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## Section 04 ENGINE

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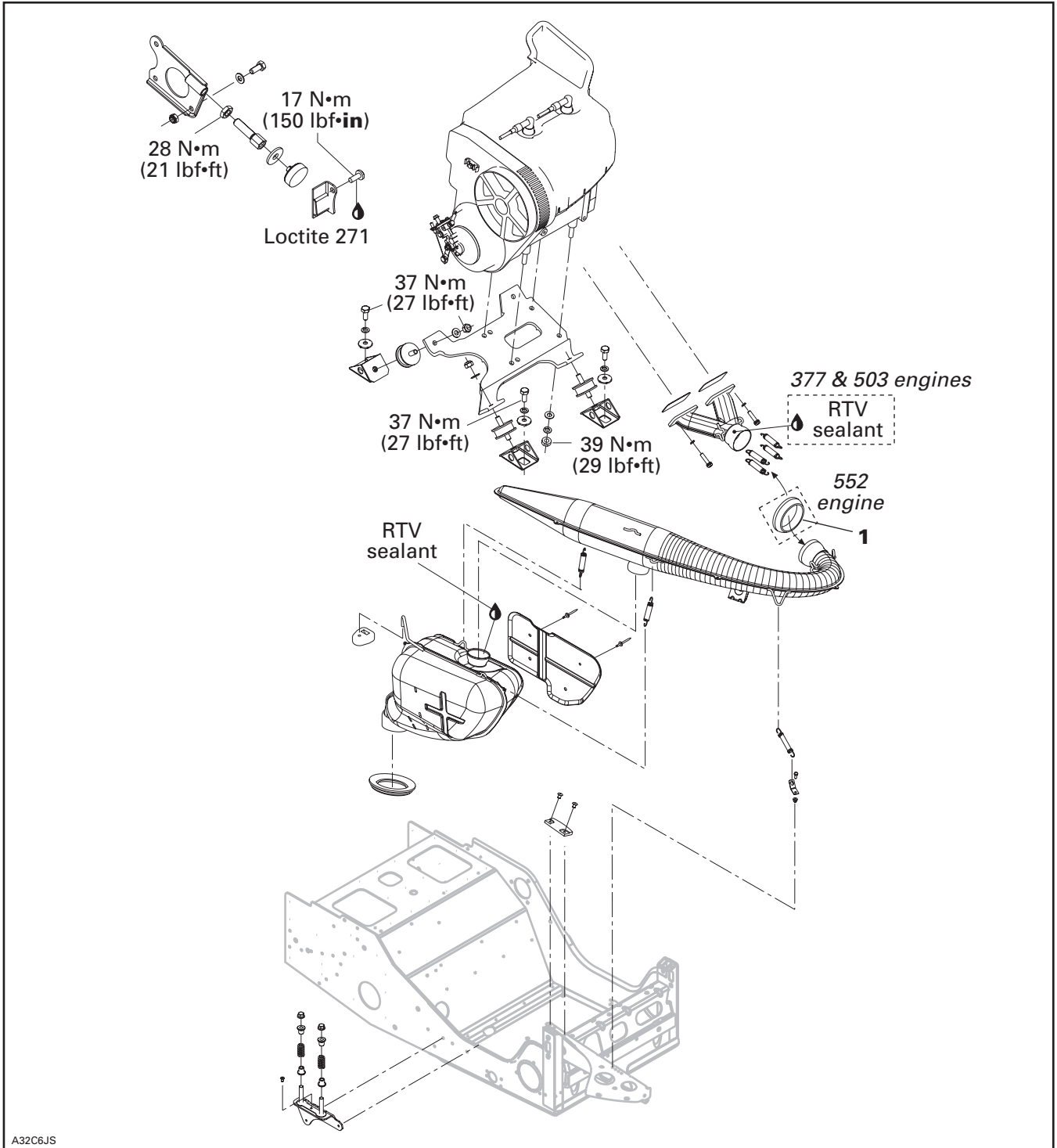
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# 377, 503 AND 552 ENGINE TYPES

## ENGINE REMOVAL AND INSTALLATION

377, 503 and 552 Engine Types



A32C6JS

## Section 04 ENGINE

### Subsection 02 (377, 503 AND 552 ENGINE TYPES)

## ENGINE REMOVAL AND INSTALLATION

Disconnect or remove the following:

### **⚠ WARNING**

Before disconnecting any electrical wire in starter system always first disconnect the **BLACK** negative battery cable (on electric starting models).

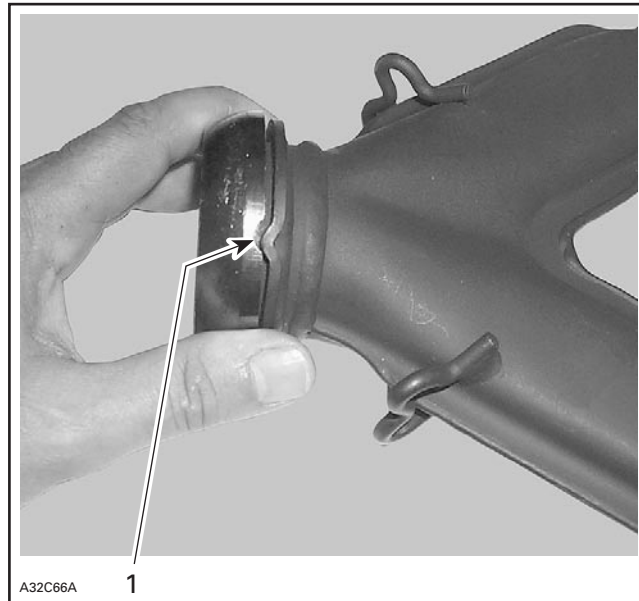
- negative cable from battery (on electric starting models)
- guard
- drive belt
- drive pulley using appropriate puller, refer to DRIVE PULLEY
- air silencer and carburetors
- impulse line from engine crankcase
- electrical connector housings
- exhaust pipe
- oil pump inlet line and plug it
- oil pump cable
- rewind cable: tie a knot near rewind housing and remove starting grip.

Tighten fasteners to recommended torque in appropriate exploded view.

Apply high temperature RTV sealant (P/N 293 800 090) on metal-to-metal exhaust joints.

### **552 Engine Only**

Install doughnut shaped exhaust gasket no. 1 with its both notches aligned with Y-manifold protrusions.



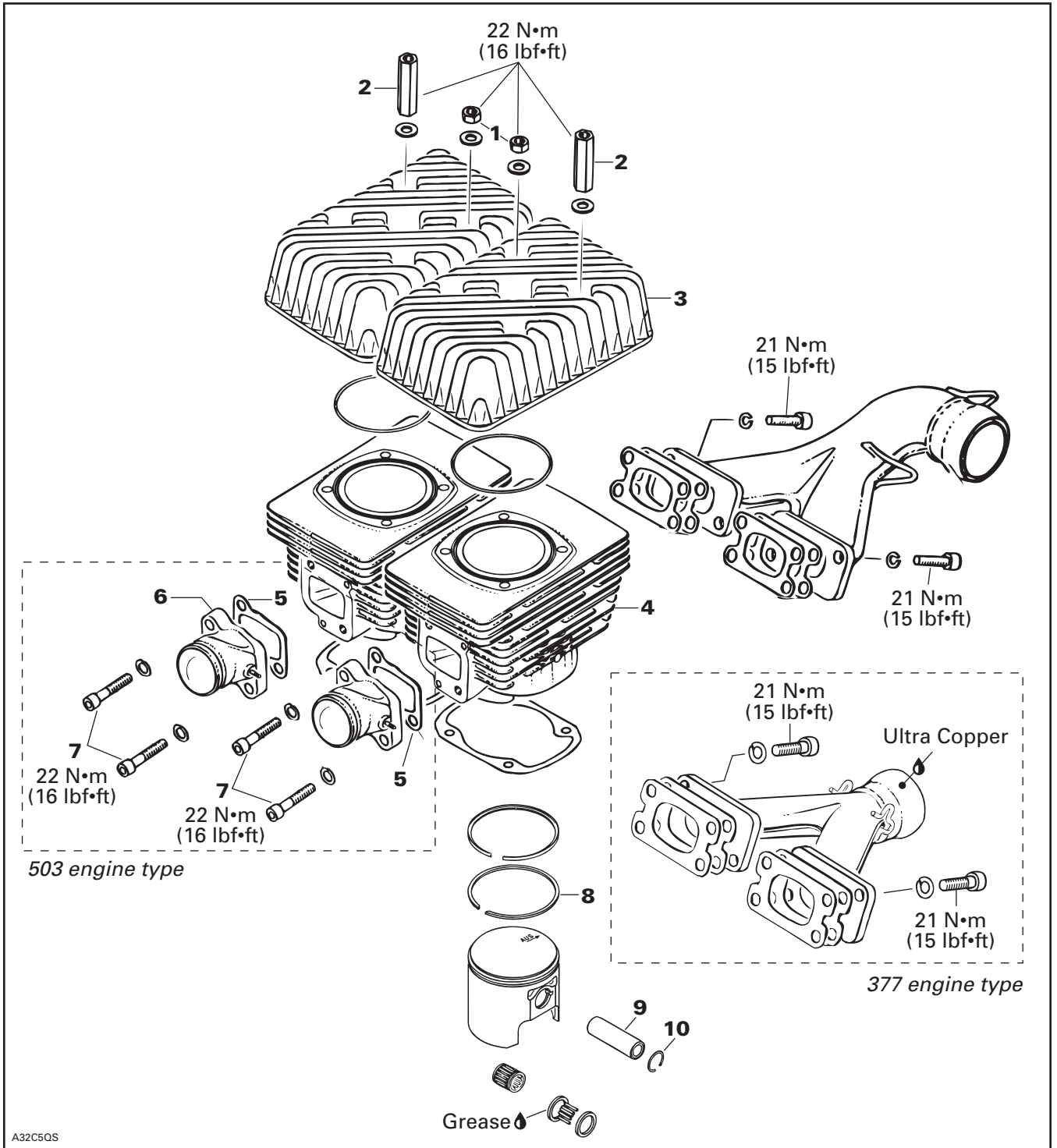
### **ONE SIDE SHOWN**

1. Notch aligned with protusion

**NOTE:** No RTV sealant required on doughnut shaped exhaust gasket no. 1.

**TOP END**

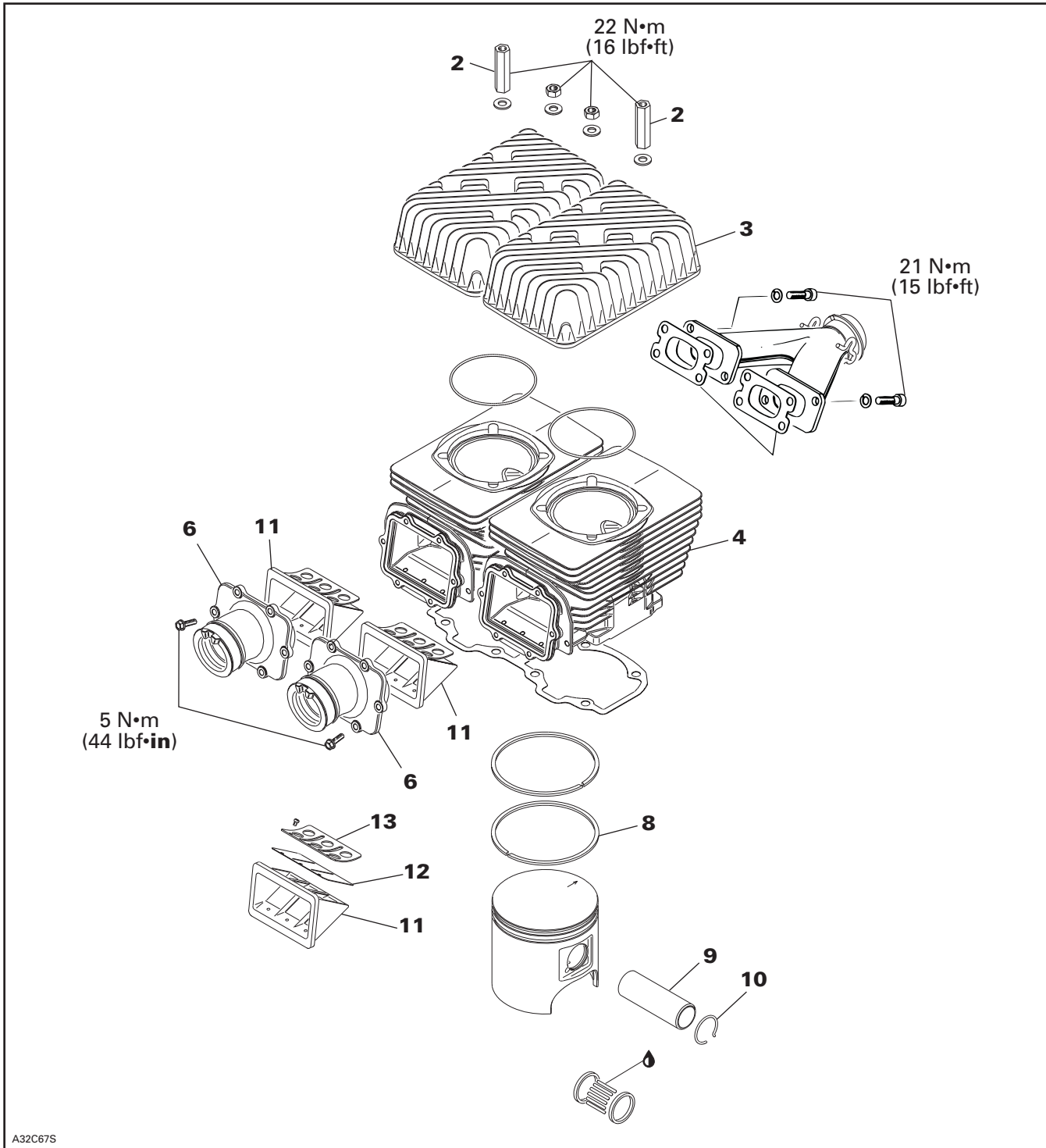
**377 and 503 Engine Types**



## Section 04 ENGINE

### Subsection 02 (377, 503 AND 552 ENGINE TYPES)

#### 552 Engine Types



A32C67S

## TROUBLESHOOTING

Before completely disassemble engine, check air-tightness. Refer to LEAK TEST AND ENGINE DIMENSION MEASUREMENT.

**NOTE:** The following procedures can be done without removing the engine from chassis.

## CLEANING

Discard all gaskets. Use Gasket Remover (P/N 413 708 500) to clean mating surfaces.

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 letters "AUS" and arrow on the piston dome must be visible after cleaning.

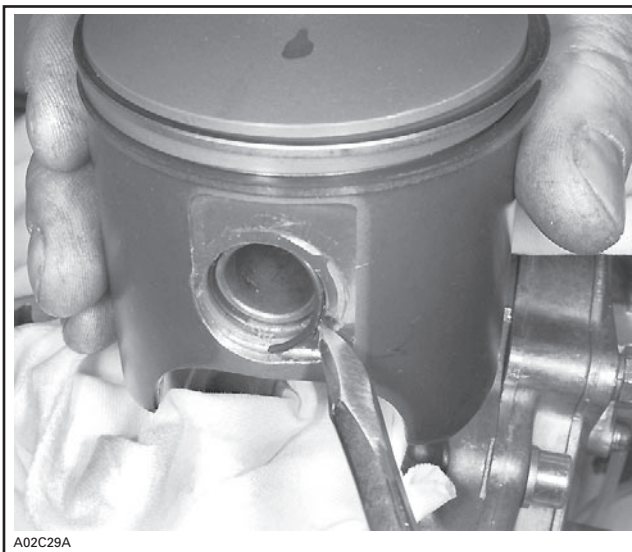
Clean the piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

## DISASSEMBLY

Remove top fan cowl, intake sockets and lower fan cowl.

Remove cylinder heads.

Place a clean cloth or rubber pad (P/N 529 023 400) over crankcase to prevent circlips **no. 10** from falling into crankcase. Then with a pointed tool inserted in piston notch, remove both circlips from piston **no. 8**.



A02C29A

TYPICAL

### 377 Engine

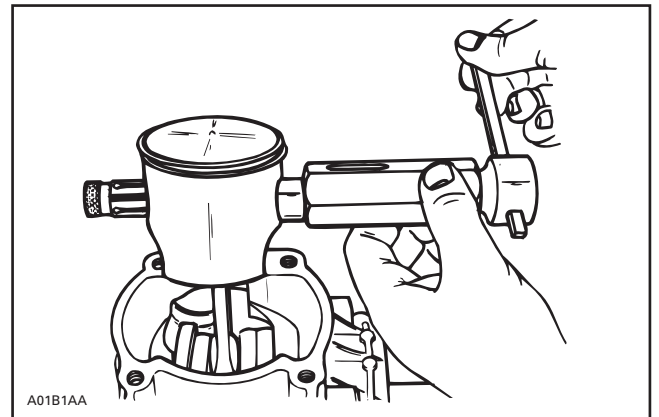
To remove piston pin **no. 9**, use piston pin puller (P/N 529 035 503).

Fully screw puller handle.

Insert puller end into piston pin.

Screw (LH threads) extracting nut.

Hold puller firmly and rotate puller handle counter-clockwise to pull piston pin.



A01B1AA

TYPICAL

**NOTE:** The PTO cylinder or fan housing have to be removed to give access to MAG piston pin with the puller.

### 503 and 552 Engines

On these engines, piston pin needle bearing is mounted without a cage.

**NOTE:** The PTO cylinder or fan housing have to be removed to give access to MAG piston pin with the puller.

Use piston pin puller (P/N 529 035 503) along with 18 mm sleeve kit (P/N 529 035 541) and locating sleeve (P/N 529 023 800).

**NOTE:** The locating sleeve is the same that contains new cageless bearing.

Place a clean cloth or rubber pad (P/N 529 023 400) over crankcase to prevent circlips **no. 10** from falling into crankcase. Then with a pointed tool inserted in piston notch, remove both circlips from piston **no. 8**.



## Section 04 ENGINE

### Subsection 02 (377, 503 AND 552 ENGINE TYPES)

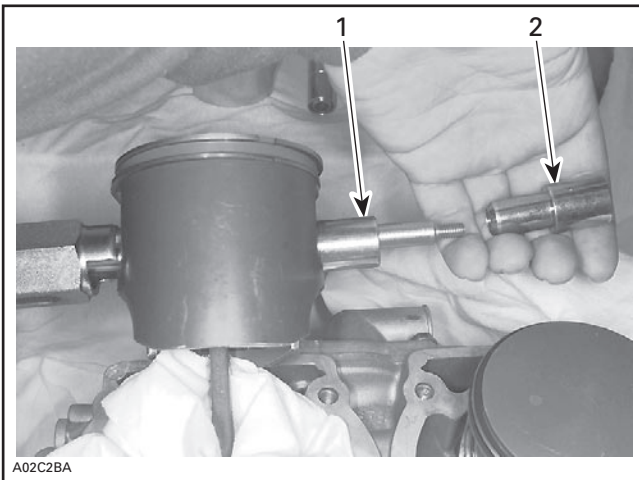
Insert piston pin puller (P/N 529 035 503) making sure it sits squarely against piston.



**TYPICAL**

1. Properly seated all around

Install sleeve then shouldered sleeve over puller rod.



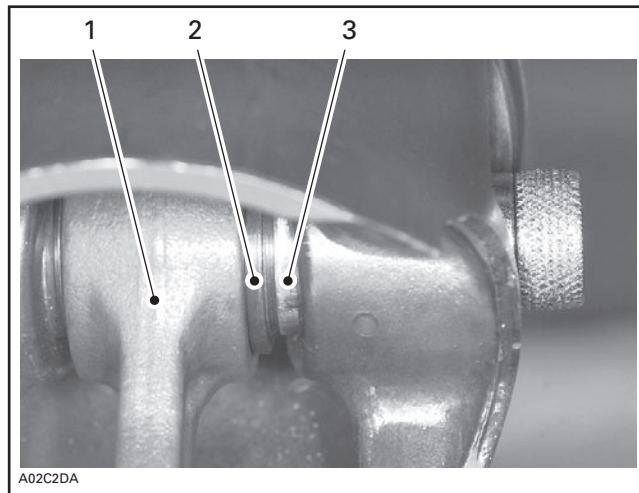
**TYPICAL — INSTALLATION OF SLEEVE KIT**

1. Sleeve
2. Shouldered sleeve

Pull out piston pin **no. 10** by unscrewing puller until shouldered sleeve end is flush with thrust washer of piston pin bearing.



