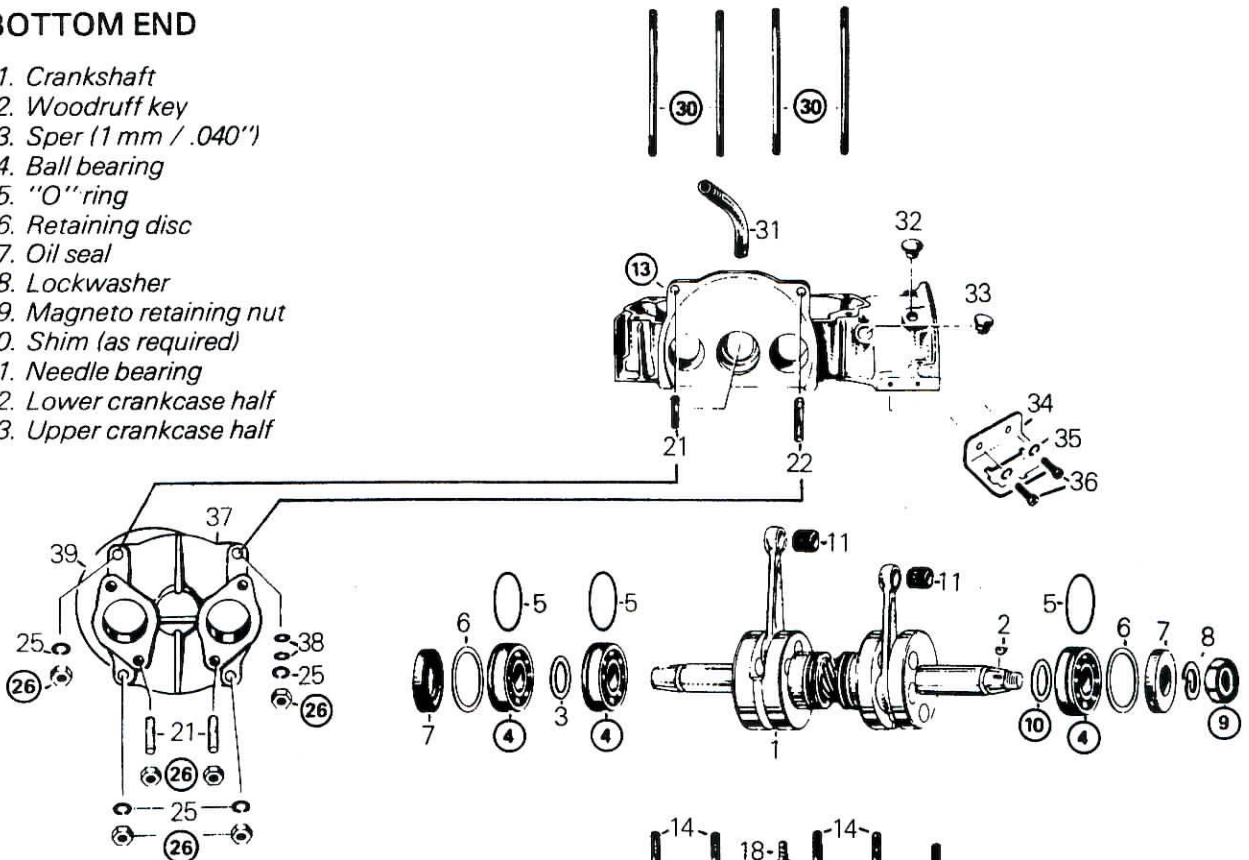
At assembly, torque retaining nut to 6.4 kg-m (46 ft-lbs). Make sure that belt is not squeezed between pulley halves.



245 ENGINE TYPE

BOTTOM END

1. Crankshaft
2. Woodruff key
3. Sper (1 mm / .040")
4. Ball bearing
5. "O" ring
6. Retaining disc
7. Oil seal
8. Lockwasher
9. Magneto retaining nut
10. Shim (as required)
11. Needle bearing
12. Lower crankcase half
13. Upper crankcase half