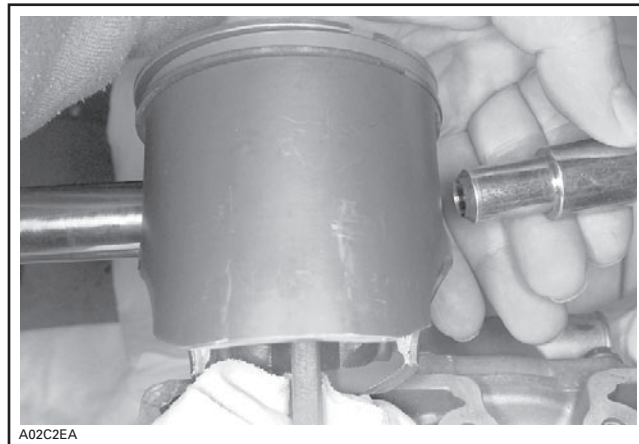
**TYPICAL — PISTON PIN EXTRACTION**



**TYPICAL**

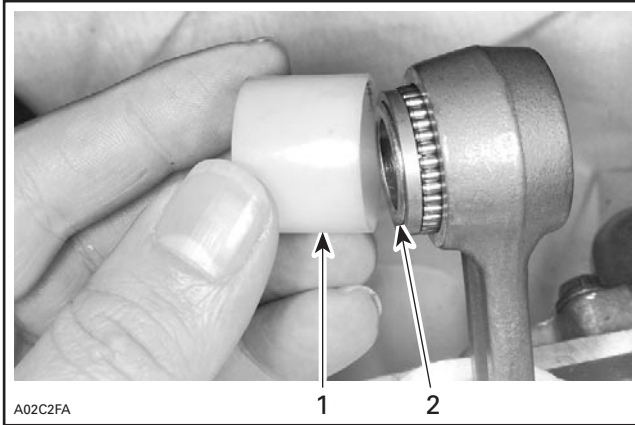
1. Sleeve inside bearing
2. Thrust washer
3. Shouldered sleeve end

Remove puller. Pull out shouldered sleeve carefully.



**TYPICAL**

Remove piston from connecting rod.  
Install locating sleeve. Then push needle bearings along with thrust washers and sleeve.



**TYPICAL**

- 1. Locating sleeve
- 2. Sleeve

**NOTE:** 0.25 and 0.5 mm oversized piston and rings are available if necessary.

Use a locking tie to fasten all needles and thrust washers along with locating sleeve.

**INSPECTION**

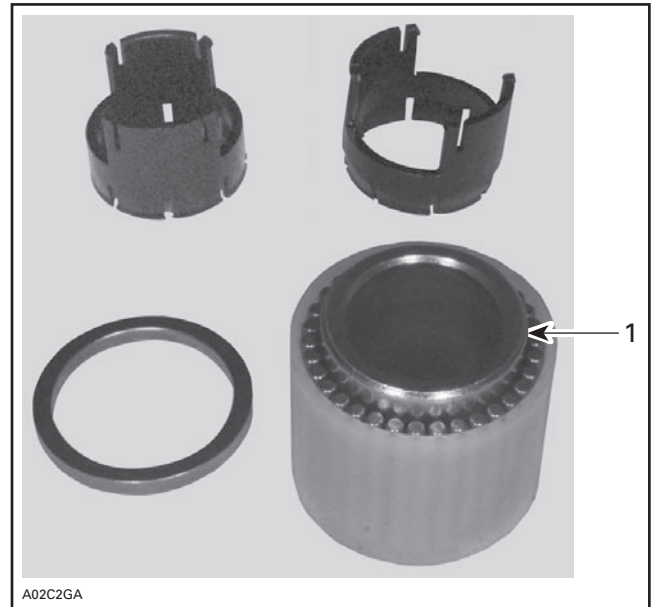
Refer to ENGINE DIMENSIONS MEASUREMENT.

**ASSEMBLY**

**503 and 552 Engines**

When reinstalling original needle bearings, make sure that 31 needles are inserted between sleeve and locating sleeve.

When installing a new cageless bearing, replace half plastic cages by sleeve.



**TYPICAL**

- 1. Sleeve

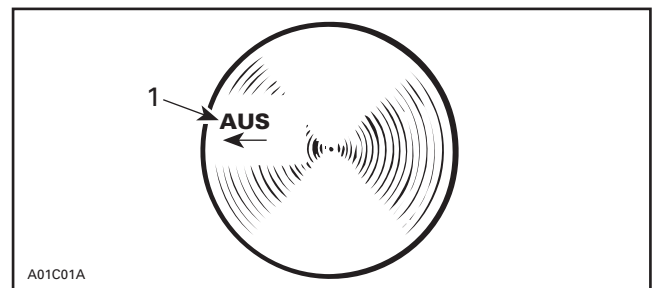
Grease thrust washers and install them on each end of needles.

Insert cageless bearing into connecting rod.



**TYPICAL — CAGELESS BEARING AND SLEEVE INSTALLED**

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



- 1. Exhaust

## Section 04 ENGINE

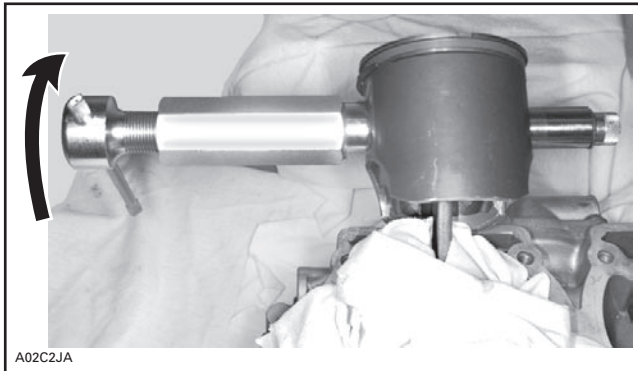
### Subsection 02 (377, 503 AND 552 ENGINE TYPES)

Install shouldered sleeve.



TYPICAL — SHOULDERED SLEEVE INSTALLATION

Install piston pin puller and turn handle until piston pin is correctly positioned in piston.

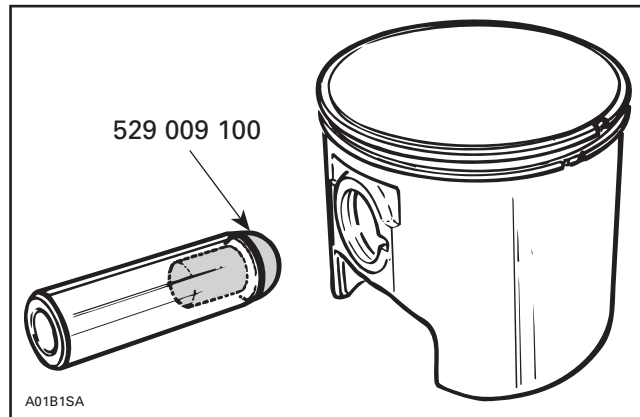


TYPICAL

– Remove piston pin puller and sleeve kit.

#### 377 Engine

To center the piston pin with the connecting rod bearing, use centering tool (P/N 529 009 100).



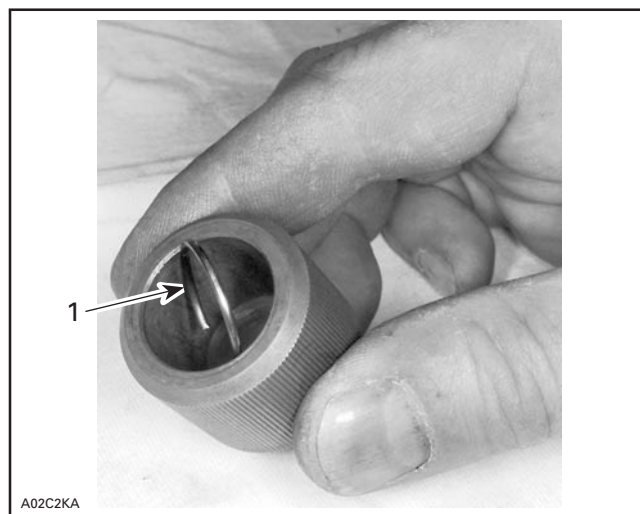
**NOTE:** The circlip on the opposite side can be installed before pin installation, the tool will easily go out.

Use piston pin puller (P/N 529 035 503) to install a piston pin that cannot be installed as described above.

#### All Engines

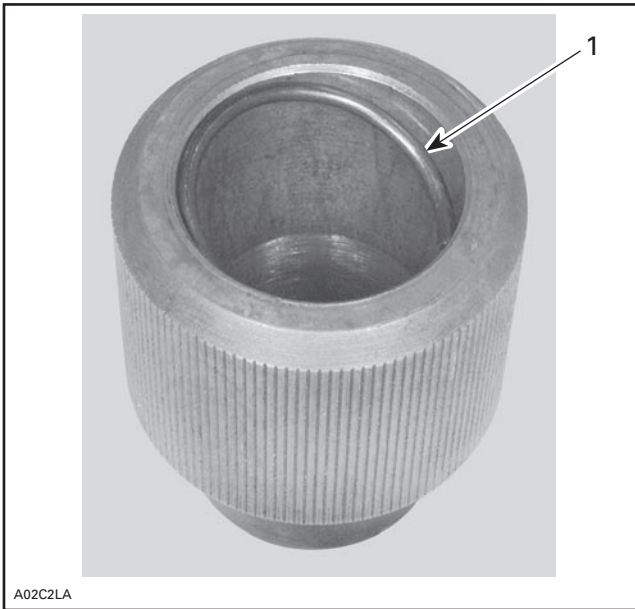
To minimize the effect of acceleration forces on circlip, install each circlip so the circlip break is at 6 o'clock as illustrated. Use piston circlip installer (P/N 529 035 561 for 503 and P/N 529 035 562 for 552 engine).

Insert circlip in tool at an angle.



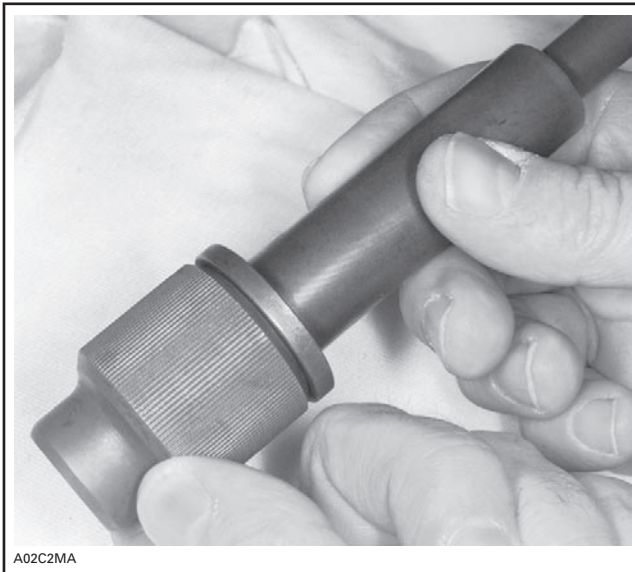
1. Circlip

Square it up using a finger.

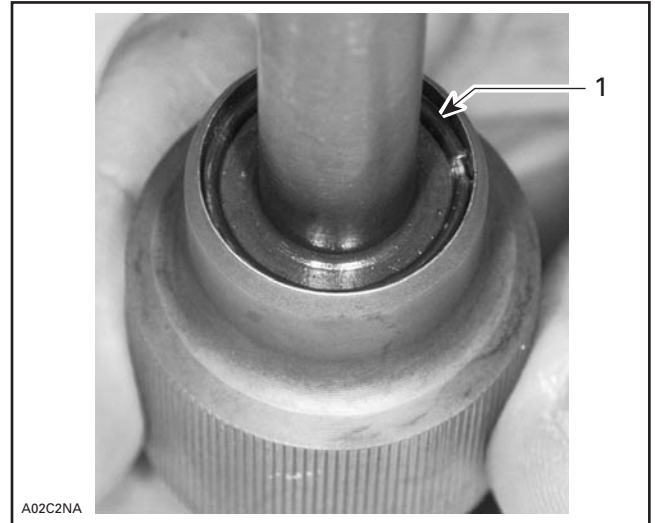


1. Circlip

Continue to square it up using round end of circlip installer.

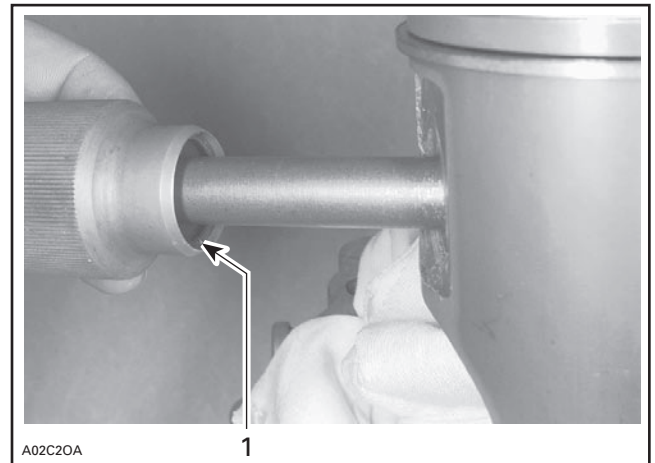


Using square end of tool, push circlip in until it rests in groove.



1. Circlip in groove

Mount tool in piston making sure that circlip break is facing down.



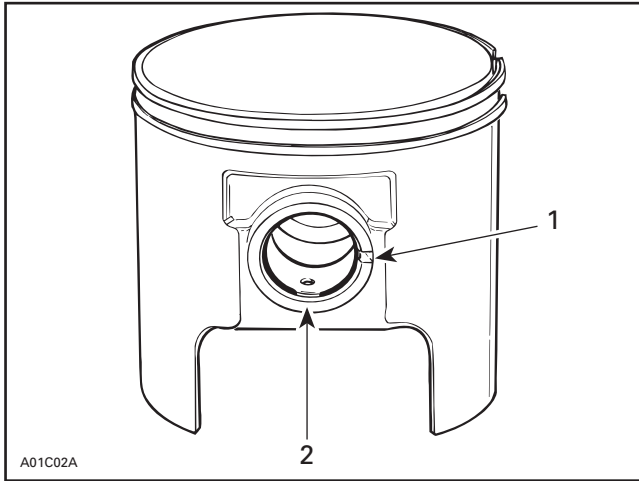
**TYPICAL**

1. Circlip break facing down

## Section 04 ENGINE

### Subsection 02 (377, 503 AND 552 ENGINE TYPES)

Hold tool firmly against piston then strike on round end of tool with a plastic hammer. Circlip will move from tool groove to piston groove.



1. Piston notch
2. Circlip break at 6 o'clock

**CAUTION:** Circlips must not move freely in the groove after installation. If so, replace them.

**NOTE:** Be sure to restore the chamfer around all cylinder sleeve port openings.

Before inserting piston in cylinder **no. 4**, lubricate the cylinder with new injection oil or equivalent.

Install proper ring compressor on piston assembly.

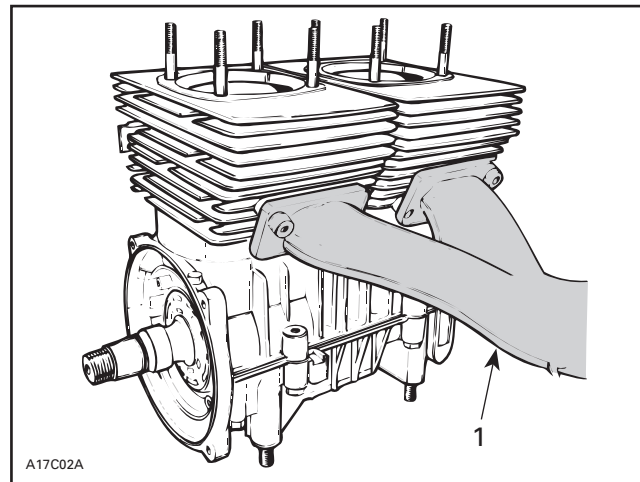
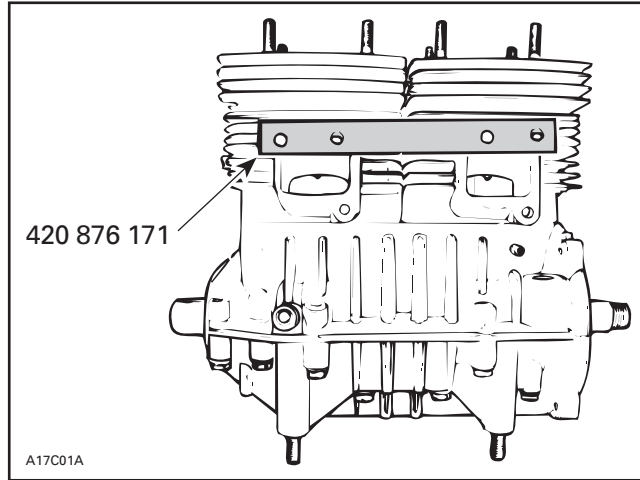
| ENGINE TYPE | RING COMPRESSOR P/N |
|-------------|---------------------|
| 377         | 420 876 090         |
| 503         | 420 876 970         |
| 552         | 420 876 972         |

**NOTE:** The ring compressor will not fit on over size pistons.

Check flatness of intake sockets **no. 6**. Refer to ENGINE DIMENSION MEASUREMENT and look for CHECKING SURFACE FLATNESS.

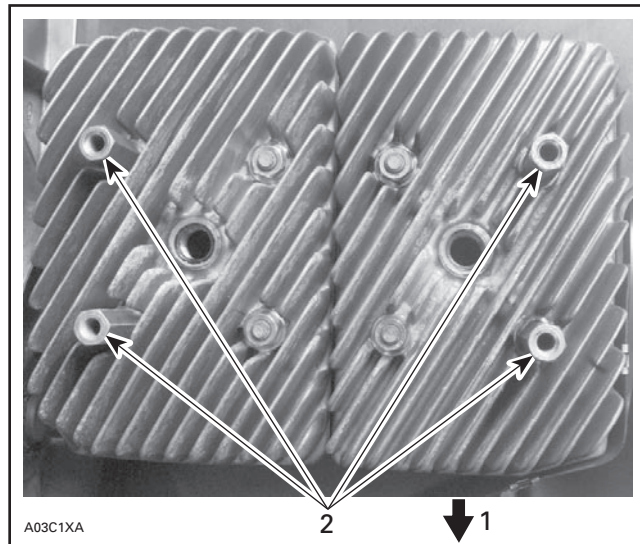
At cylinder **no. 4** and/or cylinder head **no. 3** installation, use aligning tool or exhaust manifold itself to ensure sealing of intake manifold and exhaust before tightening cylinder head nuts.

| ENGINE TYPE      | ALIGNING TOOL P/N |
|------------------|-------------------|
| 377, 503 and 552 | 420 876 171       |



1. Or use exhaust manifold to align cylinders

Position distance nuts **no. 2** as per photo.



1. Exhaust
2. Distance nuts

Cross torque cylinder head nuts **nos. 1 and 2** to 22 N•m (16 lbf•ft); torque each cylinder head individually.

Install armature plate, fan housing and then air deflector.

Install a gasket on each side of the air deflector.

Torque intake socket bolts to 22 N•m (16 lbf•ft).

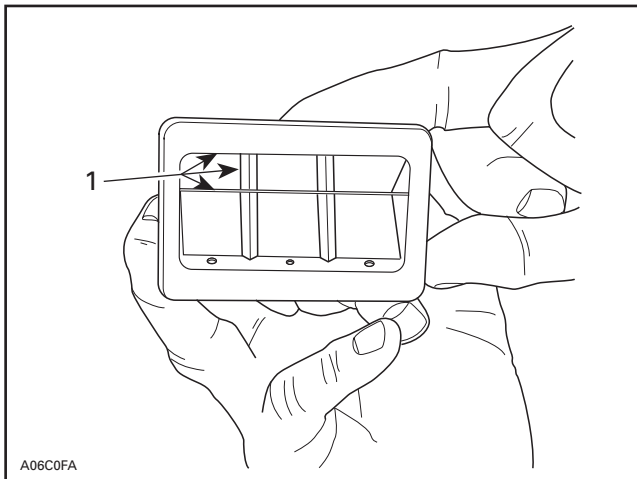
**552 Engine**

**12, Reed Valve**

Blades have a curved shape. Install with their curve facing reed block.

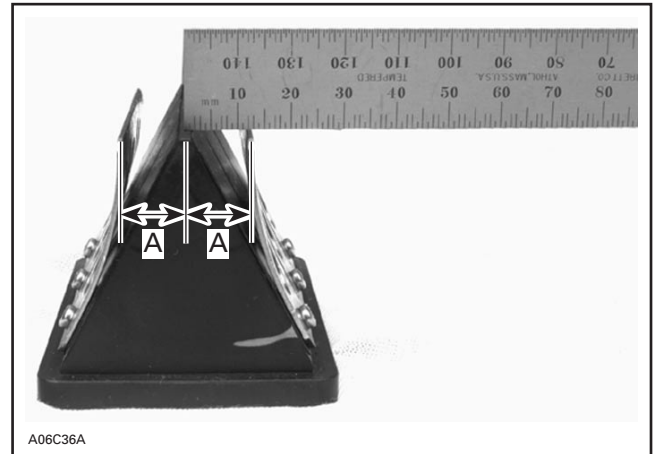
With blade stopper **no. 13** removed, check reed valve for proper tightness. There must be no play between blade and valve body when exerting a finger pressure on blade at blade stopper location.

In case of a play, turn blade upside down and re-check. If there is still a play, replace blade and/or valve body.



1. No play

Check distance from blade stopper outer edge and distance from center of reed valve block.



**TYPICAL**

A. 17.0 - 0, + 0.75 mm (.669 - 0, + .030 in)

Bent blade stopper as required to obtain the proper distance.

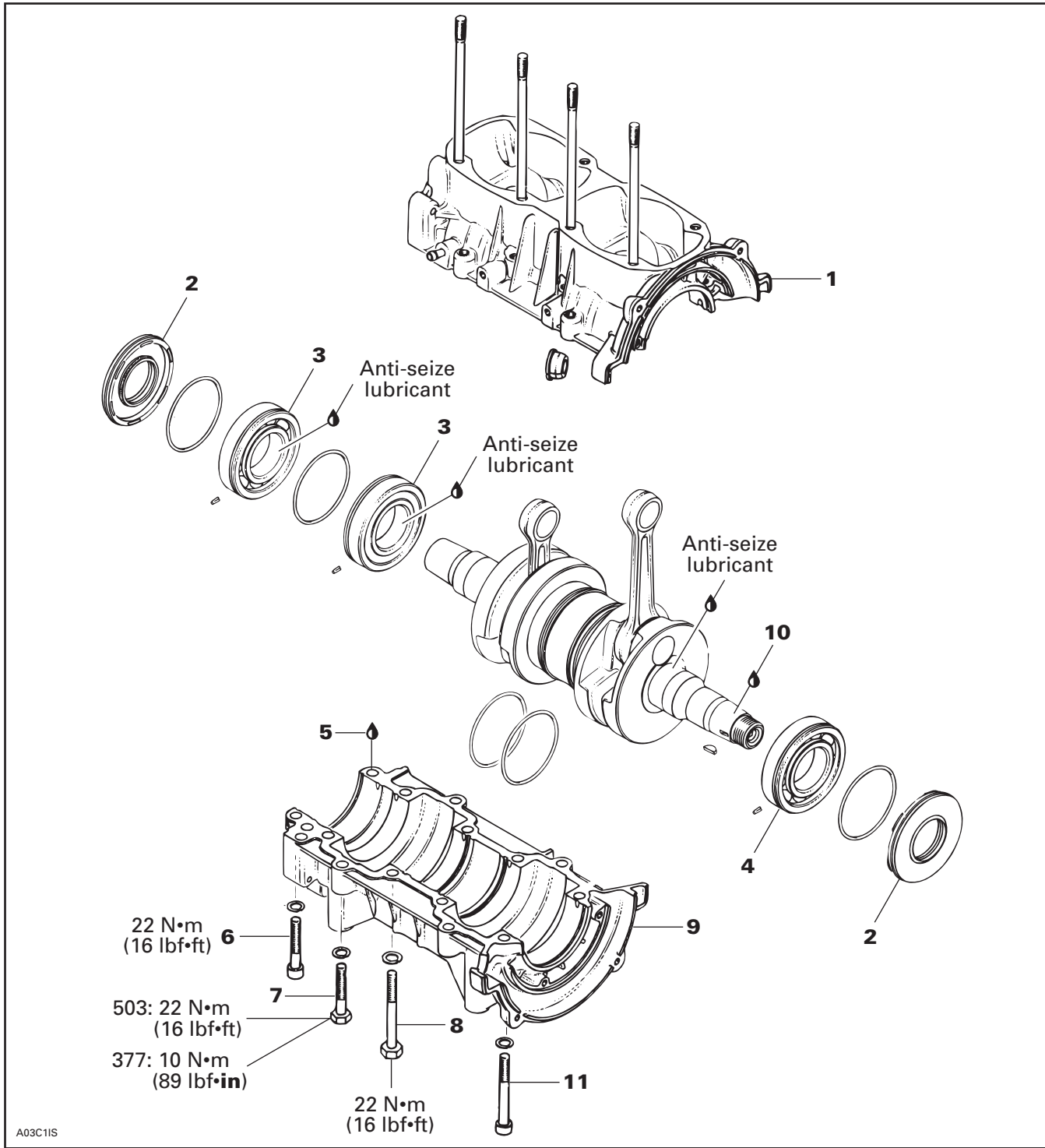
Blade stoppers may slightly interfere with cylinder during installation. Adjusted distance will be reduced automatically upon installation.

## Section 04 ENGINE

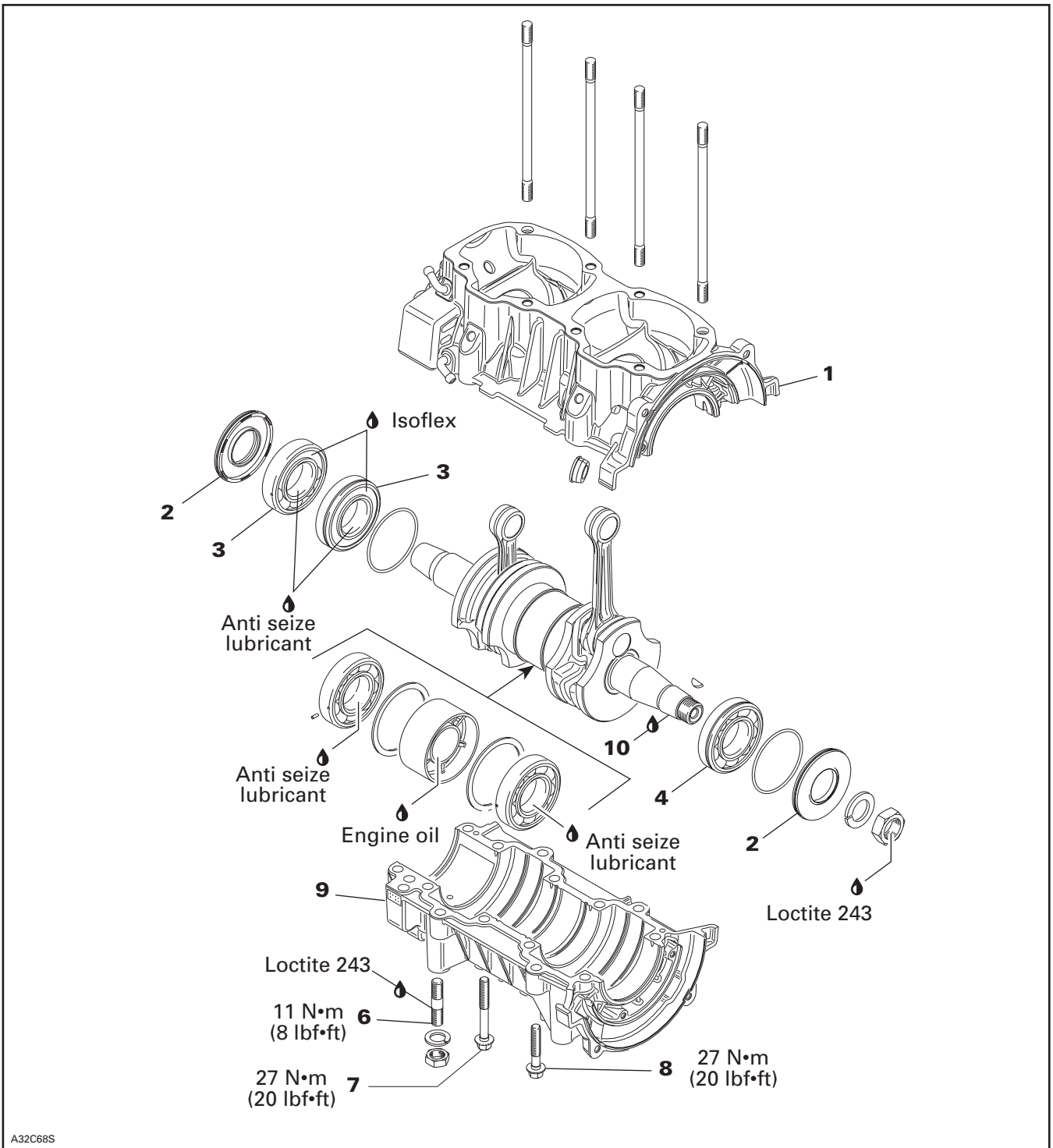
### Subsection 02 (377, 503 AND 552 ENGINE TYPES)

## BOTTOM END

### 377 and 503 Engine Types



**552 Engine Types**





## Section 04 ENGINE

### Subsection 02 (377, 503 AND 552 ENGINE TYPES)

**NOTE:** Engine must be removed from chassis to perform the following procedures.

Remove engine from chassis.

Remove fan guard, rewind starter, starting pulley, trigger coil wire from 4-connector housing, mag-neto flywheel then fan housing.

Remove stator plate.

## CLEANING

Discard all seals, gaskets and O-rings.

Clean all metal components in a non-ferrous metal cleaner. Use gasket remover (P/N 413 708 500) accordingly.

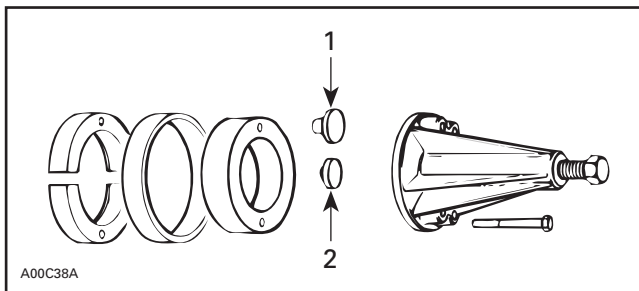
Remove all trace of Loctite 243 from crankshaft taper.

Remove old sealant from crankcase mating surfaces with Bombardier gasket remover (P/N 413 708 500).

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

## DISASSEMBLY

To remove bearings nos. 3 and 4 from crankshaft, use a protective cap and a special puller, as illustrated.



1. PTO side
2. MAG side

## INSPECTION

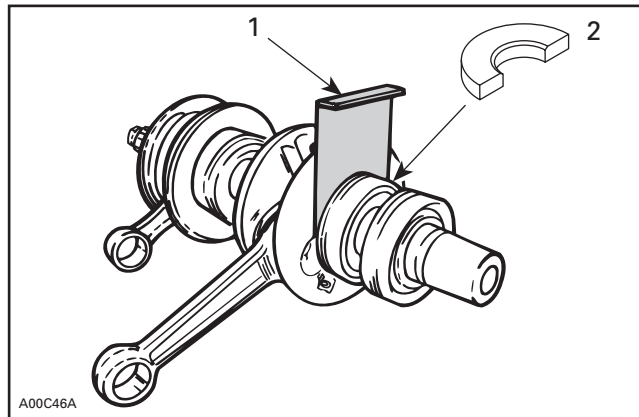
Refer to ENGINE DIMENSIONS MEASUREMENT.

## ASSEMBLY

Smear anti-seize lubricant (P/N 413 701 000) on part of crankshaft where bearing fits.

To check proper clearance between bearing no. 3 and counterweight, use feeler gauge (P/N 420 876 620).

Mount second bearing with distance gauge (P/N 420 876 822) for 377 and (P/N 420 876 824) for 503 for proper positioning.



1. Feeler gauge
2. Distance gauge

Prior to installation, place bearings into an oil container filled with oil heated to 75°C (167°F).

This will expand bearings and ease installation. Install bearings with groove as per exploded view.

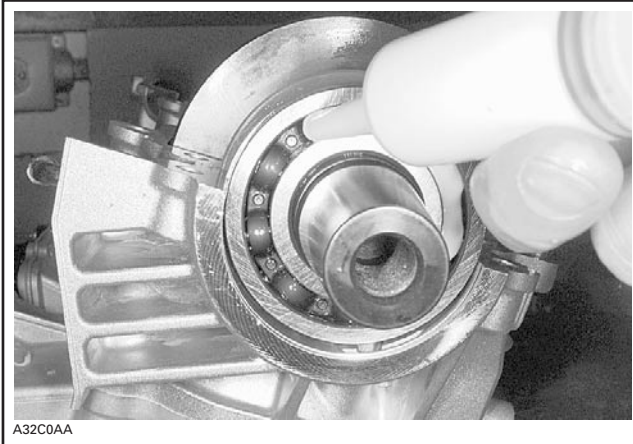
### 552 Engine

Bearings must be lubricated with Isoflex grease (P/N 293 550 021).

**CAUTION:** Use only the recommended Isoflex grease. Make sure not to push Isoflex grease between outside bearing race and half crankcase.

**NOTE:** The 50 g tube corresponds to 50 cc of grease. Put 35 to 40 mL of grease in a syringe.

With the syringe, fill the outer ball bearings with 35 to 40 mL of Isoflex grease.

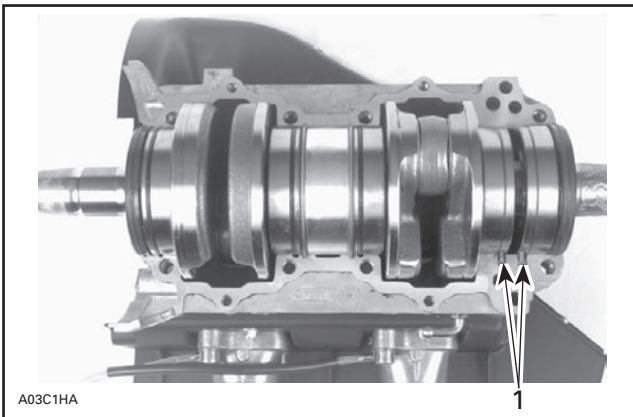


*TYPICAL — BALLS COATED WITH A SEAM OF GREASE*

**All Engines**

Bearings are pressed on crankshaft until they rest against radius. These radius maintain the gap needed for bearings lubrication.

When installing crankshaft, position drive pins **no. 12** as illustrated.



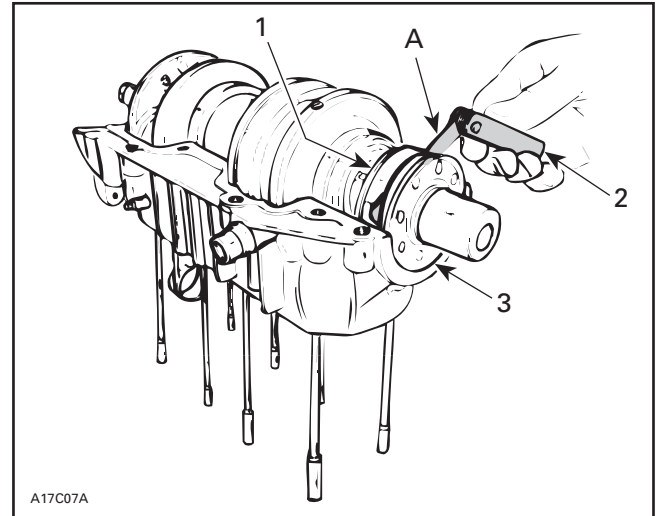
*TYPICAL*

- 1. Drive pins

At seal **no. 2** assembly, apply a light coat of lithium grease on seal lip.

For bearing lubrication purpose, a gap of 1.0 mm (.040 in) must be maintained between seals and bearings.

When installing plain oil seals (seal without locating ring or without spacing legs), ensure to maintain 1.0 mm (.040 in) gap.



- 1. Bearing
- 2. Feeler gauge
- 3. Plain oil seal
- A. 1 mm (.040 in)

Crankcase halves **nos. 1** and **9** are factory matched and therefore, are not interchangeable as single halves.

**Crankcase Assembly**

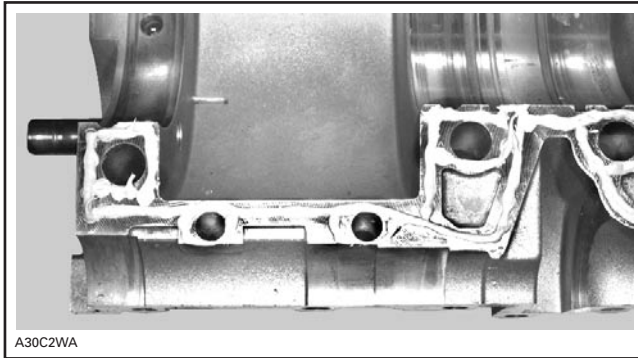
**IMPORTANT:** The total assembly sequence, including sealing compound spreading, screwing and torquing of bolts according to the proper sequence must be performed within 10 minutes.

Before screwing both parts of crankcase, seal it with a sealing compound (P/N 420 297 906). Make sure surfaces are clean and degreased before applying sealing compound.

## Section 04 ENGINE

### Subsection 02 (377, 503 AND 552 ENGINE TYPES)

Spread a seam of 1.2 mm (1/16 in) maximum in diameter on surface of lower crankcase half.



TYPICAL

As far as possible, sealing compound must be applied in one run to avoid any risks of leaking through the crankcase.

Align both crankcase halves before tightening screws.

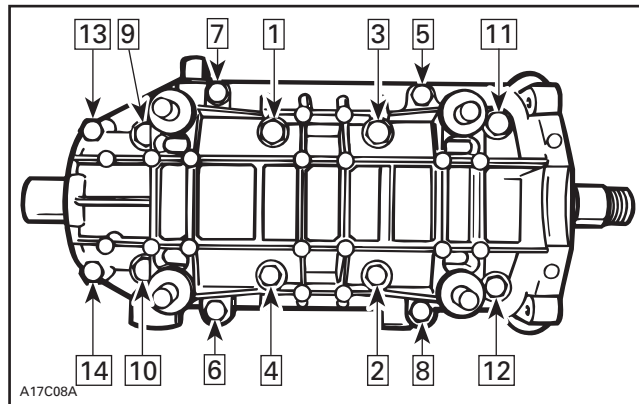
Position the crankcase halves together and tighten bolts by hand then install and tighten armature plate on magneto side to correctly align the crankcase halves.

Screw the 4 central bolts (bolts nos. 1 to 4 in the torquing sequence) to squeeze compound between crankcase halves before it starts to dry.

**NOTE:** Sealing compound spreading plus screwing of engine four central bolts must be performed within 2 minutes to ensure a good sealing and avoid linking.

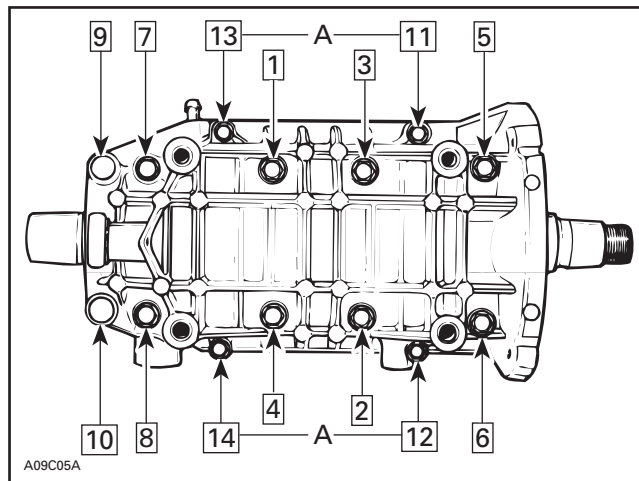
Screw all crankcase bolts in place in the following sequence and to the appropriate torque through a two steps torquing: first, screw bolts up to 60% of the final torque (13 N•m (115 lbf•in) for M8 bolts), then, tighten to the required torque (i.e. 22 N•m (16 lbf•ft)).

#### 503 and 552 Engine Types



TIGHTENING SEQUENCE FOR 503 ENGINE TYPE

#### 377 Engine Type



TIGHTENING SEQUENCE FOR 377 ENGINE TYPE

A. 10 N•m (89 lbf•in)  
All the other screws are torqued to 22 N•m (16 lbf•ft)

#### All Engines

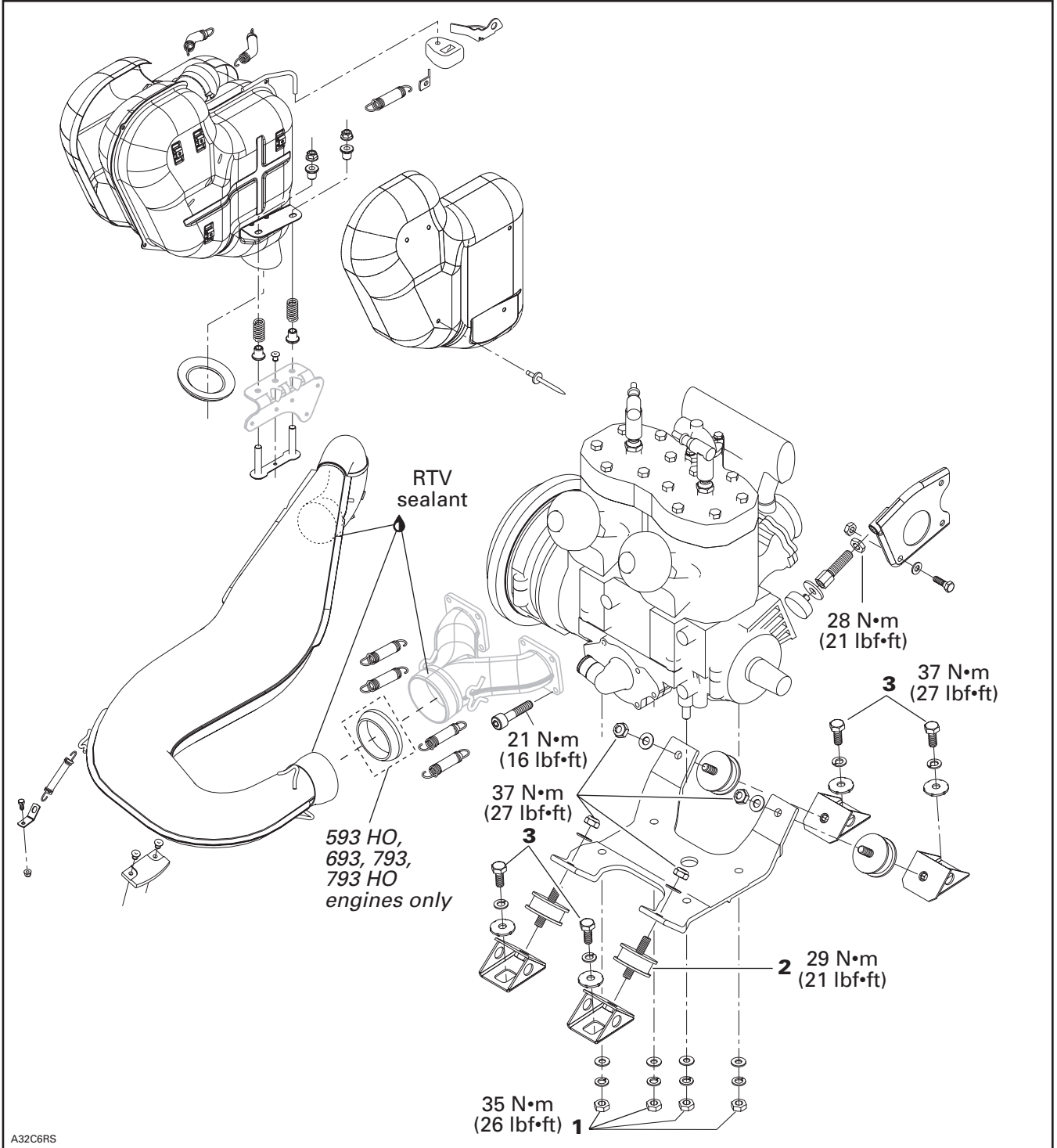
To install magneto, refer to CDI MAGNETO.