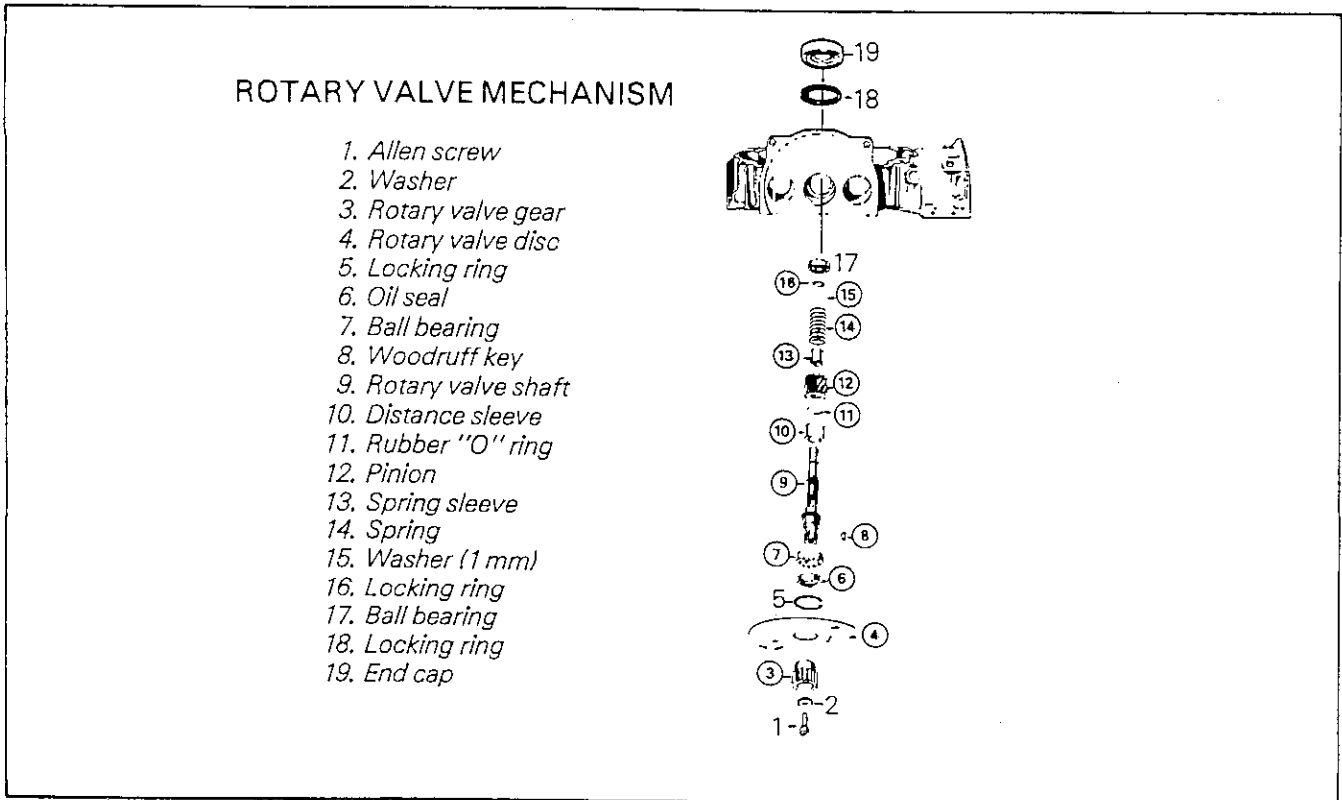
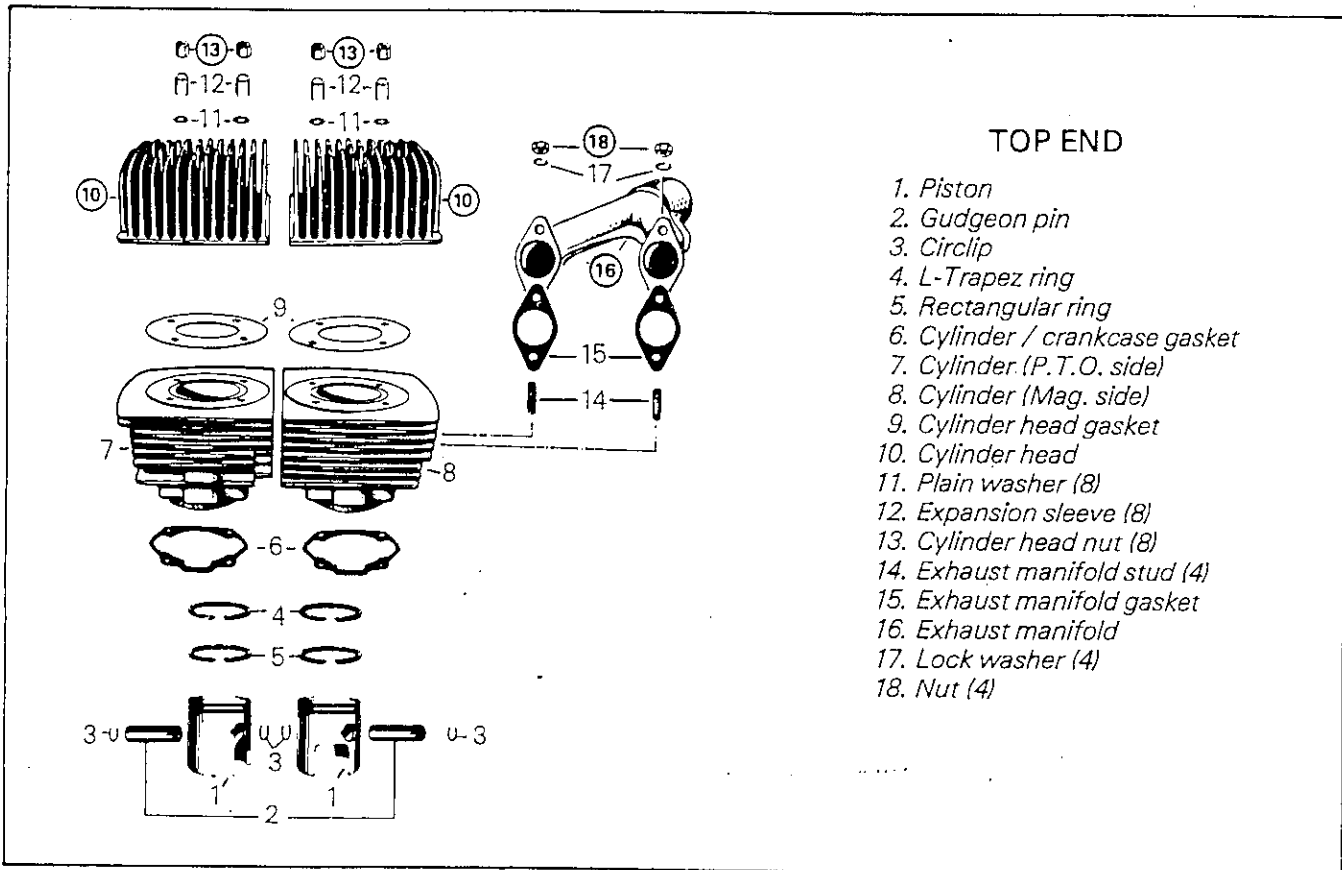


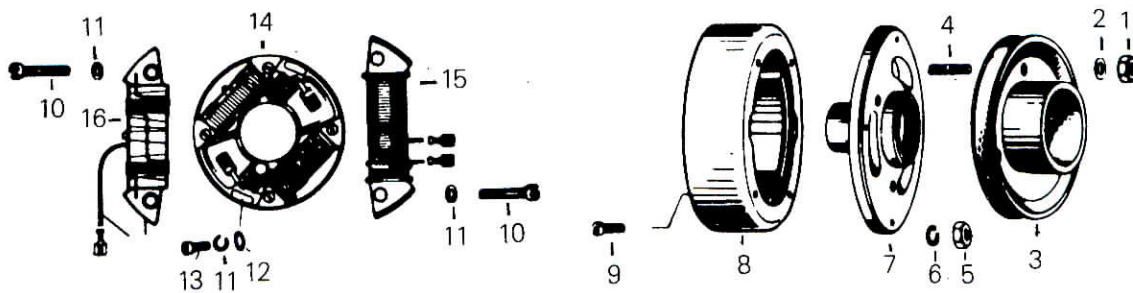
14. Crankcase stud (8) (57 mm)
15. Crankcase stud (2) (37 mm)
16. Dowel pin
17. Sealing ring
18. Oil inlet nipple
19. Cap
20. Spring clip
21. Valve cover stud (18 mm)
22. Valve cover stud (25 mm)
23. Crankcase support stud (4)
24. Flat washer (10)
25. Lock washer (14)
26. Nut (18)
27. Lock washer (4)
28. Nut (4)
29. Drain screw
30. Cylinder stud (8)
31. Vent elbow
32. Rubber cap

33. Rubber grommet
34. Junction block bracket
35. Lock washer
36. Screw
37. Rotary valve cover
38. Plain washer
39. "O" ring

*Applies to engine up to serial no 2,762,210

SECTION 04
 SUB-SECTION 02 (TWO CYLINDER ENGINE)





MAGNETO

- | | |
|-------------------------|------------------------------|
| 1. Nut (3) | 9. Allen screw (4) |
| 2. Lockwasher (3) | 10. Coil retaining screw (4) |
| 3. Starting pulley | 11. Lockwasher (6) |
| 4. Starting pulley stud | 12. Washer (2) |
| 5. Nut (4) | 13. Allen screw (2) |
| 6. Washer (4) | 14. Armature plate ass'y |
| 7. Magneto housing | 15. Lighting coil |
| 8. Magneto ring | 16. Capacitor charging coil |

REMOVAL

Disconnect or remove the following from vehicle, if applicable:

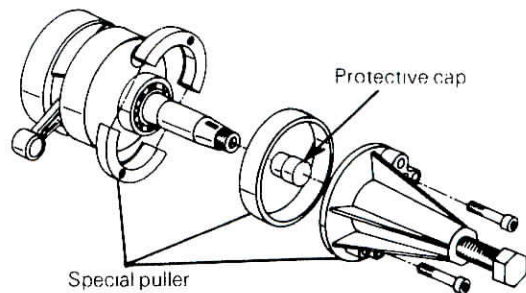
- Drive belt
- Air silencer
- Unscrew slide chamber cover from carburetors then withdraw throttle slide ass'y from carburetor.
- Rotary valve mechanism vent tube
- Fuel lines, primer lines and impulse line
- Electrical wires
- Muffler
- Rewind starter
- Engine mount nuts and front air deflector
- Drive pulley (as described in Drive Pulley Section).