#### BREAK-IN

After rebuilding an engine always observe a break-in period as described in *Operator's Guide*.

# 493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES

ZX Series



TYPICAL

## Section 04 ENGINE

### Subsection 03 (493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES)

## MAINTENANCE

Tuned pipe gear clamps must be retightened to 3.5 N•m (31 lbf•in) after the first 10 hours of use, then every 3200 km (2000 m.).

**CAUTION:** Do not over tighten.

**NOTE:** Replace with new ones any damaged gear clamps. Refer to appropriate *Parts Catalogs* to order new gear clamps.

## REMOVAL FROM VEHICLE

Open hood.

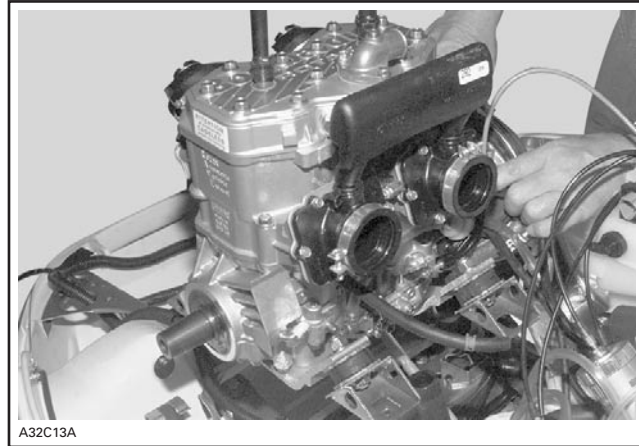
Remove tuned pipe and muffler.

Drain engine coolant.

Remove or unplug the following then lift off engine from engine compartment.

**NOTE:** Use of a hoist is recommended.

- guard
- air silencer
- drive belt
- rewind starter handle
- drive pulley  
(not necessary if engine does not have to be disassembled)
- hood, refer to BODY
- carburetors
- impulse hose and electrical connectors
- oil injection inlet line at oil injection pump, install hose pincher
- oil pump cable
- coolant hoses between cylinder head and radiator
- coolant by-pass hose
- coolant hose at front of coolant reservoir
- engine support screws
- engine stopper (left rear of engine).



TYPICAL — ENGINE REMOVAL

### 1,2,3,4, Engine Support Nut and Manifold Screw

Torque the engine/support nuts **no. 1** to 35 N•m (26 lbf•ft).

Torque rubber mounts **no. 2** to support bracket to 29 N•m (21 lbf•ft).

Torque rubber mount/support nuts to 37 N•m (27 lbf•ft).

Torque support brackets/chassis screws **no. 3** to 37 N•m (27 lbf•ft).

Torque manifold screws **no. 4** to: M6 for 10 N•m (89 lbf•in) and M8 for 23 N•m (17 lbf•ft).

## INSTALLATION ON VEHICLE

To install engine on vehicle, reverse removal procedure. However, pay attention, to all appropriate component/system reinstallation procedures described throughout this *Shop Manual* and to the following:

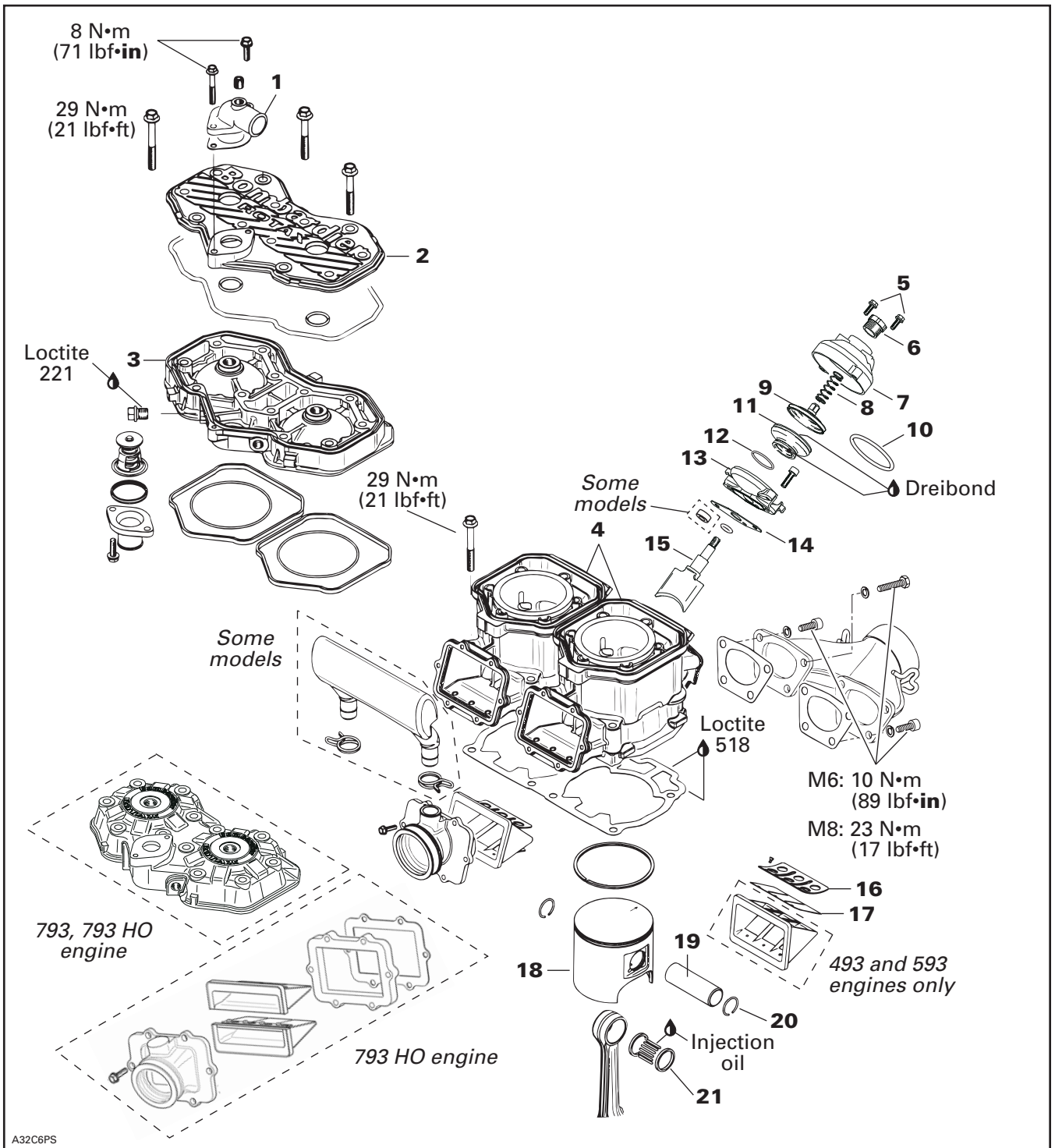
- After throttle cable installation, check carburetor maximum throttle opening and oil injection pump adjustment.
- Check pulley alignment and drive belt tension.
- Seal exhaust ball joints with RTV sealant (P/N 293 800 090).

### 593 HO, 693, 793, 793 HO Engines

Install doughnut shaped exhaust gasket **no. 4** with both of its notches aligned with Y-manifold protrusions.

**NOTE:** No RTV sealant required on doughnut shaped exhaust gasket **no. 4**.

**TOP END**



## Section 04 ENGINE

### Subsection 03 (493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES)

## TROUBLESHOOTING

Before completely disassembling the engine, check airtightness. Refer to LEAK TEST AND ENGINE DIMENSION MEASUREMENT.

**NOTE:** The following procedures can be done without removing the engine from the chassis.

## COMPONENT REMOVAL WITH THE ENGINE INSTALLED

Most engine components can be removed with engine on vehicle such as:

- cylinder head
- cylinder head cover
- piston(s)
- piston ring(s)
- cylinder(s)
- rewind starter
- oil pump
- water pump
- magneto flywheel
- RAVE valve(s)
- reed valve(s).

## CLEANING

Discard all gaskets and O-rings.

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 letters "AUS" (over an arrow on the piston dome) must be visible after cleaning.

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

## DISASSEMBLY

### RAVE System

**NOTE:** RAVE stands for Rotax Adjustable Variable Exhaust.

Remove spring clip or screws **no. 5**, cover **no. 7** and spring **no. 8**.

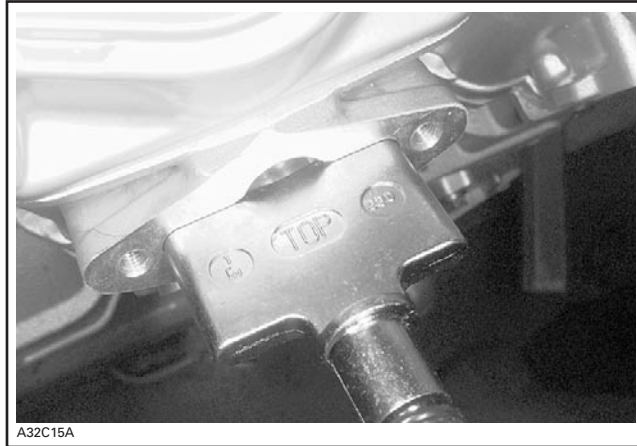
Remove spring **no. 10**.

Unscrew valve piston **no. 9**.

Remove bellows **no. 11** and spring **no. 12**.

Remove cylindrical screws. Remove valve housing **no. 13**.

Pull out exhaust valve **no. 15**.



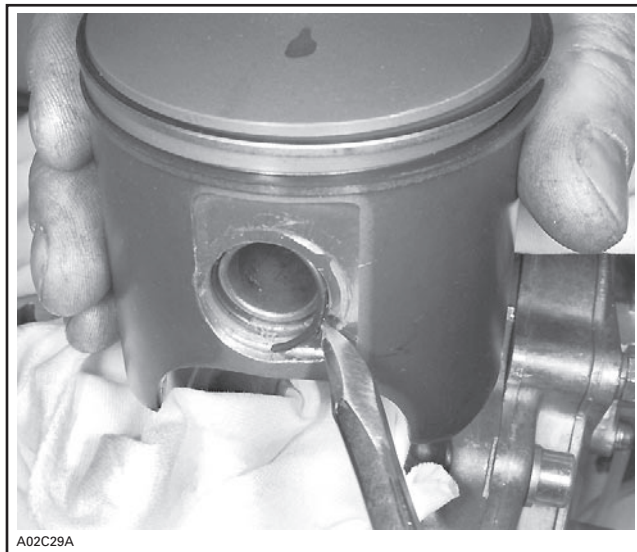
RAVE VALVE PARTIALLY REMOVED

### 2, Cylinder

Remove spark plugs, coolant outlet **no. 30**. Unscrew cylinder head cover **no. 2** then cylinder head **no. 3**.

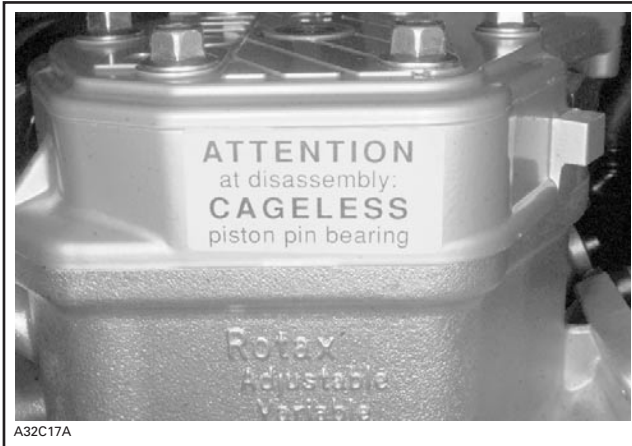
### 18, Piston

Place a clean cloth or rubber pad (P/N 529 023 400) over crankcase. Then with a pointed tool inserted in piston notch, remove both circlips **no. 20** from piston **no. 18**.



TYPICAL

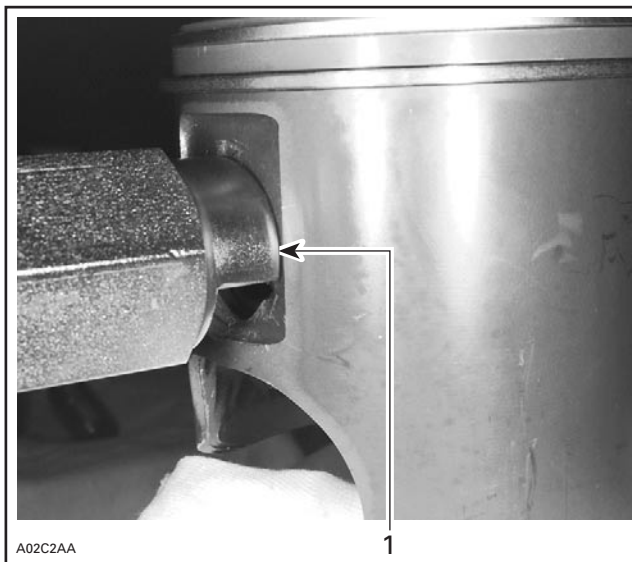
All engines are equipped with cageless piston pin bearings.



Use piston pin puller (P/N 529 035 503) along with 18 mm sleeve kit (P/N 529 035 041) for 493 engine and 20 mm sleeve kit (P/N 529 035 542) for 593, 693 and 793 engines. Use also a locating sleeve.

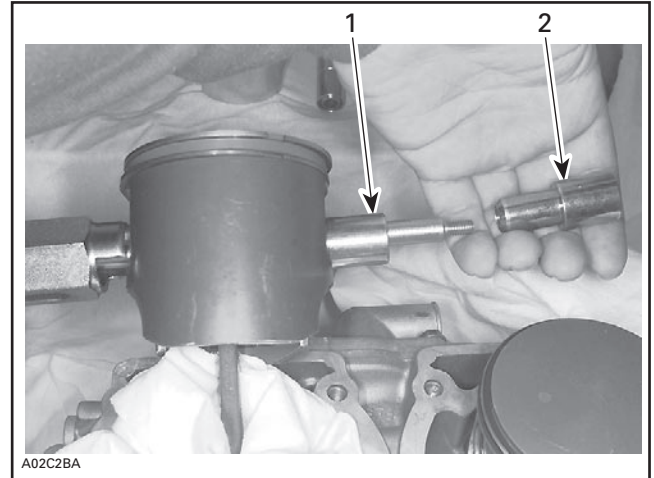
**NOTE:** The locating sleeve is the same that contains new cageless bearing.

Insert piston pin puller (P/N 529 035 503) making sure it sits squarely against piston.



**TYPICAL**  
1. Properly seated all around

Install sleeve then shouldered sleeve over puller rod.



**TYPICAL — INSTALLATION OF SLEEVE KIT**

1. Sleeve
2. Shouldered sleeve

Screw (LH threads) extracting nut.

Pull out piston pin no. 19 by unscrewing puller until shouldered sleeve end is flush with thrust washer of piston pin bearing.

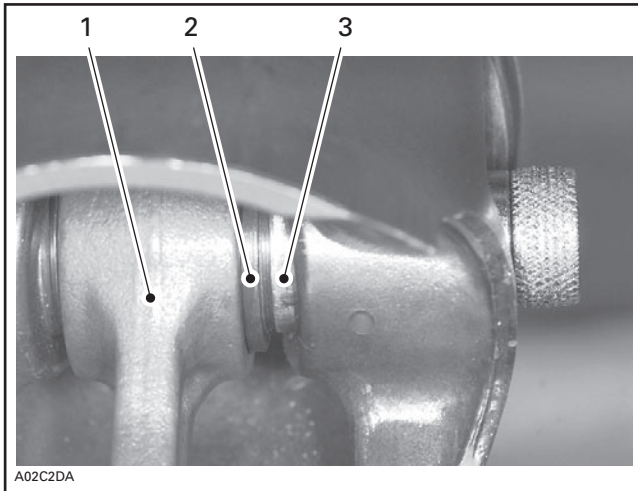


**TYPICAL — PISTON PIN EXTRACTION**



## Section 04 ENGINE

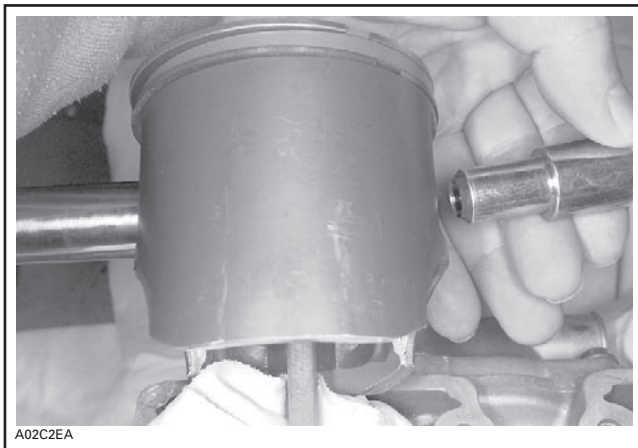
### Subsection 03 (493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES)



#### TYPICAL

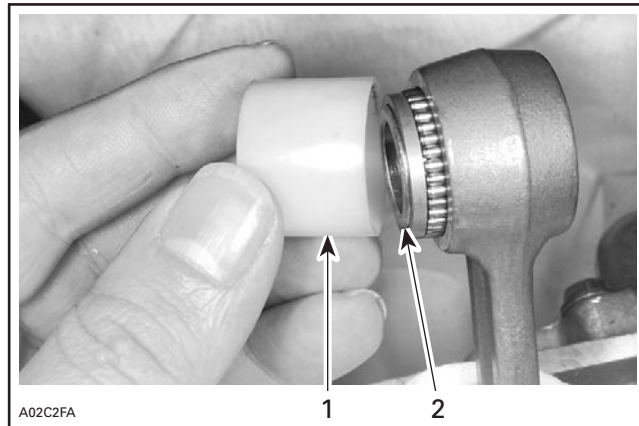
1. Sleeve inside bearing
2. Thrust washer
3. Shouldered sleeve end

Remove puller. Pull out shouldered sleeve carefully.



#### TYPICAL

Remove piston from connecting rod.  
Install locating sleeve. Then push needle bearings along with thrust washers and sleeve.



#### TYPICAL

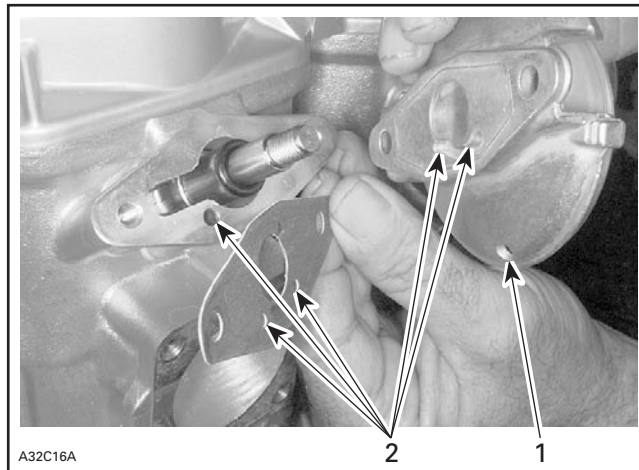
1. Locating sleeve
2. Sleeve

## INSPECTION

**NOTE:** Refer to LEAK TEST AND ENGINE DIMENSIONS MEASUREMENT.

## RAVE System

Check valve rod housing and cylinder for clogged passages.