DISASSEMBLY & ASSEMBLY

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

Bottom End

④ To remove bearing from crankshaft, use a protective cap and special puller as illustrated.

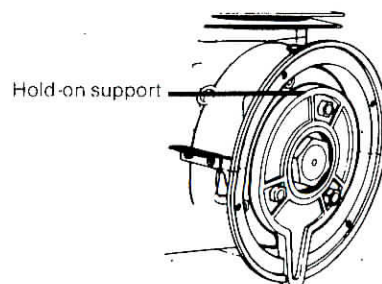


Prior to installation, place bearings into an oil container and heat the oil to 93° C (200° F) for 5 to 10 min. This will expand bearing and ease installation.

Install bearings with groove outward.

⑨ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support, as illustrated. (See Tool Section).

At assembly, torque magneto retaining nut to 8.0-8.6 kg-m (58-62 ft-lbs).



SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

⑩ Whenever the crankshaft and / or the crankcase is replaced, the crankshaft end-play must be adjusted. To adjust proceed as follows:

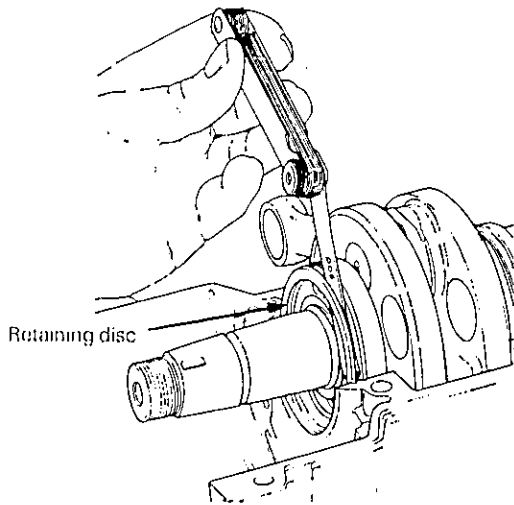
Remove magneto side bearing and existing shims. Re-install magneto side bearing without the shims making sure bearing sits flush against crankshaft shoulder.

Position crankshaft ass'y into lower crankcase half. Make sure that retaining discs are correctly seated into their grooves.

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

Any free-play between the magneto side bearing and retaining disc minus recommended end-play is the distance to be covered by shim(s).

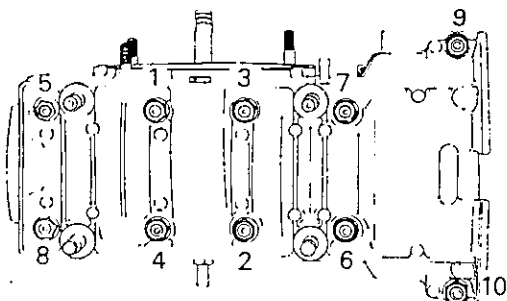
Shims are available in thickness of 0.15 mm (.006"), 0.2 mm (.008"), 0.3 mm (.012") and 1.0 mm (.039").



⑫ ⑬ ⑳ Prior to joining of crankcase halves prepare mating surfaces with crankcase sealant primer then apply a light coat of crankcase sealant as per instructions printed on containers.

Position spring washers, lock washers and nuts on crankcase studs then torque nuts to 1.9-2.2 kg-m (14-16 ft-lbs) following illustrated sequence.

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



⑳ At assembly, torque to 1.9-2.2 kg-m (14-16 ft-lbs).

㉑ At assembly, torque to 4.0-4.8 kg-m (29-35 ft-lbs).

㉒ Apply Loctite Lock'n Seal on the threads of the two (2) studs, screwed into the crankcase, above the intake ports.

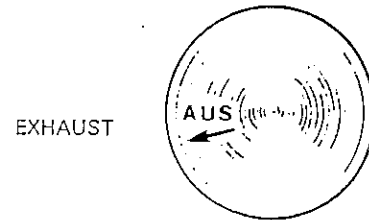
Top End

① ② ③ Place a clean cloth over crankcase to prevent circlips from falling into crankcase then use a pointed tool to remove circlips from piston.

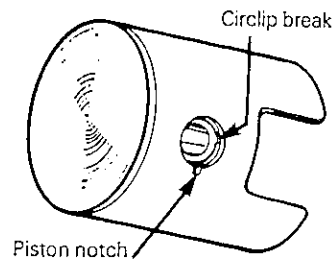
Drive the gudgeon pins in or out using a suitable drive punch and hammer.

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

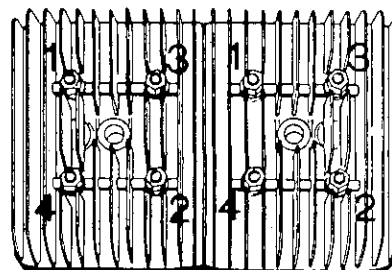
At assembly, place the pistons over the connecting rods with the letters AUS, over an arrow on the piston dome, facing direction of the exhaust port.



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



⑩ ⑬ ⑮ At assembly, torque to 2.2-2.5 kg-m (16-18 ft-lbs) following illustrated sequence.

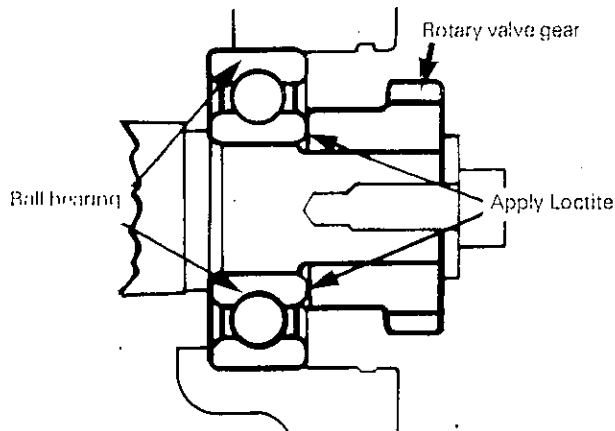


○ NOTE: To prevent leakage, install exhaust manifold prior to cylinder head tightening.

⑱ At assembly, torque to 1.9-2.2 kg-m (14-16 ft-lbs).

Rotary Valve Mechanism

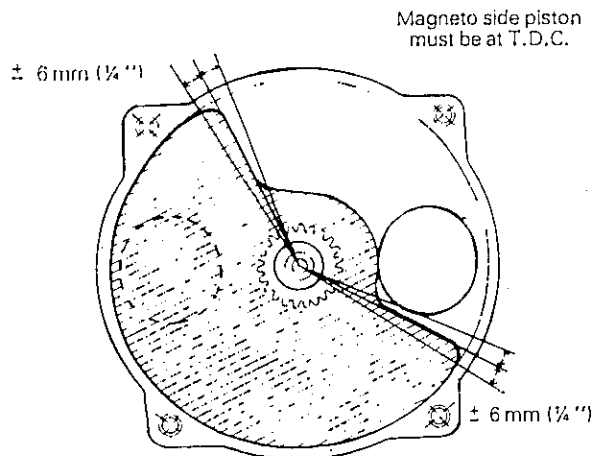
③ ⑦ At assembly, apply Loctite crankcase sealant on rotary valve gear and bearing mating surfaces.