1. Draining hole
2. Passages

**NOTE:** Oil dripping from draining hole indicates a loosen spring or damaged bellows.

**11, Bellows**

Check for cracked, dried or perforated bellows.

**8, Spring**

| ENGINE TYPE         | SPRING P/N  | COLOR     | WIRE DIA. mm (in) | FREE LENGTH mm (in) | PRELOAD IN N (LBF) AT COMPRESSED LENGTH OF 14 mm (.551 in) |
|---------------------|-------------|-----------|-------------------|---------------------|--|
| 493                 | 420 239 948 | Grey      | 1.0 (.039)        | 38.0 (1.50)         | 19.5 (4.37)  |
| 593, 593 HO and 693 | 420 239 944 | Brown     | 0.9 (.035)        | 48.5 (1.91)         | 15.9 (3.56)  |
| 793 HO              | 420 239 942 | Black     | 0.8 (.031)        | 42.5 (1.67)         | 7.3 (1.64)   |
| 793                 | 420 239 941 | Dark blue | 0.8 (.031)        | 52.5 (2.07)         | 10.5 (2.36)  |

**ASSEMBLY**

**RAVE System**

Install RAVE valve with its mention top as illustrated in the removal photo. Tighten red cap **no. 6** screw to bottom.

**4,18, Cylinder and Piston**

**493 and 593 Engines Only**

Be sure to restore the chamfer around all cylinder sleeve port openings.

**All Engines**

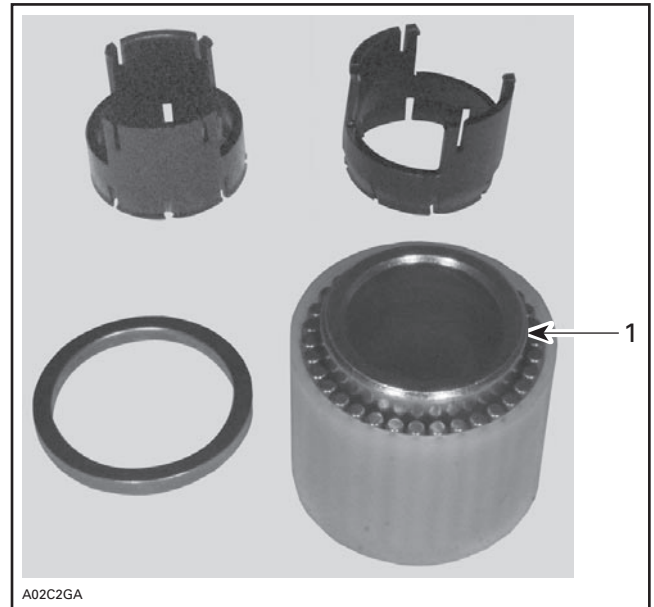
Before inserting piston in cylinder, lubricate the cylinder with new injection oil or equivalent.

**2,3,4, Cylinder Head Cover, Cylinder Head and Cylinder**

Make sure parts' sealing surfaces are flat. Refer to LEAK TEST AND ENGINE DIMENSION MEASUREMENT and look for CHECKING SURFACE FLATNESS.

When installing a new cageless bearing, replace half plastic cages with sleeve.

**NOTE:** 493 engine cageless bearings have 31 needles. 593, 593 HO, 693, 793 and 793 HO engine cageless bearings have 28 needles.



A02C2GA

*TYPICAL*

1. Sleeve

Oil needle bearing with injection oil. Grease thrust washers and install them on each end of needles.

Insert cageless bearing into connecting rod.



A02C2HA

*TYPICAL — CAGELESS BEARING AND SLEEVE INSTALLED*

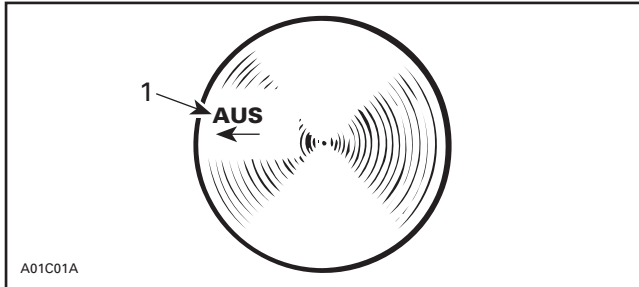
Heat piston with a 100 W lamp or a heat gun before piston installation.

**CAUTION:** Piston temperature must not exceed 46°C (115°F). Never use direct flame to heat the piston and never freeze the pin.

## Section 04 ENGINE

### Subsection 03 (493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES)

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



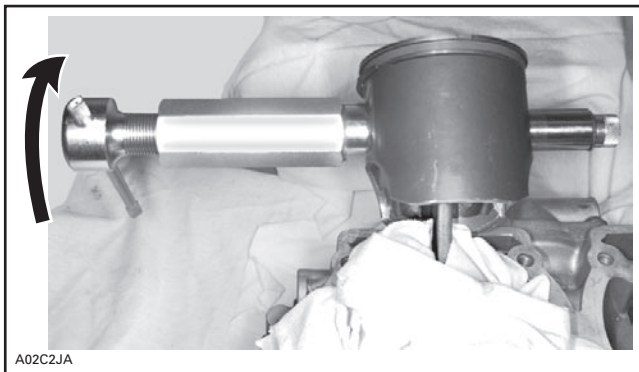
1. Exhaust

Install shouldered sleeve.



TYPICAL — SHOULDERED SLEEVE INSTALLATION

Install piston pin puller and turn handle until piston pin is correctly positioned in piston.



TYPICAL

#### All Models

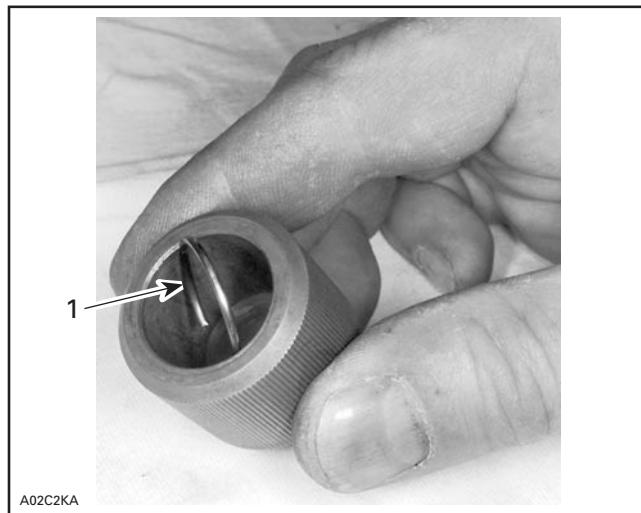
**CAUTION:** Always install new circlips.

To minimize the effect of acceleration forces on circlip, install each circlip so the circlip break is at 6 o'clock as illustrated. Use appropriate piston circlip installer.

| ENGINE TYPE                      | PISTON CIRCLIP INSTALLER (P/N) |
|----------------------------------|--------------------------------|
| 493                              | 529 035 561                    |
| 593, 593 HO, 693, 793 and 793 HO | 529 035 686                    |

#### 493 Engine

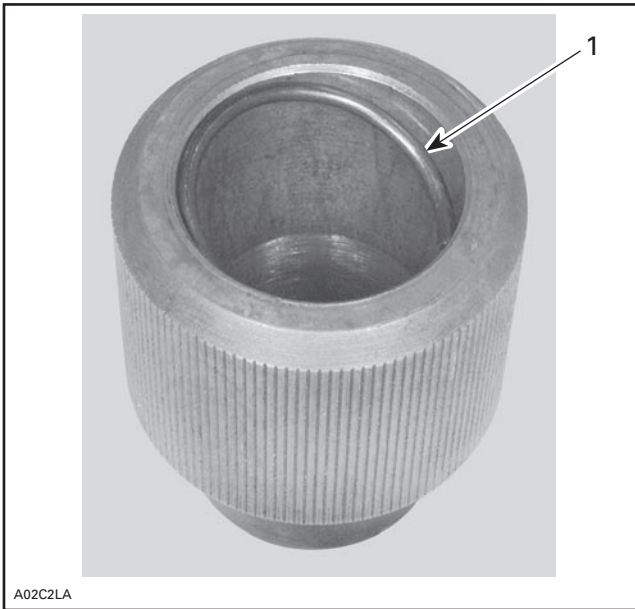
Insert circlip in tool at an angle.



TYPICAL

1. Circlip

Square it up with your finger.

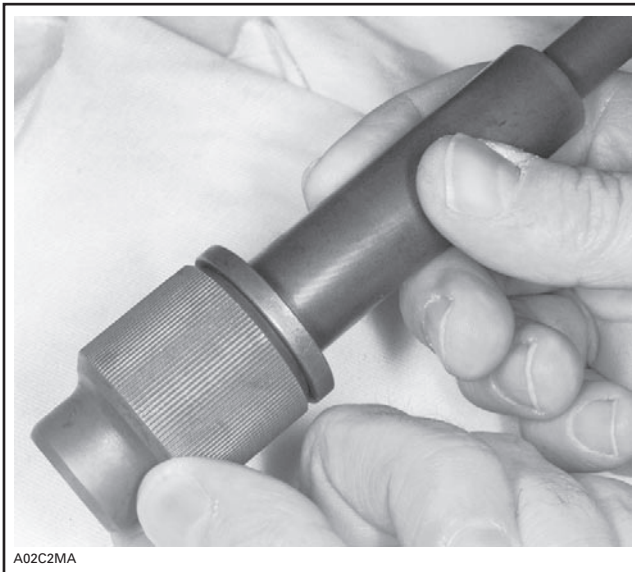


A02C2LA

**TYPICAL**

1. Circlip

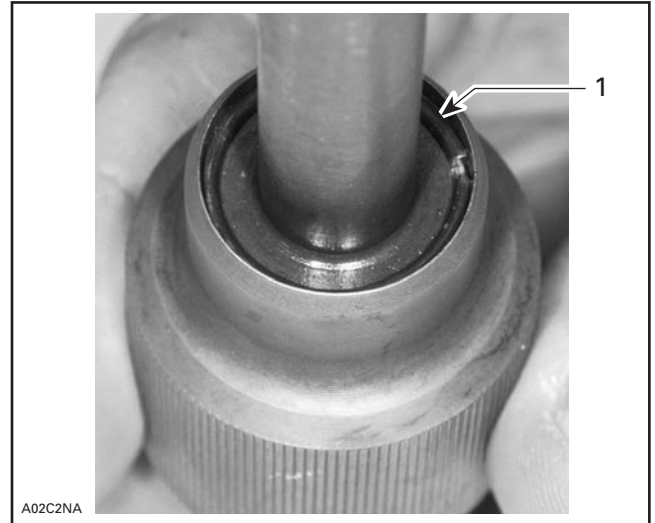
Continue to square it up using round end of circlip installer.



A02C2MA

**TYPICAL**

Push the circlip in with the tool's square end until it rests in the groove.

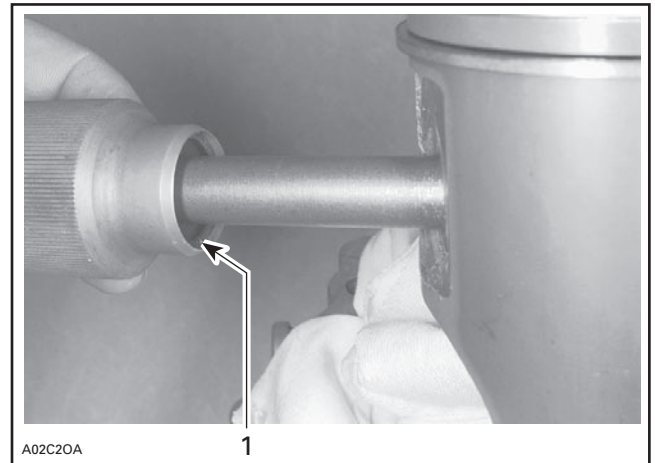


A02C2NA

**TYPICAL**

1. Circlip in groove

Mount tool in piston making sure that circlip break is facing down.



A02C2OA

**TYPICAL**

1. Circlip break facing down

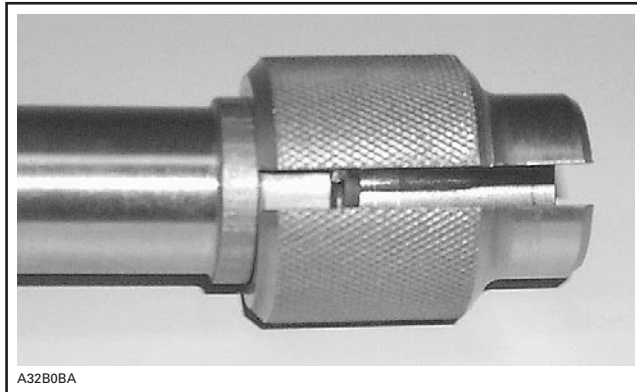
Hold tool firmly against the piston then strike on round end of tool. Circlip will move from tool groove to piston groove.

## Section 04 ENGINE

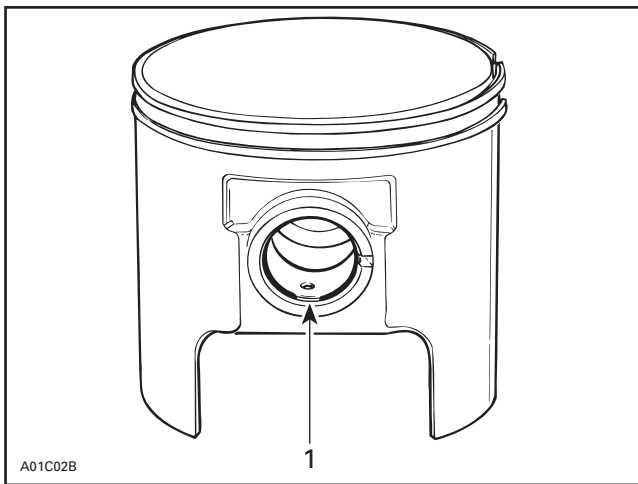
### Subsection 03 (493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES)



TYPICAL



With the other end of the pusher, push circlip into the support groove.



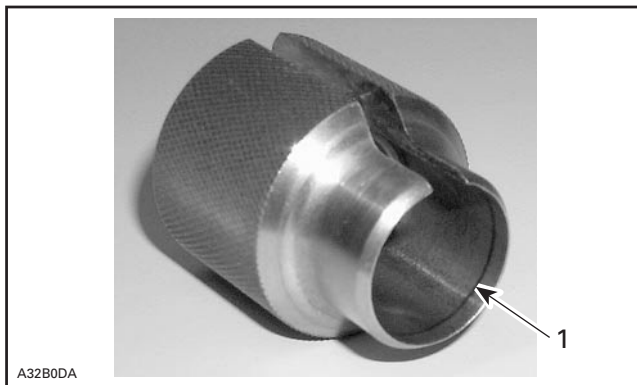
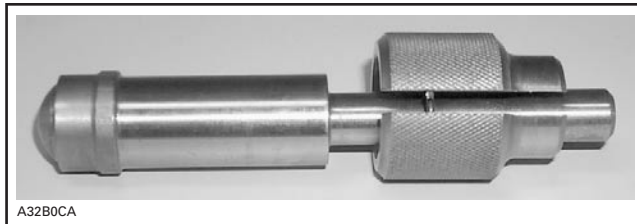
TYPICAL

1. Circlip break

#### 593, 593 HO, 693, 793 and 793 HO Engines

Use circlip installer (P/N 529 035 686) to install new mono-hook circlips no. 20.

Insert circlip into support so that, when installed in piston groove, the tab faces upward.



1. Groove

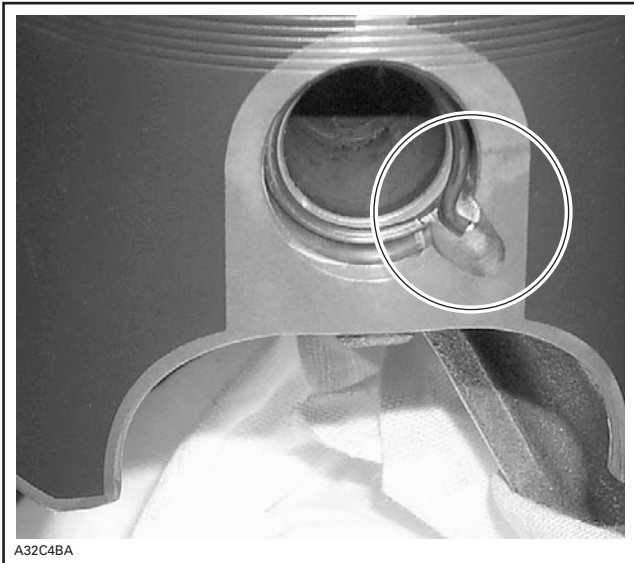


With round end of pusher, position circlip perpendicularly to the support axis.



CIRCLIP READY TO BE INSTALLED ON PISTON

Using a plastic hammer, tap pusher to put circlip in place. Make sure to install new circlips with tab toward top as per following photo.



TAB TOWARD TOP

**CAUTION:** Always install new mono-hook circlips. If circlip installation fails at the first attempt, always retry with a new one because, on a second attempt, the circlip will lose its normal retaining capabilities.

**All Engines**

**CAUTION:** Circlips must not move freely after installation; if so, replace them.

Clean cylinders and crankcase mating surfaces with Loctite Chisel (P/N 413 708 500).

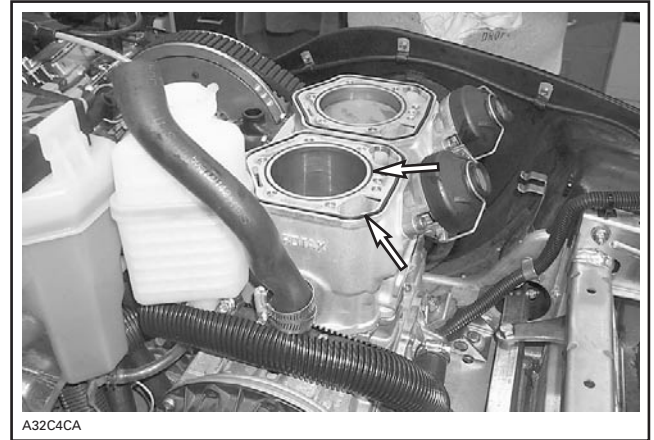
Coat crankcase mating surface with Loctite 518 (P/N 293 800 038). Choose the right gasket thickness according to combustion chamber volume. Refer to LEAK TEST AND ENGINE DIMENSION MEASUREMENT. Install it on crankcase. Coat gasket with Loctite 518.

**CAUTION:** Always install a gasket of the proper thickness. Failure to do so may cause detonation and severe engine damage.

Before inserting piston in cylinder, lubricate the cylinder with new injection oil or equivalent.

Install cylinders. Do not tighten.

Install new rubber ring and round O-rings on each cylinder.



TYPICAL

**NOTE:** Carefully clean screws before reinstallation, specifically under screw head.

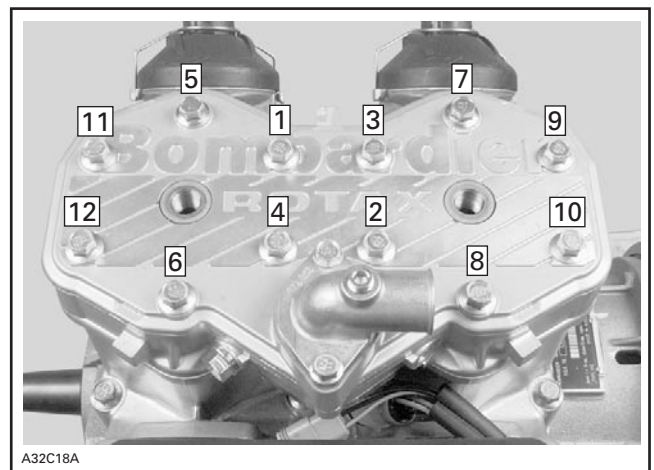
Install exhaust manifold with gaskets. Do not tighten yet.

Torque cylinder screws in a crisscross sequence as per the following table.

|     |                    |
|-----|--------------------|
| M8  | 29 N•m (21 lbf•ft) |
| M10 | 40 N•m (29 lbf•ft) |

At assembly, torque cylinder head screws to 29 N•m (21 lbf•ft) in the following illustrated sequence.

Tighten exhaust manifold bolts to 23 N•m (17 lbf•ft) in a criss-cross sequence.

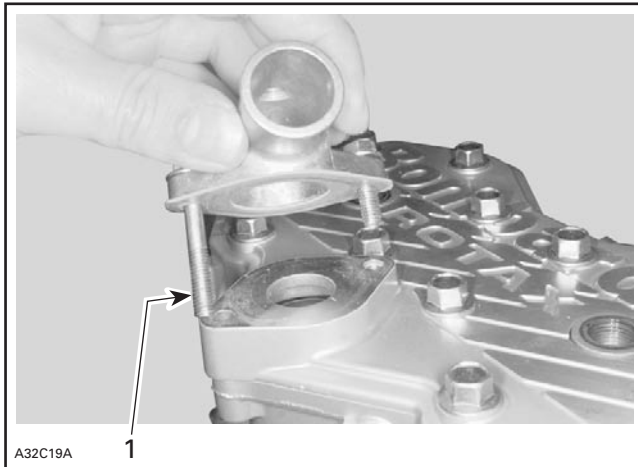


TYPICAL

## Section 04 ENGINE

### Subsection 03 (493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES)

Apply Loctite 243 (P/N 293 800 060) on screws threads. Install outlet socket and tighten screws to 12 N•m (106 lbf•in). Note position of longer screw.