④ To correctly install the rotary valve disc proceed as follows:

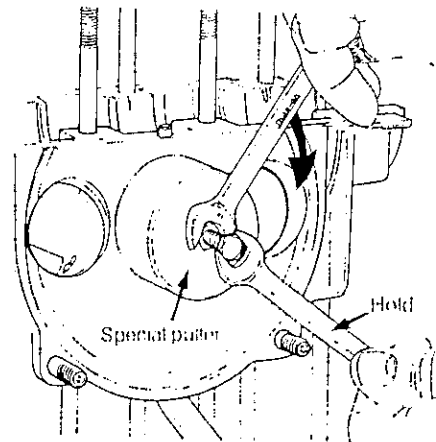
- Bring magneto side piston to Top Dead center using a Top Dead Center gauge (See Tools Section).
- Position the rotary valve disc on gear so that both edges fall within range of 6 mm (1/4") on either side of timing marks.

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

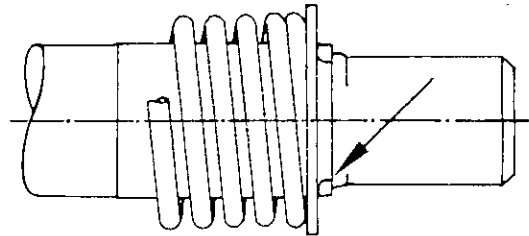


⑥ to ⑱ To remove rotary valve shaft assembly from crankcase a special puller is needed. (See Tools Section).

Place special puller over shaft bore and screw puller bolt into rotary valve shaft. While holding puller bolt, turn puller nut clockwise until shaft comes out.



⑱ At assembly, position square edge of locking ring against shaft shoulder as illustrated.



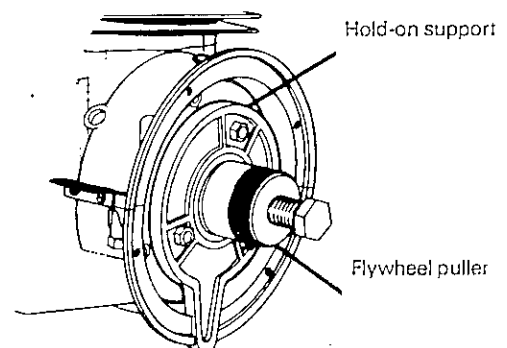
⑲ At assembly, apply a light coat of Loctite crankcase sealant on end cap sealing surface.

Magneto

① At assembly, torque to 1.9 - 2.2 Kg-m (14-16 ft-lbs).

⑤ At assembly, torque to 1.3 kg-m (9 ft-lbs).

⑦ With magneto retaining nut removed and hold-on support in place, install special puller onto hub. Tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper. (See Special Tool).

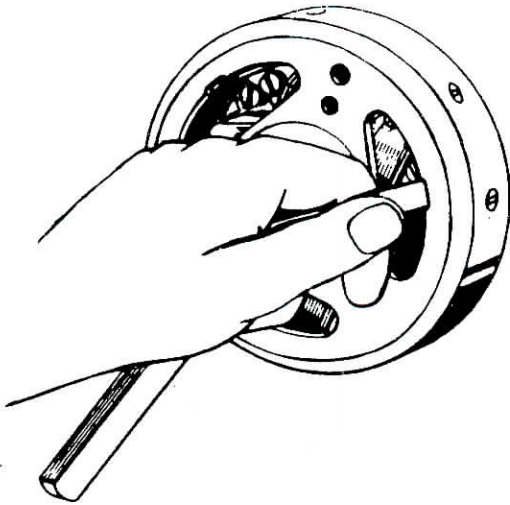


SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

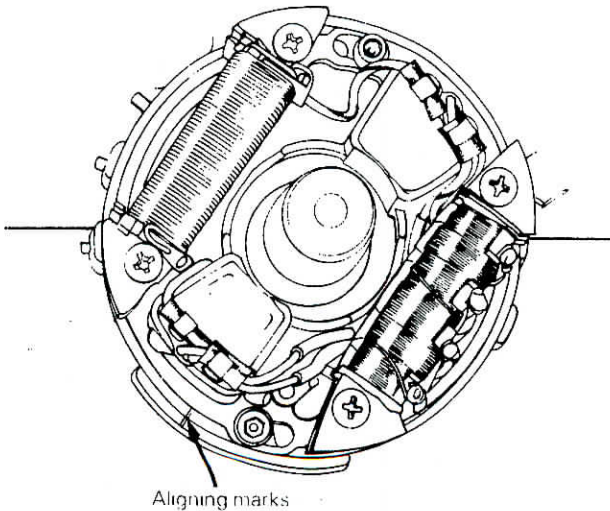
⑨ At assembly, apply Loctite Lock'n Seal on screw threads.

⑮⑯ Whenever a coil is replaced, the air gap (distance between magnet and armature end) must be adjusted. To check air gap, insert a feeler gauge of correct thickness (0.31 mm / .012" - 0.45 mm / .018") between magnet and armature ends.

To adjust, slacken retaining screw and relocate armature.



⑭ To facilitate timing procedure, perform primary adjustment by matching crankcase and armature plate marks.



CLEANING

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

▼ **CAUTION:** Clean armature using only a clean cloth.

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

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

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

Remove old sealant from crankcase mating surfaces.

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

INSTALLATION

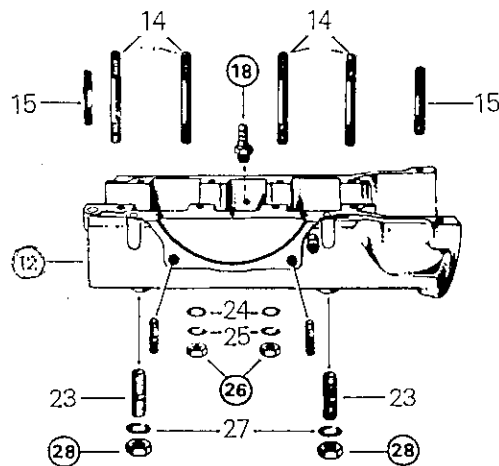
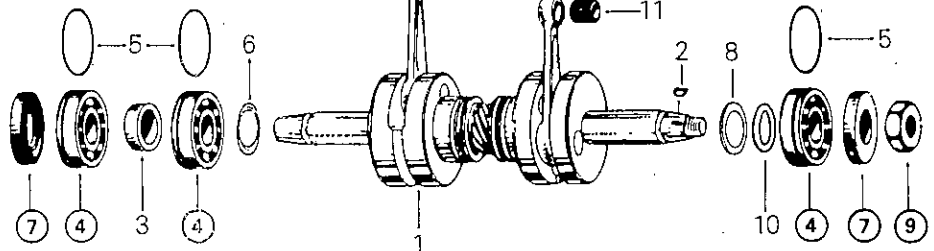
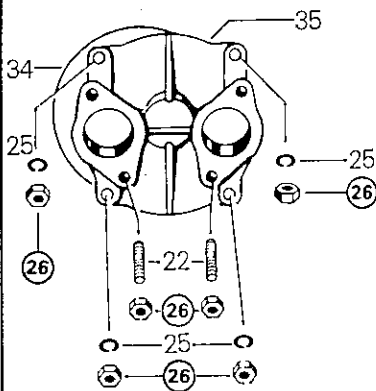
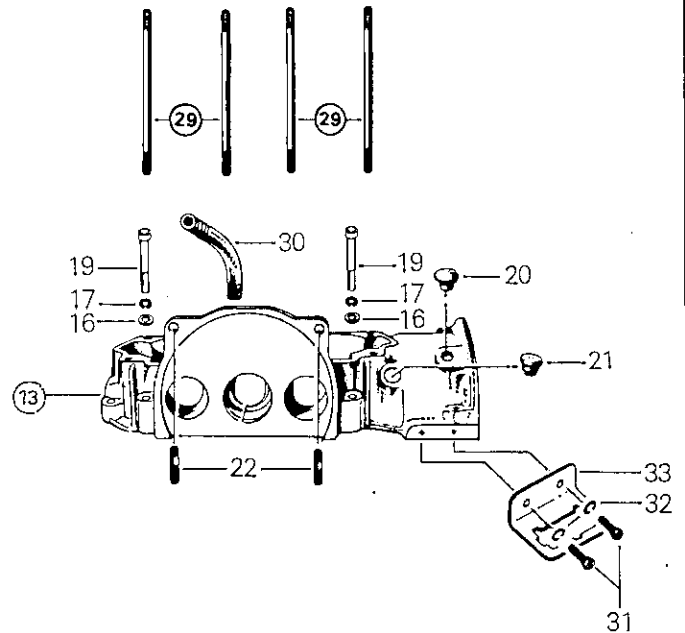
To install engine on vehicle, inverse removal procedure. However, pay attention to the following:

- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.

245*, 345 ENGINE TYPE

BOTTOM END

1. Crankshaft
2. Woodruff key
3. Distance sleeve
4. Ball bearing
5. "O" ring
6. Spacer, 1 mm (.039")
7. Oil seal
8. Spacer, 2 mm (.078")
9. Magneto retaining nut
10. Shim, 0.50 mm (.020")
11. Needle bearing
12. Lower crankcase half
13. Upper crankcase half
14. Crankcase stud (8) (57 mm)
15. Crankcase stud (4) (37 mm)
16. Plain washer
17. Lock washer
18. Oil inlet nipple
19. Allen screw (4)

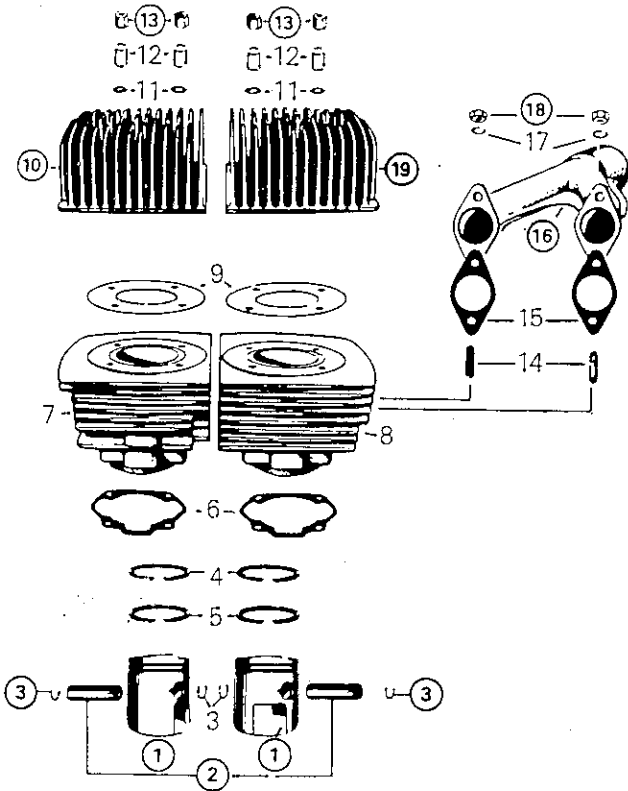


20. Rubber cap
21. Rubber grommet
22. Valve cover stud (18 mm)
23. Crankcase support stud (4)
24. Flat washer (10)
25. Lock washer (14)
26. Nut (18)
27. Lock washer (4)
28. Nut (4)
29. Cylinder stud (8)
30. Vent elbow
31. Screw
32. Lock washer
33. Junction block bracket
34. "O" ring
35. Rotary valve cover

* From engine serial no 2,762,211

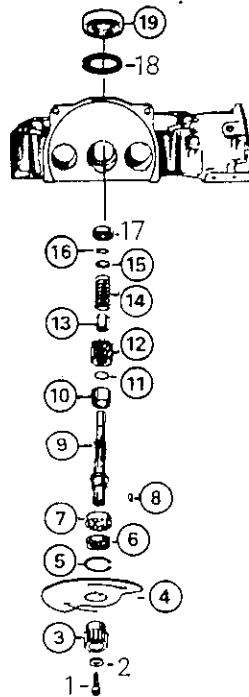
SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