1. Longer screw

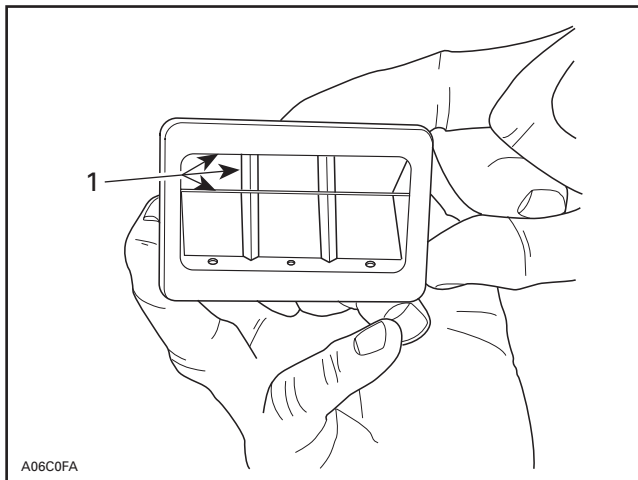
## 17, Reed Valve

### All Engines except 793 HO

Blades have a curved shape. Install with their curve facing reed block.

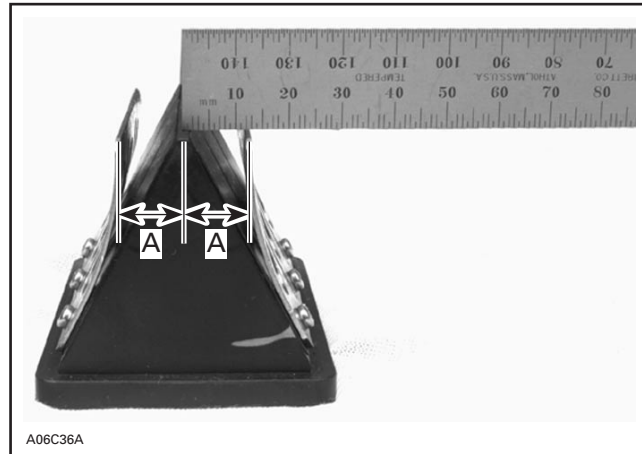
With blade stopper no. 16 removed, check reed valve for proper tightness. There must not be any play between blade and valve body when exerting a finger pressure on blade at blade stopper location.

In case of a play, turn blade upside down and re-check. If there is still a play, replace blade and/or valve body.



1. No play

Check distance from blade stopper outer edge and distance from center of reed valve block.



### TYPICAL

A. 17.0 - 0, + 0.75 mm (.669 - 0, + .030 in)

Bent blade stopper as required to obtain the proper distance.

Blade stoppers may slightly interfere with cylinder during installation. Adjusted distance will be reduced automatically upon installation.

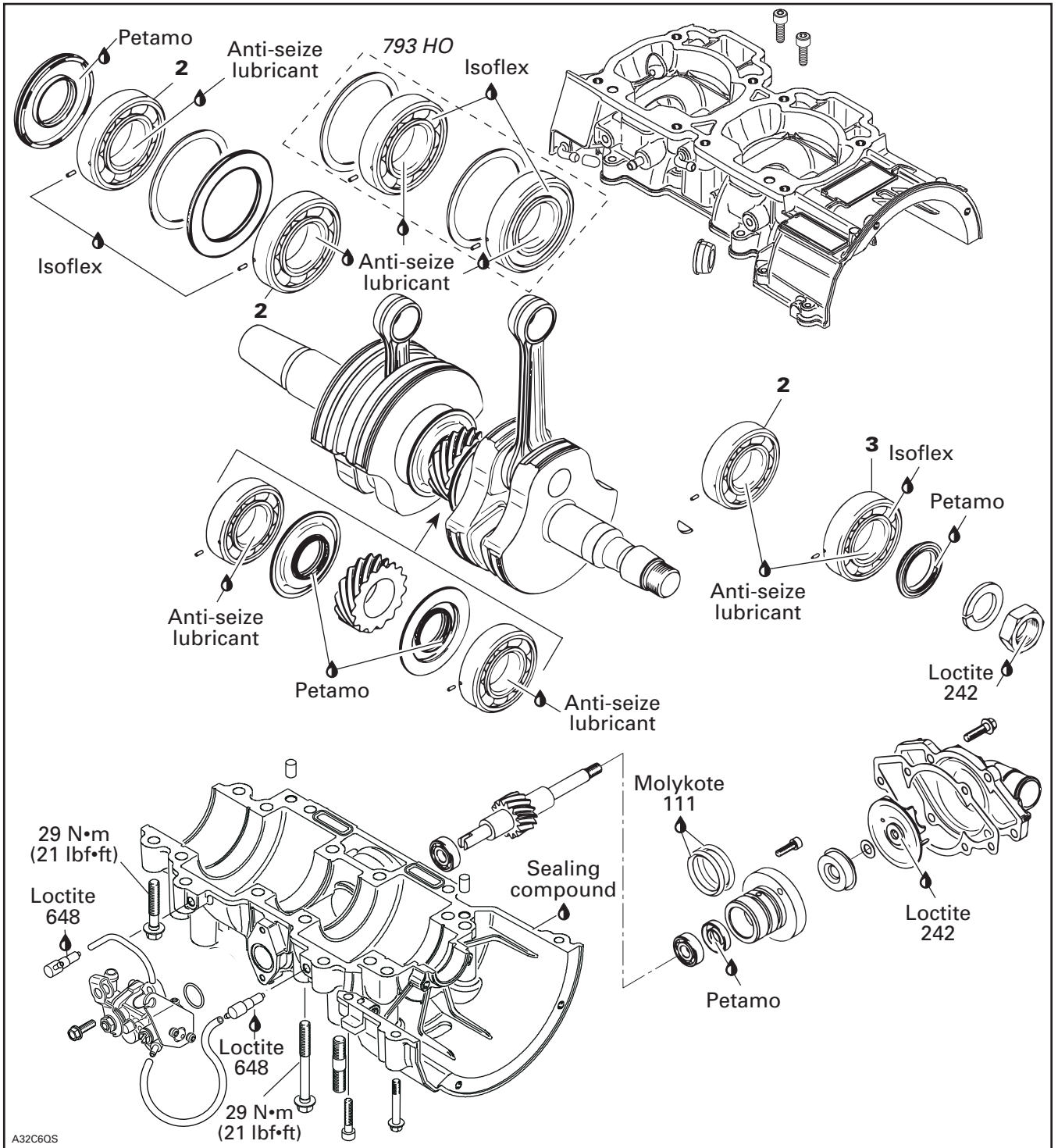
## 22, Dual Reed Valves

### 793 HO

While installing the reed valve pedal retaining plate and screws, pay attention to the angle of the plate. The angled surface should be towards the closed end of the reed valve.

There must not be any play between pedals and reed valve surface. Check the pedals by looking through the reed valve under the light. Make sure they are completely closing the reed valve and that no light filters through. If there is play, or if light filters through, check the pedal retaining screws and if required, replace the reed valve.

**BOTTOM END**





## Section 04 ENGINE

### Subsection 03 (493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES)

**NOTE:** Engine must be removed from chassis to perform the following procedures.

## CLEANING

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

Clean all metal components in a non-ferrous metal cleaner. Use Gasket remover (P/N 413 708 500) accordingly.

Remove old paste gasket from crankcase mating surfaces with Gasket remover (P/N 413 708 500).

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

## DISASSEMBLY

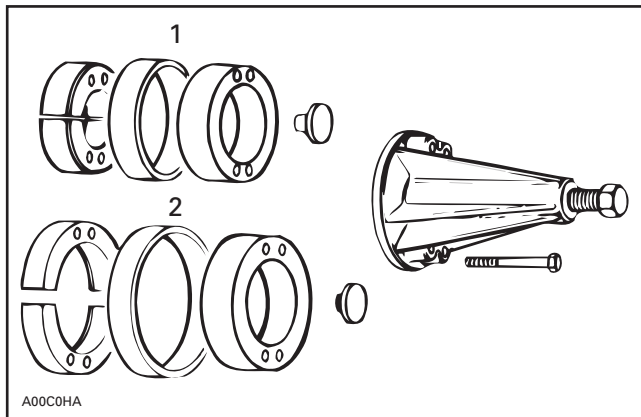
### General

To remove drive pulley, refer to DRIVE PULLEY.

To remove magneto, refer to CDI SYSTEM.

### 2,3, Crankshaft Bearing

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



1. PTO side
2. MAG side

## INSPECTION

**NOTE:** Refer to LEAK TEST AND ENGINE DIMENSIONS MEASUREMENT.

## ASSEMBLY

Coat lip of all seals with Petamo grease (P/N 420 899 271).

### 2, Crankshaft Bearing

Smear anti-seize lubricant (P/N 413 701 000) on part of crankshaft where bearing fits.

Prior to installation, place bearings into an oil container filled with injection oil previously heated to 75°C (167°F). This will expand bearing and ease installation.

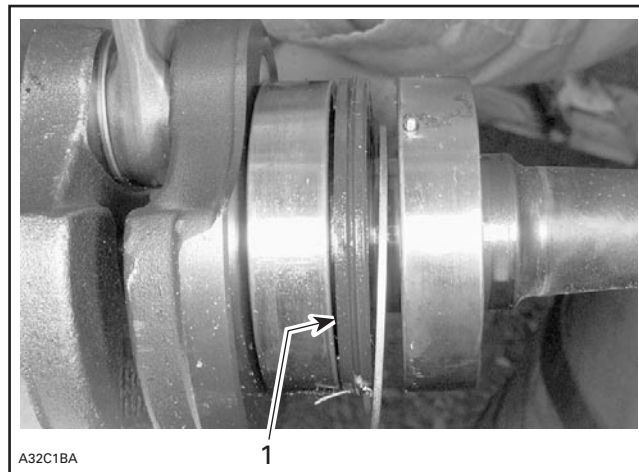
Some bearings must be lubricated with Isoflex grease (P/N 293 550 021).

**CAUTION:** Use only the recommended Isoflex grease. Make sure not to push Isoflex grease between outside bearing race and half crankcase.

**NOTE:** The 50 g tube corresponds to 50 cc of grease.

Put 45 to 50 mL of grease in a syringe.

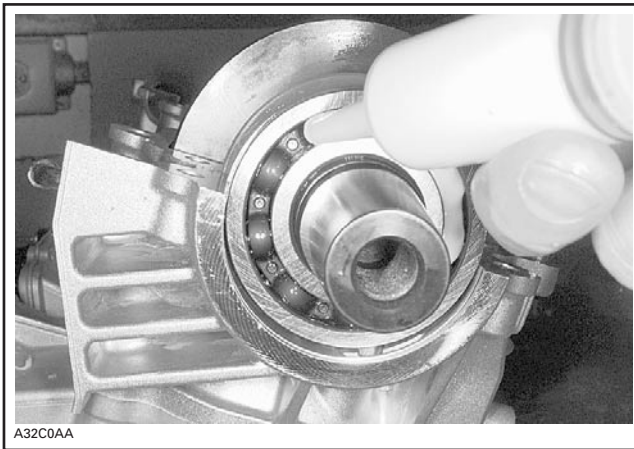
Fill PTO side inner seal with Isoflex grease (about 10 mL).



### TYPICAL

1. PTO side inner seal filled with Isoflex grease

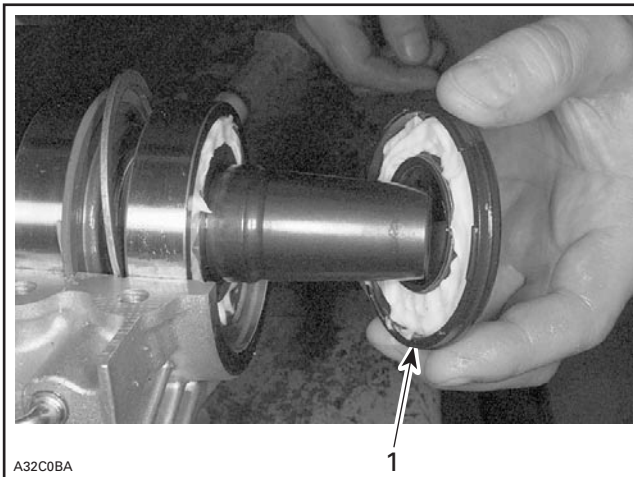
With the syringe, fill the outer ball bearing with 35 to 40 mL of Isoflex grease.



A32C0AA

**BALLS COATED WITH A SEAM OF GREASE**

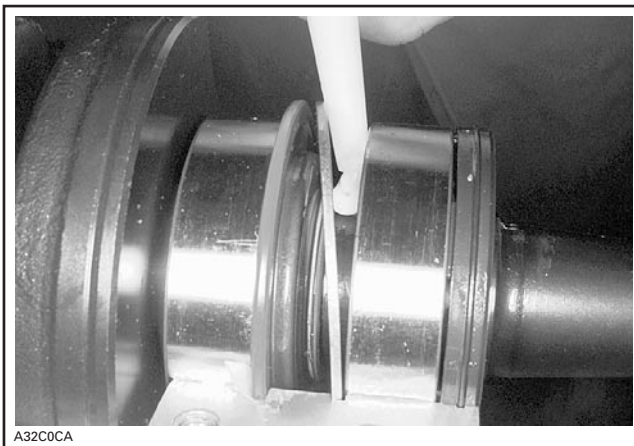
Coat inner side of outer seal (about 35 mL for 493 and 593 engine types and 40 mL for 693 and 793 engine types) and set it in place.



A32C0BA

1. Fill with grease and set in place

Use the remaining grease to coat the inner side of the ball bearing.



A32C0CA

**All Engines except 493 Engine**

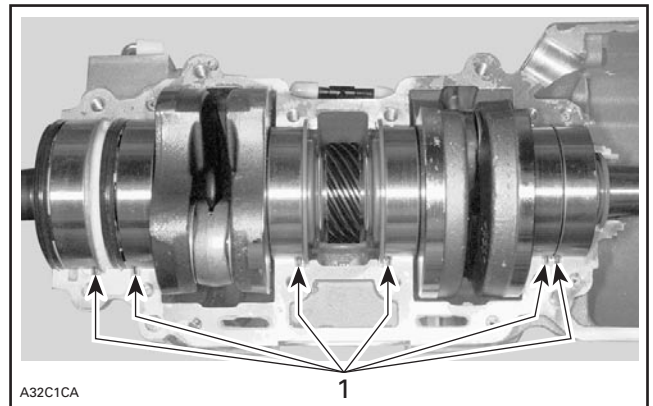
Apply 6 mL of grease to MAG side outer bearing.

**493 Engine**

Apply 4 mL of grease to MAG side outer bearing.

**All Engines**

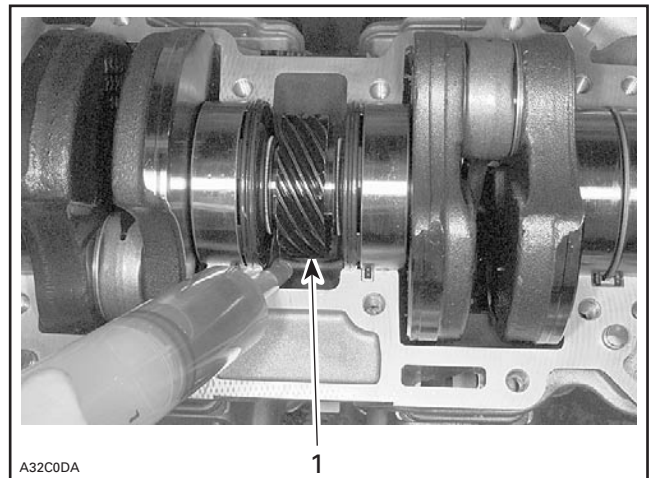
At crankshaft installation, position drive pins as illustrated.



A32C1CA

1. Position pins

Pour 50 mL (2 U.S. oz) of injection oil in the pan under central gear to lubricate pump gearing as per photo.



A32C0DA

1. Oil bath

**Crankcase Assembly**

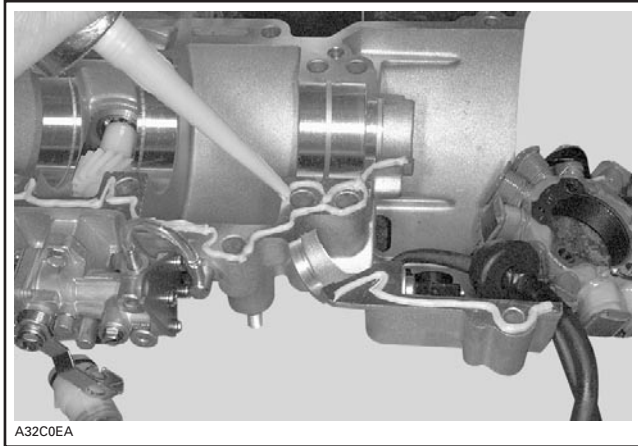
**IMPORTANT:** The total assembly sequence, including sealing compound spreading, screwing and torquing of bolts according to the proper sequence, must be performed within 10 minutes. **Do not wait between each bolt torquing. All bolts must be torqued in a row.**

## Section 04 ENGINE

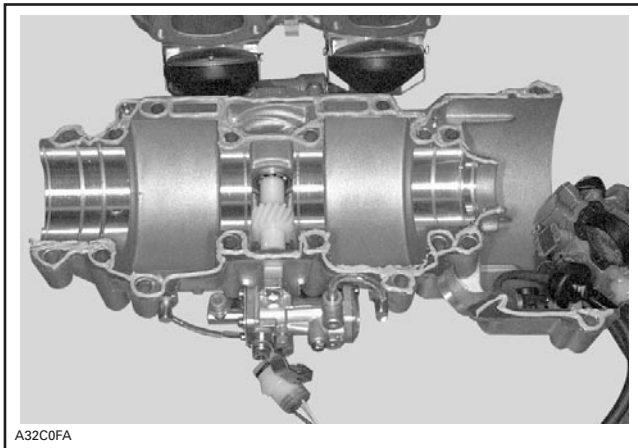
### Subsection 03 (493, 593, 593 HO, 693, 793 AND 793 HO ENGINE TYPES)

Before screwing both parts of crankcase, seal it with sealing compound (P/N 420 297 906). Make sure surfaces are clean and degreased before applying sealing compound.

Spread a seam of **1.2 mm (1/16 in)** maximum in diameter on surface of lower crankcase half.

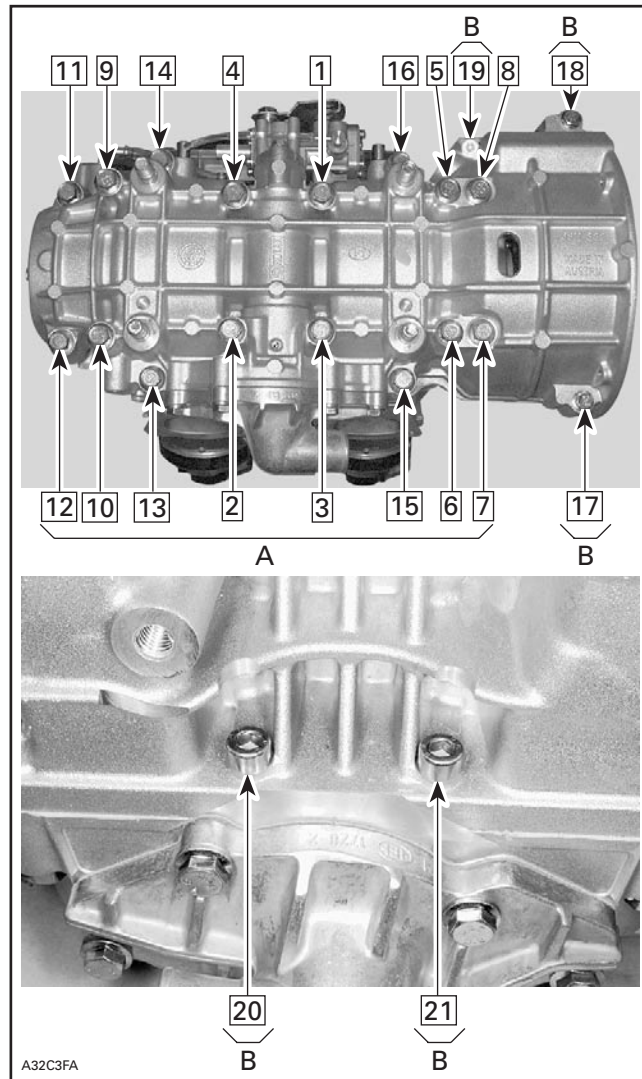


As far as possible, sealing compound must be applied in one run to avoid any risks of leakage through the crankcase.