TOP END

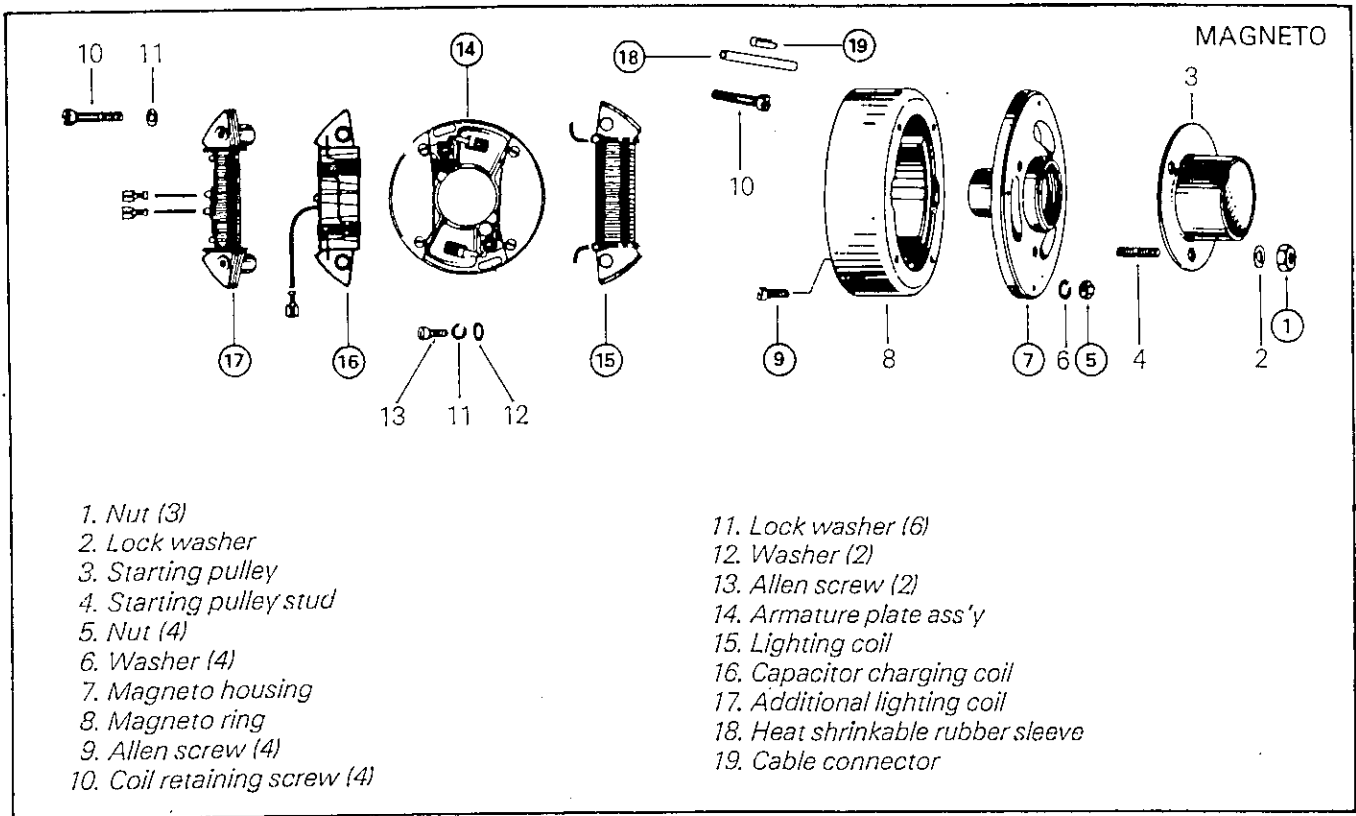


1. Piston
2. Gudgeon pin
3. Circlip
4. L-Trapez ring
5. Rectangular ring
6. Cylinder / crankcase gasket
7. Cylinder (P.T.O. side)
8. Cylinder (Mag. side)
9. Cylinder head gasket
10. Cylinder head (P.T.O. side)
11. Plain washer (8)
12. Expansion sleeve (8)
13. Cylinder head nut (8)
14. Exhaust manifold stud (4)
15. Exhaust manifold gasket
16. Exhaust manifold
17. Lock washer (4)
18. Nut (4)
19. Cylinder head (Mag. side)

ROTARY VALVE MECHANISM



1. Allen screw
2. Washer
3. Rotary valve gear
4. Rotary valve disc
5. Locking ring
6. Oil seal
7. Ball bearing
8. Woodruff key
9. Rotary valve shaft
10. Distance sleeve
11. Rubber "O" ring
12. Pinion
13. Spring sleeve
14. Spring
15. Washer (1 mm)
16. Locking ring
17. Ball bearing
18. Locking ring
19. End cap



REMOVAL

Disconnect or remove the following from vehicle:

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

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

Remove engine mount nuts then lift engine from vehicle.

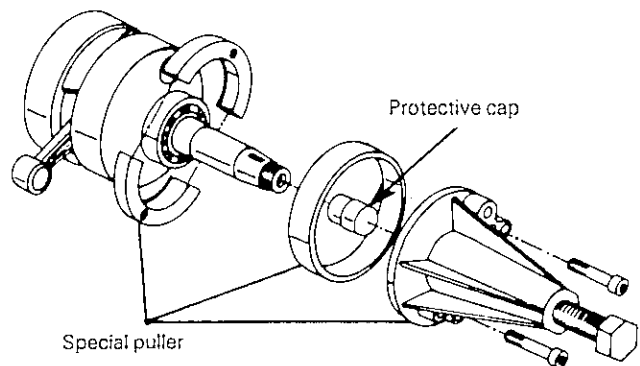
- NOTE: If necessary, remove drive pulley as detailed in Drive Pulley Section.

DISASSEMBLY & ASSEMBLY

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

Bottom End

④ To remove magneto side bearing from crankshaft, use a protective cap and special puller as illustrated. (See Tools Section).

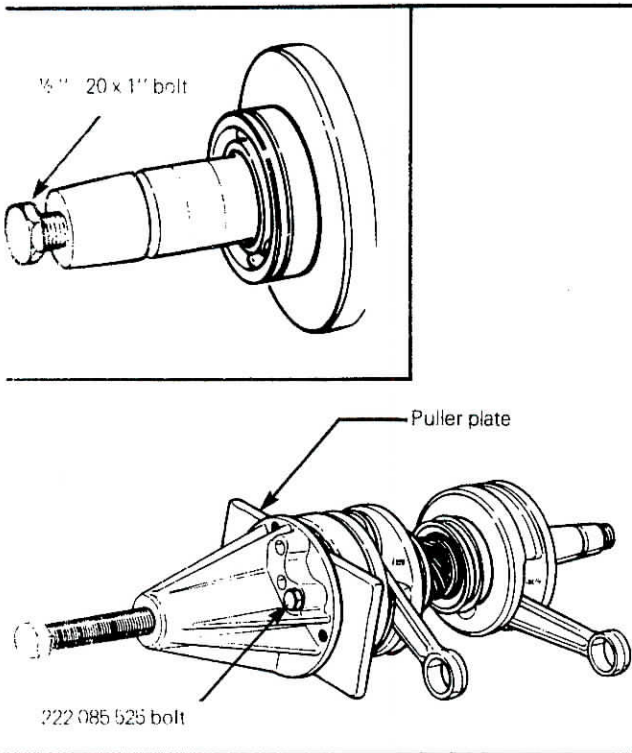


To remove PTO side bearings from crankshaft proceed as follows:

- Install a 1/2" - 20 X 1" bolt into crankshaft to protect shaft end and threads.
- Install puller on outer bearing as illustrated above then remove bearing from crankshaft.

SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

— A puller plate (from puller no 420 977 415) and two (2) longer bolts (part no 222 085 525) are needed to remove the inner bearing. Install puller plate as a spacer between puller ring halves and puller, as illustrated. (See Tools Section).

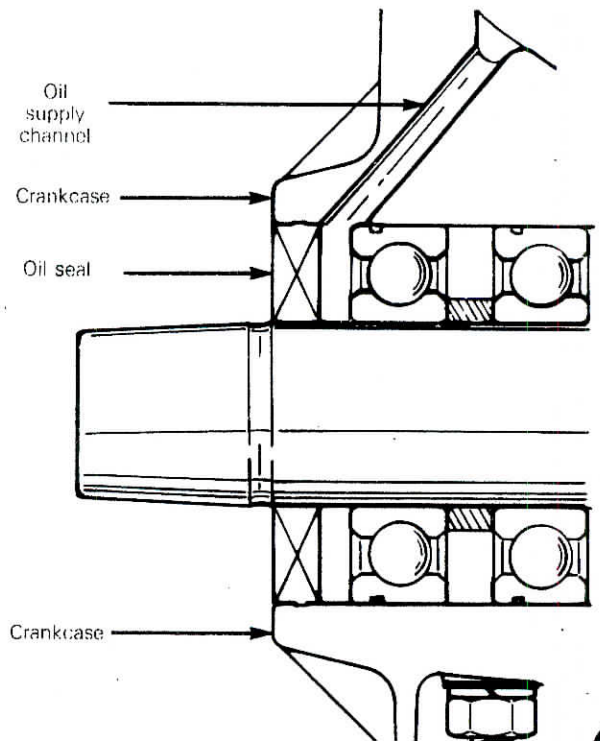


Prior to installation, place bearings into an oil container and heat the oil to 93° C (200° F) for 5 to 10 min. This will expand bearing and ease installation.

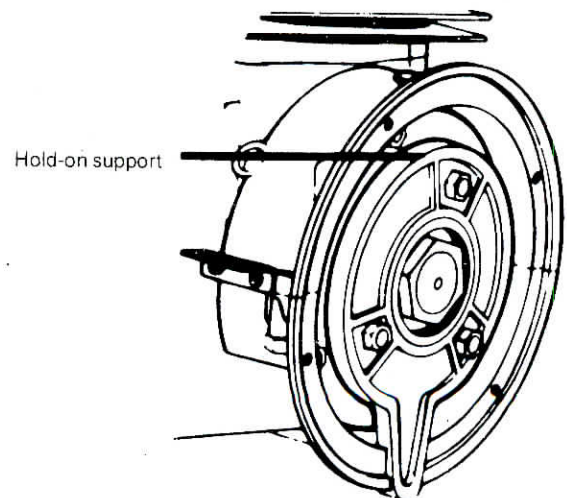
Install all bearings with groove outward.

ⓐ At assembly apply a light coat of lithium grease on all surfaces.

CAUTION: To insure adequate oil supply to the outer PTO bearing it is imperative that the oil seal outer surface be flush with crankcase as illustrated.



ⓑ To remove or install magneto retaining nut, lock crankshaft in position with special hold-on support, as illustrated. (See Tool Section). At assembly, torque magneto retaining nut to 8.0 - 8.6 kg-m (58 to 62 ft-lbs).

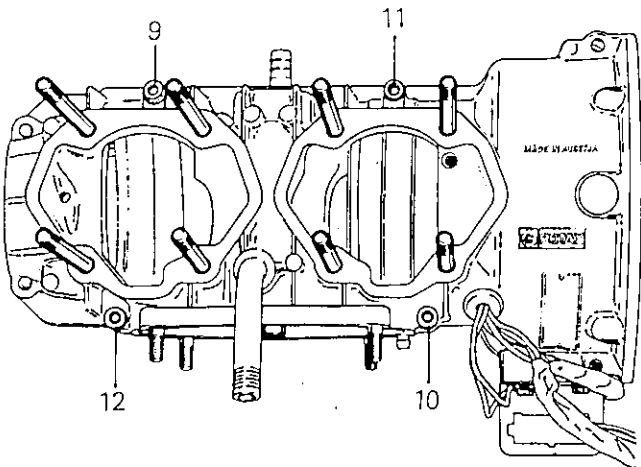
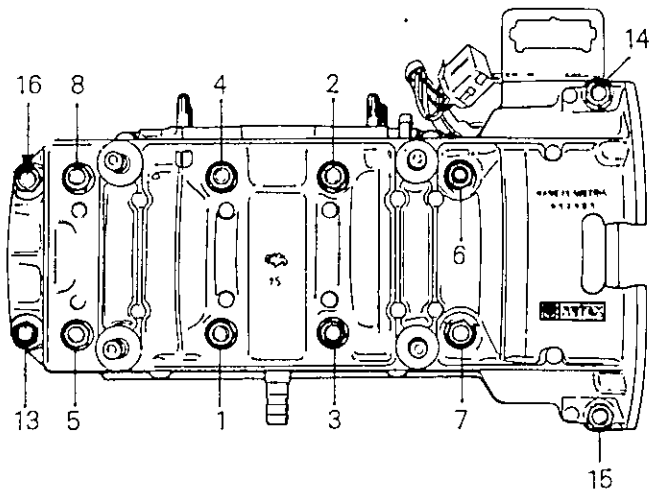


ⓐⓑ Prior to joining of crankcase halves, prepare mating surfaces with crankcase sealant primer then apply a light coat of crankcase sealant as per instructions printed on container.

SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

Position spring washers, lock washers, nuts or Allen screws on crankcase. Torque nuts to 1.9-2.2 kg-m (14-16 ft-lbs), and Allen screws to 0.8-1.1 kg-m (6-8 ft-lbs) following illustrated sequence.

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



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

26 At assembly, torque to 1.9-2.2 kg-m (14-16 ft-lbs).

28 At assembly, torque to 4.0-4.8 kg-m (29-35 ft-lbs).

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

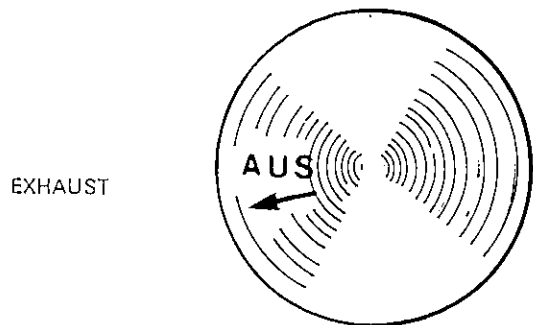
Top End

1 2 3 Place a clean cloth over crankcase to prevent circlips from falling into crankcase then use a pointed tool to remove circlips from piston.

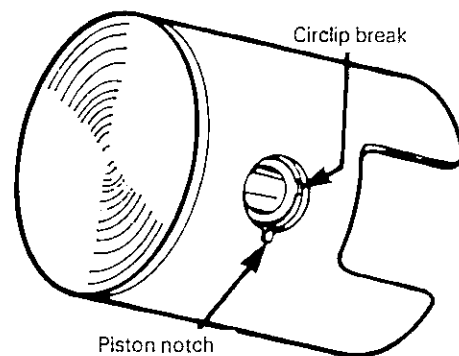
Drive the gudgeon pins in or out using a suitable drive punch and hammer.

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

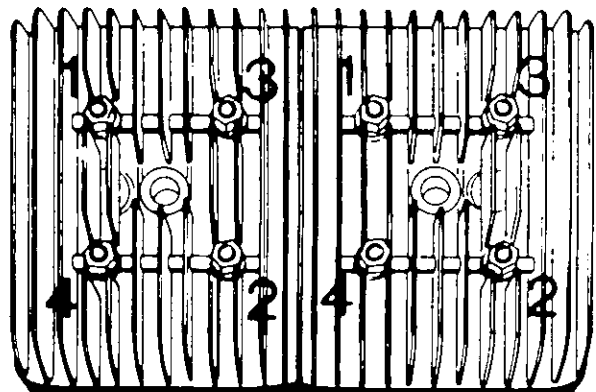
At assembly, place the pistons over the connecting rods with the letters AUS, over an arrow on the piston dome, facing direction of the exhaust port.



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



10 13 16 19 At assembly, torque to 1.5-1.8 kg-m (11-13 ft-lbs) following illustrated sequence.



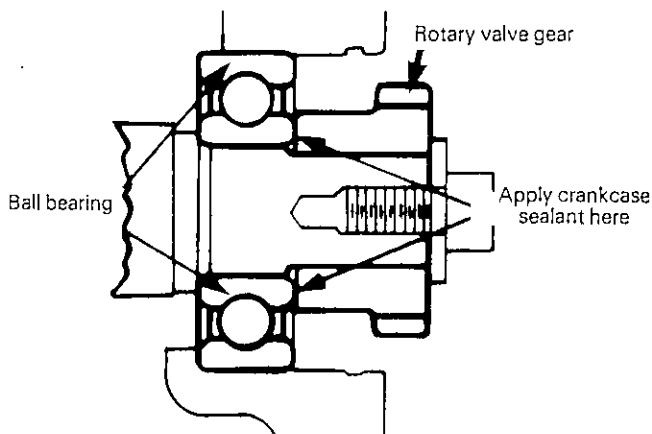
SECTION 04
SUB-SECTION 02 (TWO CYLINDER ENGINE)

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

⑩ At assembly, torque to 1.9-2.2 kg-m (14-16 ft-lbs).

Rotary Valve Mechanism

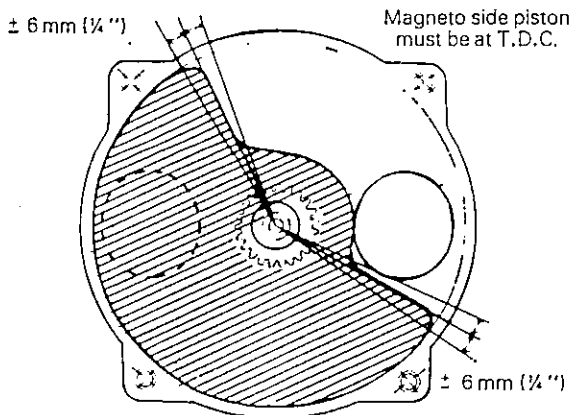
③ ⑦ At assembly, apply crankcase sealant on rotary valve gear and bearing mating surfaces.