**SEAMING COMPLETED — CONTACT SURFACES COVERED AND SCREW HOLES SURROUNDED**

Screw all crankcase bolts in place in the following sequence and to the appropriate torque; this must be done in two steps: first, screw bolts up to 60% of the final torque (18 N•m (13.5 lbf•ft) for most of the bolts), then, tighten to the required torque (i.e. 29 N•m (21 lbf•ft)).



- A. Torque bolts 1 through 16 to 29 N•m (21 lbf•ft)
- B. Torque bolts 17 through 21 to 9 N•m (80 lbf•in)

## BREAK-IN

After rebuilding an engine, always observe a break-in period as described in *Operator's Guide*.

# LEAK TEST AND ENGINE DIMENSION MEASUREMENT

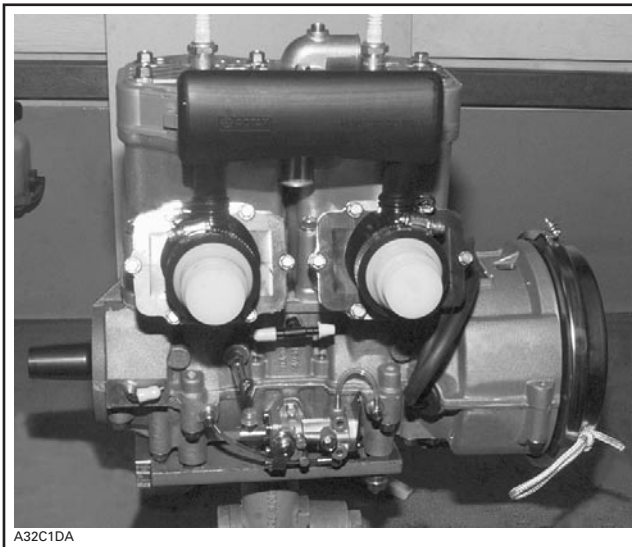
## LEAK TEST

The following gives verification procedures for liquid cooled engines though it also applies to fan cooled engines. For FC engines, do not consider information pertaining to coolant system and pump shaft oil gear reservoir.

On FC twin-cylinder engines, each cylinder cannot be verified individually due to leakage from one cylinder to the other through labyrinth sleeve in center of crankshaft.

## PREPARATION

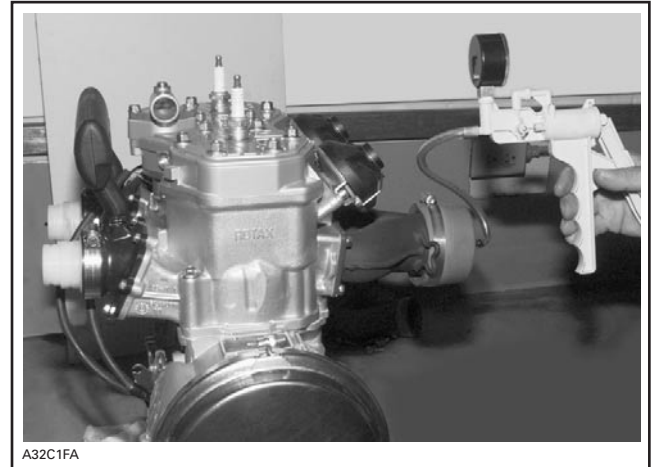
1. Remove tuned pipe.
2. Install plug over exhaust manifold.
3. Remove carburetors.
4. Insert plugs in intake rubber boots. Tighten with existing clamps.



5. Using a hose pincher (P/N 295 000 076), block impulse hose.
6. Install air pump on exhaust plug.

**NOTE:** If necessary, lubricate air pump piston with mild soap.

**CAUTION:** Using hydrocarbon lubricant (such as engine oil) will damage rubber seal of pump piston.



7. Activate pump and pressurize engine to 34 kPa (5 PSI). Do not exceed this pressure.
8. Engine must stand this pressure during 3 minutes. If pressure drops before 3 minutes, check tester kit by spraying a soapy solution on pump cylinder, all plugs and fittings.
  - If tester kit is leaking, bubbles will indicate where leak comes from.
  - If tester kit is not leaking, check engine as per following procedure.

## PROCEDURE

**NOTE:** A flow chart has been prepared as a visual reference. See last page of this chapter.

Using flow chart and following text, pressurize area to be tested and spray soapy solution at the indicated location.

**TEST PRESSURE: 34 kPa (5 PSI)  
for 3 minutes**

- If there is a leak at the tested location, it is recommended to continue testing next items before overhauling engine. There is a possibility of more than one leak.
- If there is no leak at the tested location, continue pumping to maintain pressure and continue with next items until leak is found.

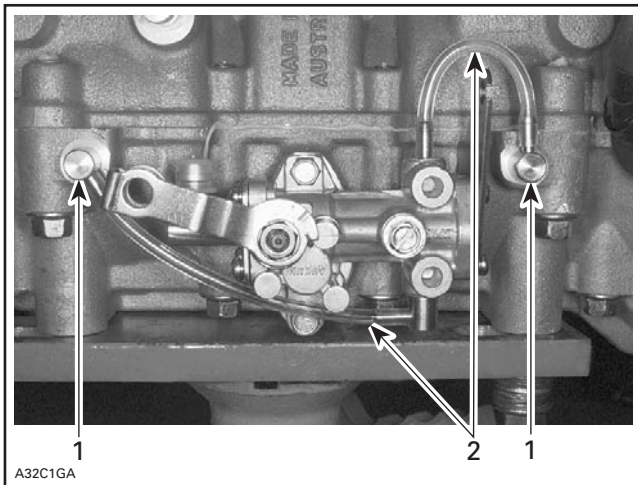
## Section 04 ENGINE

### Subsection 04 (LEAK TEST AND ENGINE DIMENSION MEASUREMENT)

#### Engine

Check the following:

1. All jointed surfaces and screw/stud threads of engine:
  - spark plug base, insulator
  - cylinder head
  - RAVE valve bellows, piston and housing
  - cylinder
  - crankcase halves (joint)
  - oil injection pump mounting flange (O-ring)
  - coolant pump housing
  - bleed screws/plugs.
2. Small injection oil lines coming from pump.



1. Injection nipples
2. Small injection oil lines

Check for air bubbles or oil column going toward pump. It indicates defective check valve in injection nipples.

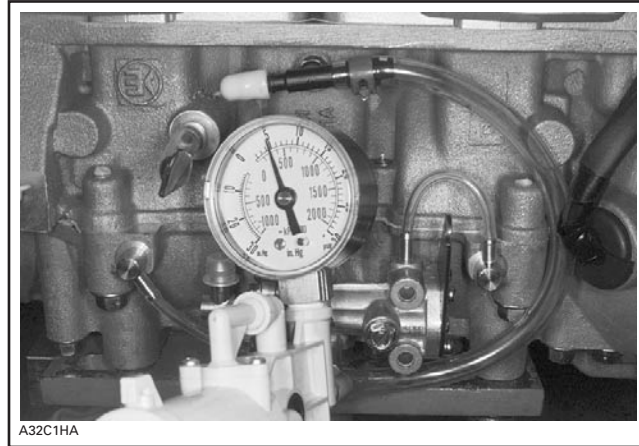
3. Remove cooling system cap.

Check for air bubbles in antifreeze. It indicates defective cylinder head O-ring or cylinder base gasket.

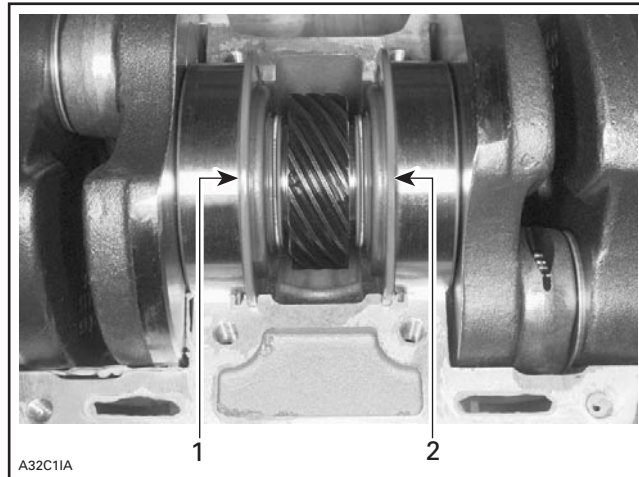
4. Remove drive pulley then check crankshaft outer seal.
5. Remove rewind starter and magneto system then check crankshaft outer seal.
6. Check pump shaft gear oil reservoir.

#### Pump Shaft Oil Gear Reservoir

Install air pump on adapter and pressurize as above.



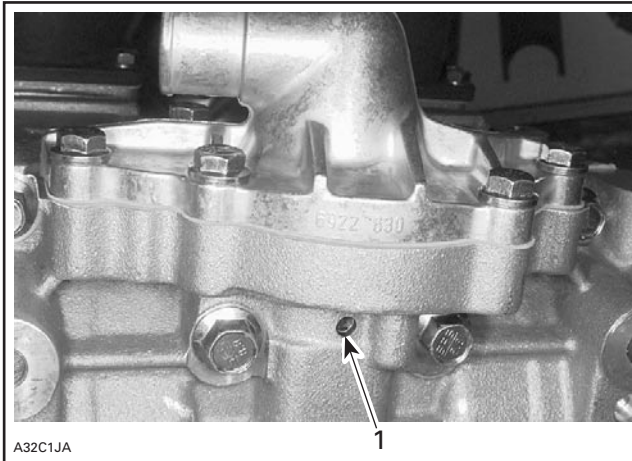
If pressure drops, it indicates a defective crankshaft inner seal.



#### CRANKSHAFT INSTALLED IN UPPER HALF CRANKCASE

1. Crankshaft inner seal on PTO side
2. Crankshaft inner seal on MAG side

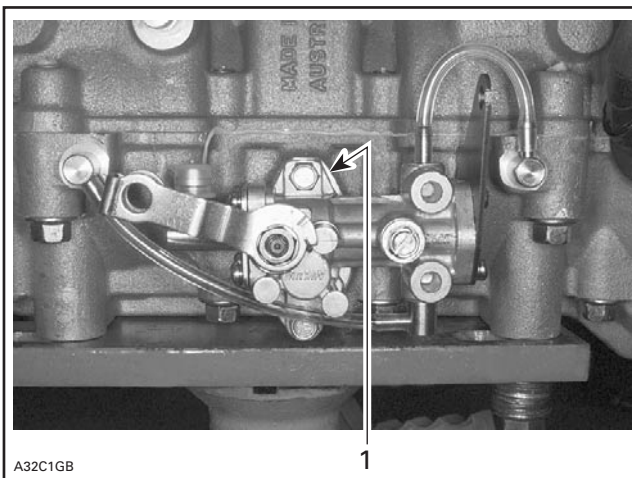
1. Check weep hole below coolant pump housing with soapy water.



1. *Weep hole*

If there is a leak, it indicates that a pump shaft is defective (oil seal beside coolant ceramic seal).

2. Leaks can be also on oil pump side. Check mounting area for leaks.



1. *Check mounting area*

3. If leak still persists, it indicates a defective casting somewhere in engine.

Disassemble engine and carefully check for defects in castings. Pay attention to tapped holes which may go through engine sealed area and thus lead to leakage.

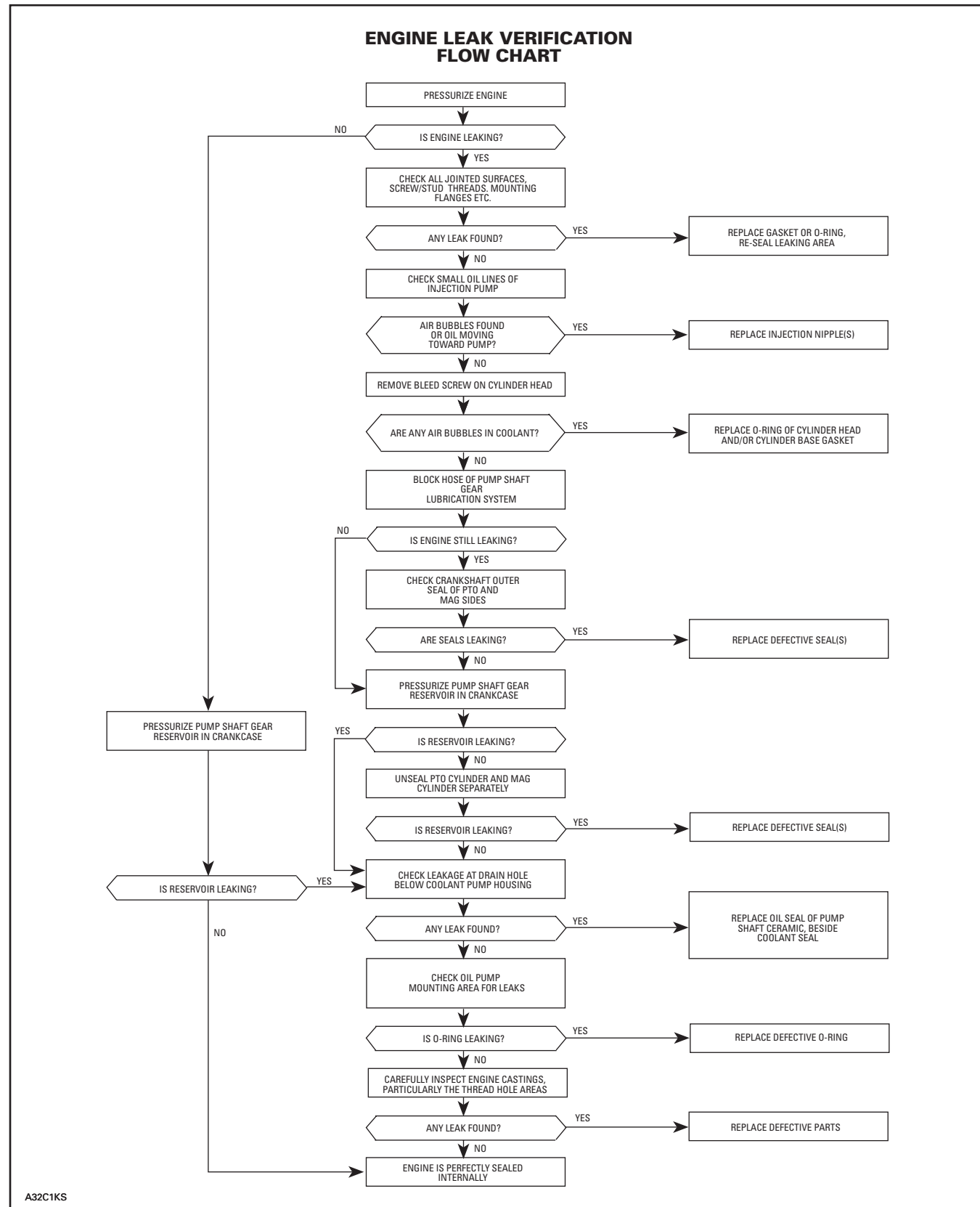
## FINALIZING REASSEMBLY

After reassembling engine, always recheck for leakage.

## Section 04 ENGINE

### Subsection 04 (LEAK TEST AND ENGINE DIMENSION MEASUREMENT)

## ENGINE LEAK VERIFICATION FLOW CHART



## ENGINE DIMENSION MEASUREMENT

This section covers all engine types.

### CYLINDER HEAD WARPAGE

| ENGINE TYPE | MAXIMUM  |
|-------------|--|
| All         | 0.05 mm (.002 in) per 50 mm (2 in) of surface      |
|             | 0.5 mm (.020 in) for total length of cylinder head |

Check gasketed surface of the cylinder head with a straightedge and a feeler gauge.

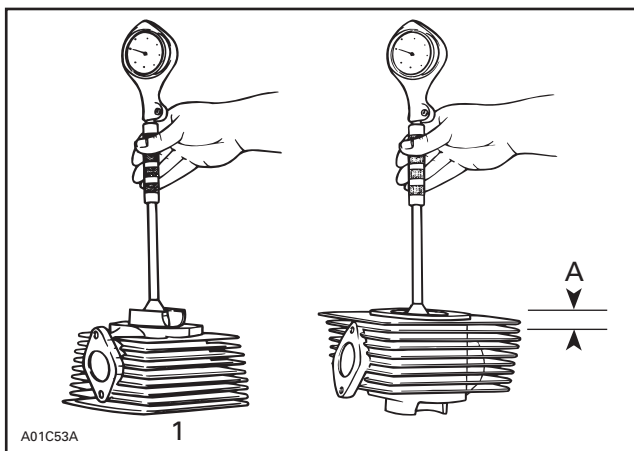
### CYLINDER TAPER

| ENGINE TYPE | MAXIMUM           |
|-------------|-------------------|
| All         | 0.10 mm (.004 in) |

Compare cylinder diameter 16 mm (5/8 in) from top of cylinder to just below its intake port area.

If the difference exceeds the specified dimension the cylinder should be rebored and honed or should be replaced. Nikasil cylinder can be honed using diamond hone but can not be rebored.

**NOTE:** Be sure to restore the chamfer around all cylinder sleeve port openings.



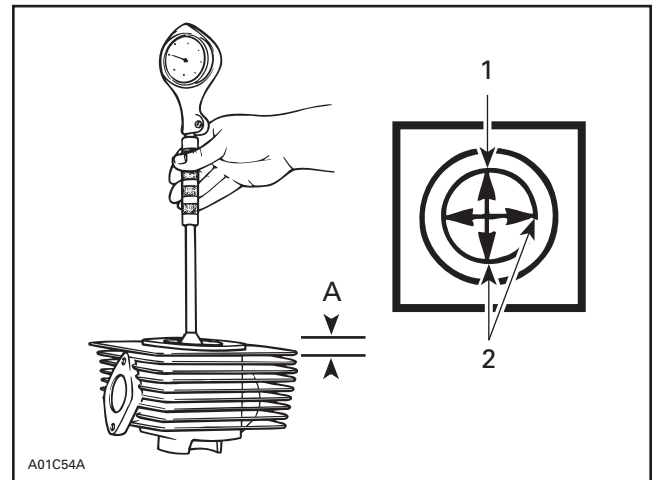
1. Below the intake port  
A. 16 mm (5/8 in) from top

### CYLINDER OUT OF ROUND

| ENGINE TYPE | MAXIMUM           |
|-------------|-------------------|
| All         | 0.08 mm (.003 in) |

Measuring 16 mm (5/8 in) from top of cylinder with a cylinder gauge, check if the cylinder out of round is more than the specified dimension. If larger, cylinder should be rebored and honed or should be replaced. Nikasil cylinder can be honed using diamond hone but cannot be rebored.

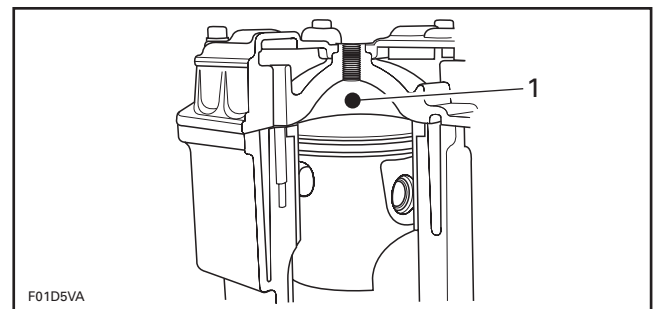
**NOTE:** Be sure to restore the chamfer around all cylinder sleeve port openings.



1. Piston pin position  
2. Measures to be compared  
A. 16 mm (5/8 in)

### COMBUSTION CHAMBER VOLUME MEASUREMENT

The combustion chamber volume is the region in the cylinder head above the piston at Top Dead Center. It is measured with the cylinder head installed on the engine.



1. Combustion chamber

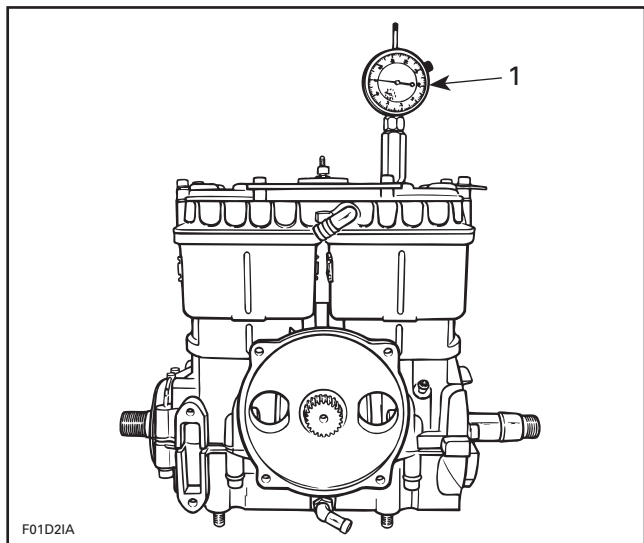


## Section 04 ENGINE

### Subsection 04 (LEAK TEST AND ENGINE DIMENSION MEASUREMENT)

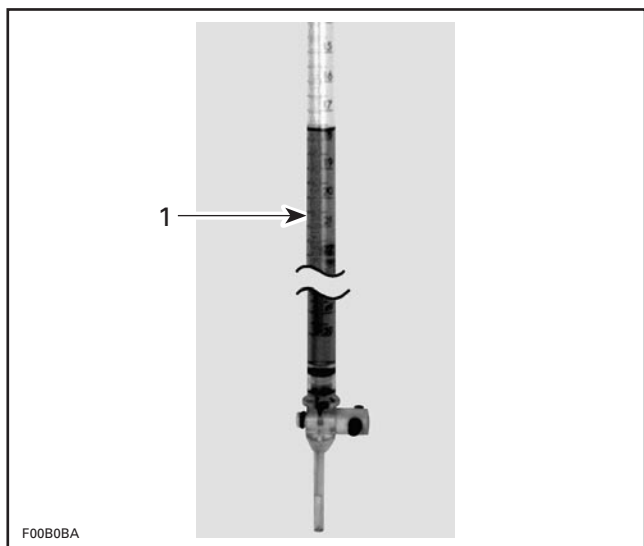
**NOTE:** When checking the combustion chamber volume, engine must be cold, piston must be free of carbon deposits and cylinder head must be leveled.