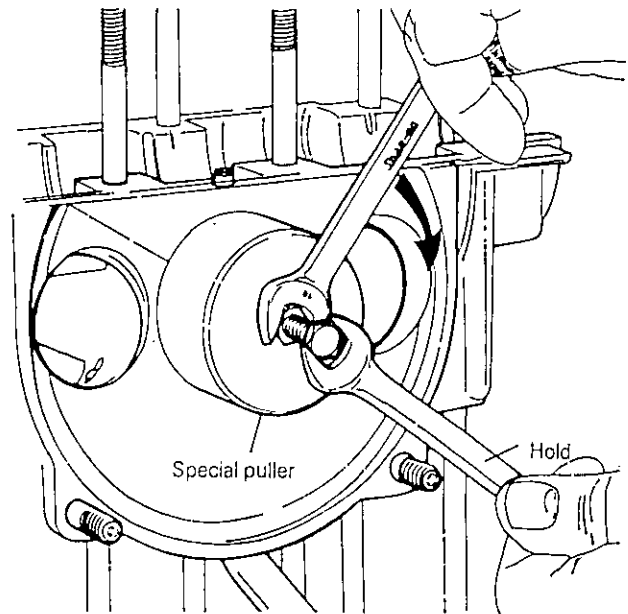
④ To correctly install the rotary valve disc proceed as follows:

- Bring magneto side piston to T.D.C. using a Top Dead Center Gauge (See Tools Section).
- Position the rotary valve disc on gear so that both edges fall within range of 6 mm (1/4") on either side of timing marks.

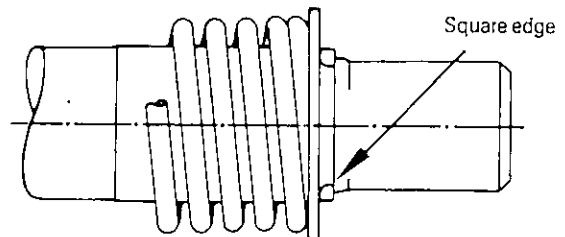
○ NOTE: The rotary valve disc is asymmetrical. Therefore, at assembly try positioning each side of disc on gear to determine best installation position.



⑤ to ⑬ To remove rotary valve shaft assembly from crankcase a special puller is needed. (See Tools Section). First remove locking ring then position special puller over shaft bore and screw puller bolt into rotary valve shaft. While holding puller bolt, turn puller nut clockwise until shaft comes out.



⑭ At assembly, position square edge of locking ring against shaft shoulder as illustrated.



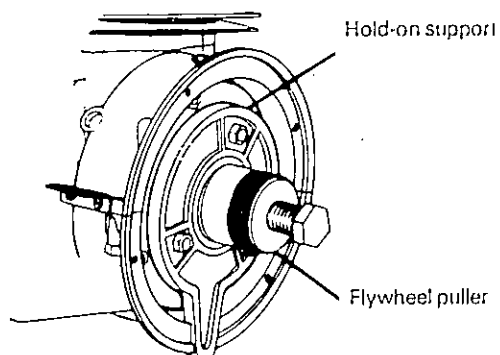
⑮ At assembly, apply a light coat of Loctite crankcase sealant on end cap sealing surface.

Magneto

① At assembly torque to 1.9-2.2 kg-m (14-16 ft-lbs).

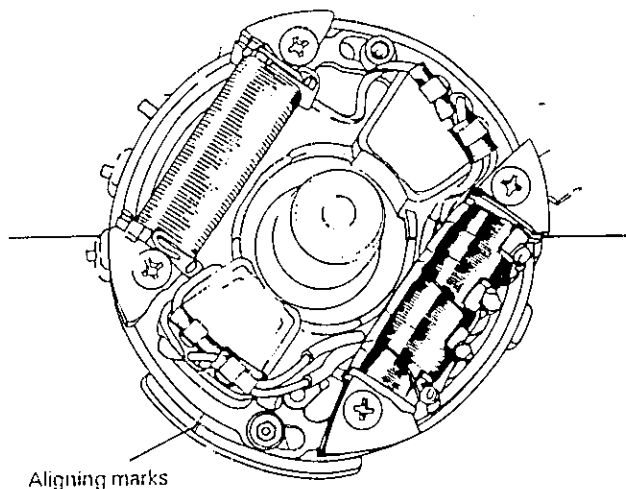
⑤ At assembly torque to 1.3 kg-m (9 ft-lbs).

⑦ With magneto retaining nut removed and hold-on support in place, install special puller onto hub. Tighten puller bolt and at same time, tap on bolt head using a hammer to release magneto from its taper. (See Special Tools).



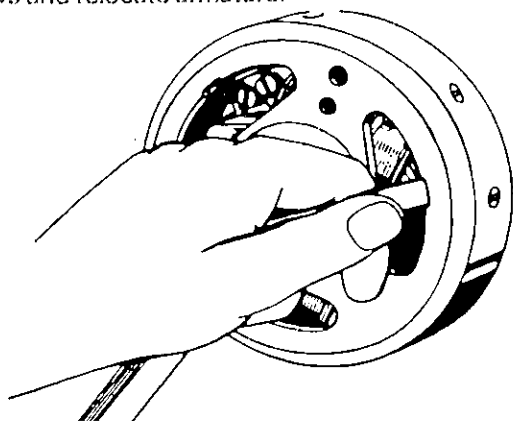
⑨ At assembly, apply Loctite Lock'n Seal on screw threads.

⑩ To facilitate timing procedure, perform primary adjustment by matching crankcase and armature plate marks.



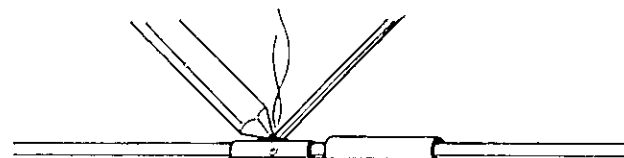
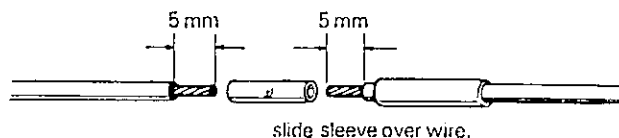
⑮ ⑯ ⑰ Whenever a coil is replaced, the air gap (distance between magnet and armature end) must be adjusted.

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

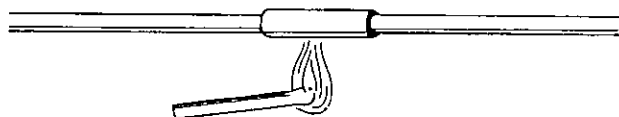


⑱ ⑲ Use a cable connector and rubber sleeve as illustrated, whenever a coil or cable is replaced.

1. Strip 5 mm of insulation from each end



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



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

CLEANING

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

▼ CAUTION: Clean armature using only a clean cloth.

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

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

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

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

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

INSTALLATION

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

- Check tightness of engine mount nuts.
- After throttle cable installation, check carburetor maximum throttle opening.
- Check pulley alignment.