1. Remove both spark plugs and bring one piston to Top Dead Center using a TDC gauge.



1. Bring piston to TDC

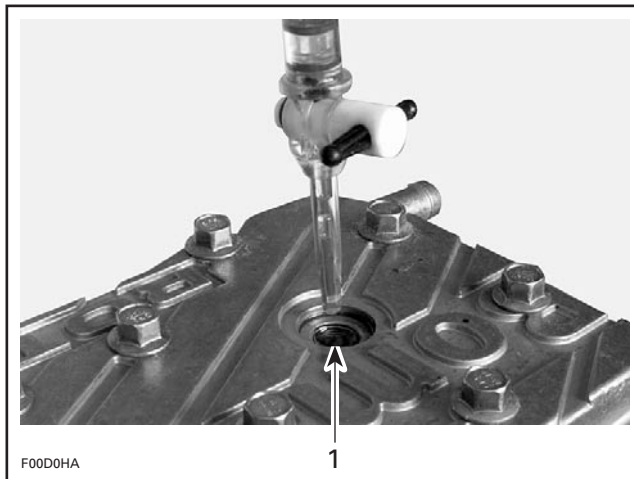
2. Obtain a graduated burette (capacity 0 - 50 cc) and fill with an equal part (50/50) of gasoline and injection oil.



1. Graduated burette (0 - 50 cc)

3. Open burette valve to fill its tip. Add liquid in burette until level reaches 0 cc.

4. Inject the burette content through the spark plug hole until liquid touches the top spark plug hole.



1. Top of spark plug hole

**NOTE:** The liquid level in cylinder must not drop for a few seconds after filling. If so, there is a leak between piston and cylinder. The recorded volume would be false.

5. Let burette stand upward for about 10 minutes, until liquid level is stabilized.
6. Read the burette scale to obtain the quantity of liquid injected in the combustion chamber.

**NOTE:** When the combustion chamber is filled to top of spark plug hole, it includes an amount of 2.25 cc corresponding to the spark plug well.

7. Repeat the procedure for the other cylinder.

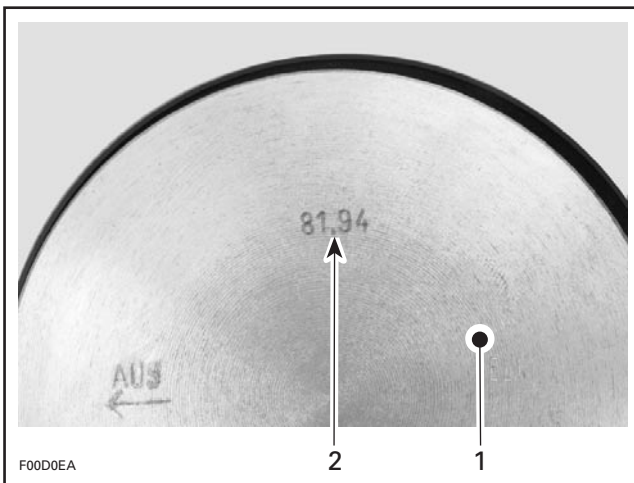
| ENGINE TYPE | COMBUSTION CHAMBER VOLUME (cc) (up to top thread of spark plug hole) |
|-------------|--|
| 377         | 20.35 ± 0.8  |
| 493         | 24.94 ± 1.00   |
| 503         | 27.55 ± 1.00   |
| 552         | 34.43 ± 1.2  |
| 593         | 28.97 ± 1.20   |
| 593 HO      | 28.65 ± 1.2  |
| 693         | 33.96 + 1.51 - 1.38  |
| 793         | 38.59 + 1.73 - 1.58  |
| 793 HO      | 34.88 ± 0.7  |

8. Install a thicker or thinner cylinder/crankcase gasket (refer to *Parts Catalogs*) in order to obtain the specified combustion chamber volume or the nearest.

| ENGINE TYPE | CHANGE IN COMBUSTION CHAMBER VOLUME (cc) FOR EVERY 0.1 mm (.004 in) OF GASKET THICKNESS |
|-------------|---|
| 493         | 0.38  |
| 552         | 0.45  |
| 593         | 0.45  |
| 593 HO      | 0.41  |
| 693         | 0.48  |
| 793         | 0.53  |
| 793 HO      | 0.53  |

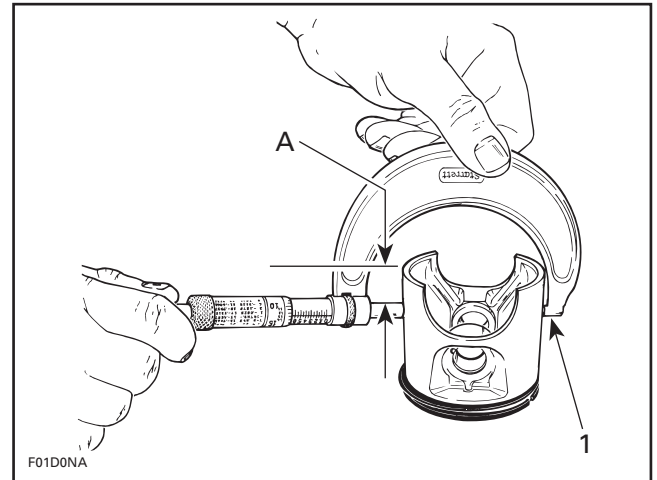
**USED PISTON MEASUREMENT**

Note the measurement on the piston dome.



1. Piston dome  
2. Piston measurement

Using a micrometer, measure piston skirt at 15 mm (.590 in) perpendicularly (90°) to piston pin.



1. Measuring perpendicularly (90°) to piston pin axis  
A. 15 mm (.590 in)

| ENGINE TYPE | MAXIMUM PISTON SKIRT WEAR mm (in) |
|-------------|-----------------------------------|
| All         | 0.15 (.006)                       |

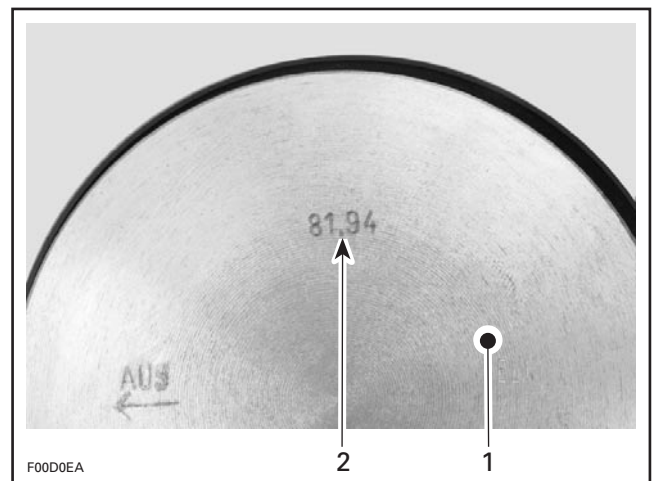
The measured dimension must not be less than 0.15 mm (.006 in) of the one scribed on piston dome. Otherwise, install a new piston.

**CYLINDER/PISTON CLEARANCE**

Used and New Pistons

**IMPORTANT:** Make sure used piston is not worn more than specified. See USED PISTON MEASUREMENT above.

Take the measurement on the piston dome.

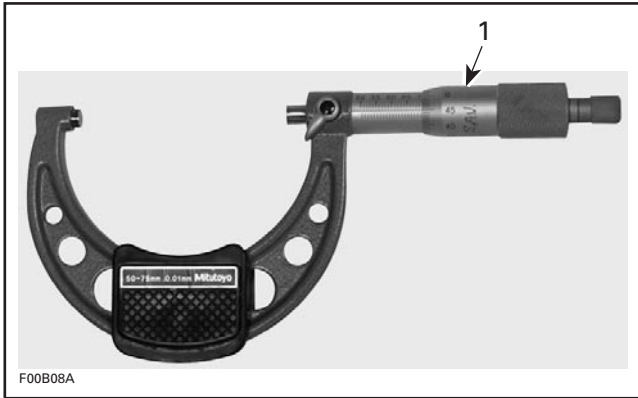


1. Piston dome  
2. Piston measurement

## Section 04 ENGINE

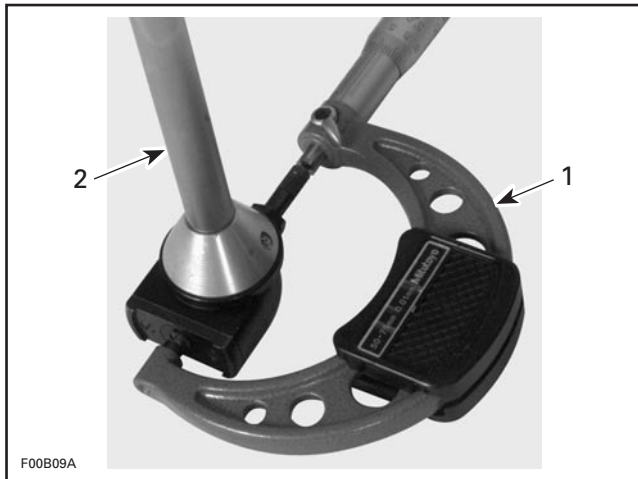
### Subsection 04 (LEAK TEST AND ENGINE DIMENSION MEASUREMENT)

Adjust and lock a micrometer to the specified value on the piston dome.

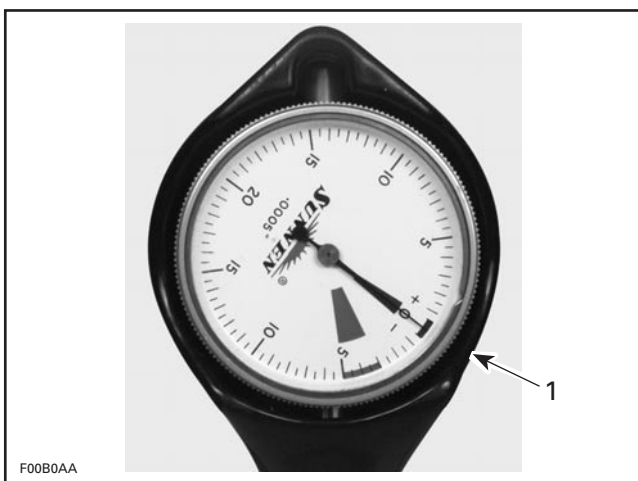


1. Micrometer set to the piston dimension

With the micrometer set to the piston dimension, adjust a cylinder bore gauge to the micrometer dimension and set the indicator to 0.



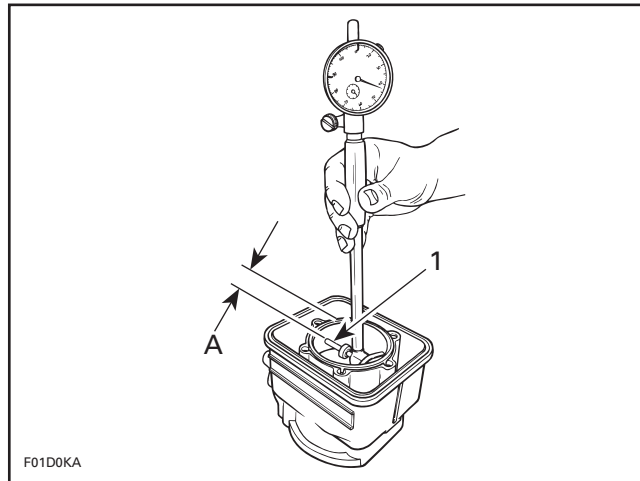
1. Use the micrometer to set the cylinder bore gauge  
2. Dial bore gauge



1. Indicator set to 0 (zero)

**IMPORTANT:** Always remove cylinders from crankcase before measuring.

Position the dial bore gauge at 16 mm (5/8 in) below cylinder top edge.



1. Measuring perpendicularly (90°) to piston pin axis  
A. 16 mm (5/8 in)

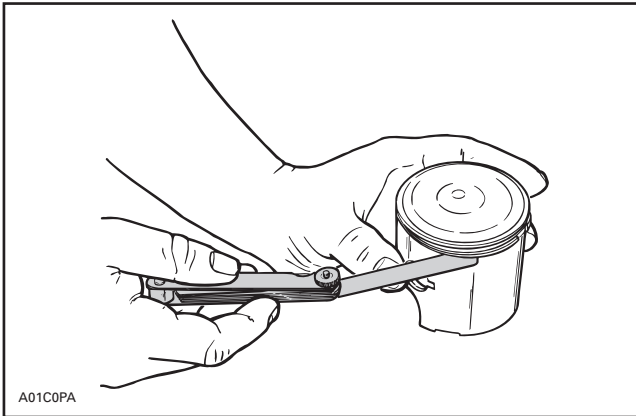
Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance. If clearance exceeds specified tolerance, replace cylinder or rebore and install oversize piston depending on engine type. Refer to TECHNICAL DATA.

**NOTE:** Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

**IMPORTANT:** The total piston/cylinder clearance (actual cylinder diameter minus actual piston skirt diameter) should be within 0.30 mm (.012 in).

### RING/PISTON GROOVE CLEARANCE

Using a feeler gauge check clearance between rectangular ring and groove. Replace piston if clearance exceeds specified tolerance. Refer to TECHNICAL DATA.

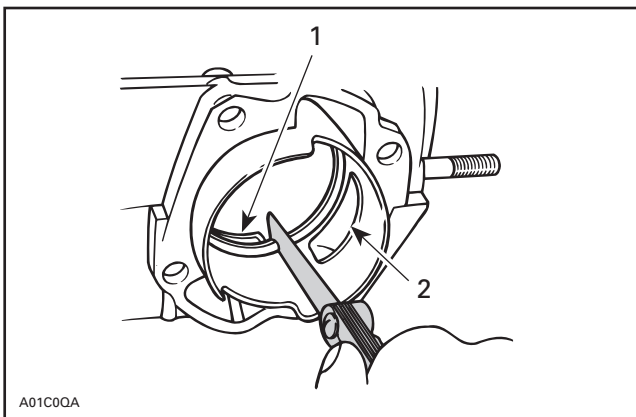


### RING END GAP

Position ring half-way between transfer ports and intake port.

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

Using a feeler gauge, check ring end gap. Replace ring if gap exceeds specified tolerance. Refer to TECHNICAL DATA.



- 1. Transfer port
- 2. Intake port

### CRANKSHAFT DEFLECTION

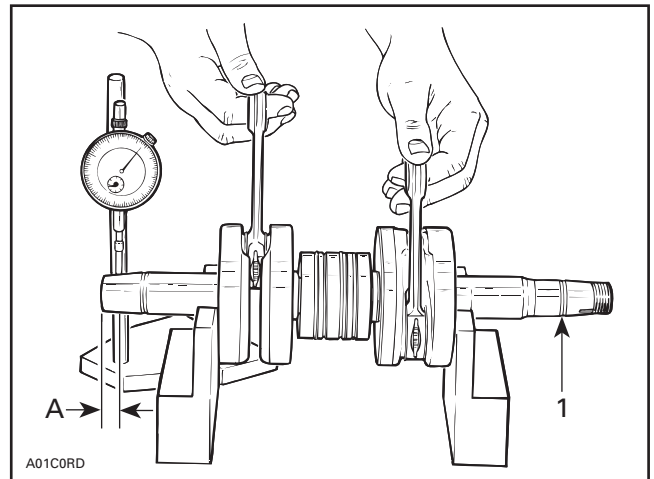
Crankshaft deflection is measured with a dial indicator.

#### Measuring (in crankcase)

First, check deflection with crankshaft in crankcase. If deflection exceeds the specified tolerance, recheck deflection using V-shaped blocks to determine the defective part(s). See below.

#### Measuring (on bench)

Once engine is disassembled, check crankshaft deflection on V-shaped blocks. If deflection exceeds the specified tolerance, it can be worn bearings or a bent crankshaft. Remove crankshaft bearings and check deflection again on V-shaped blocks to determine the defective part(s). See measurement A in following illustration.



**TYPICAL**

- 1. Measure at mid point between the key and the first thread
- A. 3 mm (1/8 in)

#### Crankshaft Deflection on PTO Side

| ENGINE TYPE | MAXIMUM ON PTO SIDE<br>mm (in) |
|-------------|--------------------------------|
| All         | 0.06 (.0024)                   |

#### Crankshaft Deflection on MAG Side

| ENGINE TYPE | MAXIMUM ON MAG SIDE<br>mm (in) |
|-------------|--------------------------------|
| All         | 0.05 (.002)                    |

## Section 04 ENGINE

### Subsection 04 (LEAK TEST AND ENGINE DIMENSION MEASUREMENT)

#### Crankshaft Deflection in Center of Crankshaft

| ENGINE TYPE | MAXIMUM IN CENTER OF CRANKSHAFT<br>mm (in) |
|-------------|--|
| All         | 0.08 (.0031)                               |

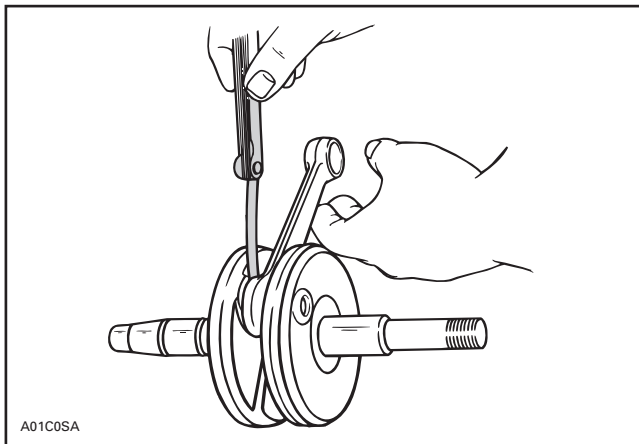
**NOTE:** Crankshaft deflection cannot be correctly measured between centers of a lathe.

If the deflection exceeds the specified tolerance, crankshaft should be repaired or replaced.

#### CONNECTING ROD BIG END AXIAL PLAY

| ENGINE TYPE | NEW PARTS<br>MIN. - MAX.           | WEAR<br>LIMIT        |
|-------------|------------------------------------|----------------------|
| All         | 0.39 - 0.74 mm<br>(.015 - .029 in) | 1.20 mm<br>(.047 in) |

Using a feeler gauge, measure distance between thrust washer and crankshaft counterweight. If the distance exceeds specified tolerance, repair or replace the crankshaft.



TYPICAL

#### CRANKSHAFT END-PLAY

##### All Engine Types

End-play is not adjustable but it should be between 0.10 - 0.30 mm (.004 - .012 in).

#### CHECKING CRANKSHAFT ALIGNMENT

Install a degree wheel (P/N 529 035 607) on crankshaft end.

Remove both spark plugs.

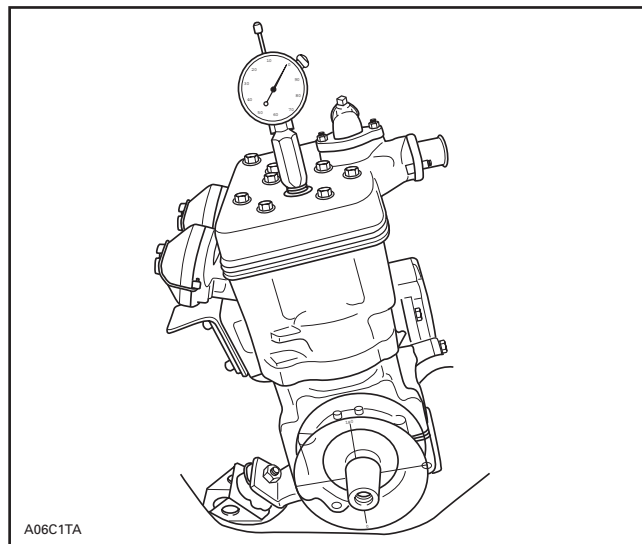
Install a TDC gauge (P/N 414 104 700) in spark plug hole on MAG side.

Bring MAG piston at top dead center.

Rotate degree wheel (not crankshaft) so that 360° mark aligns with center of crankcase. Scribe a mark on crankcase.

Remove TDC gauge and install it on center cylinder.

Bring PTO piston to top dead center. Degree wheel must rotate with crankshaft.



TYPICAL

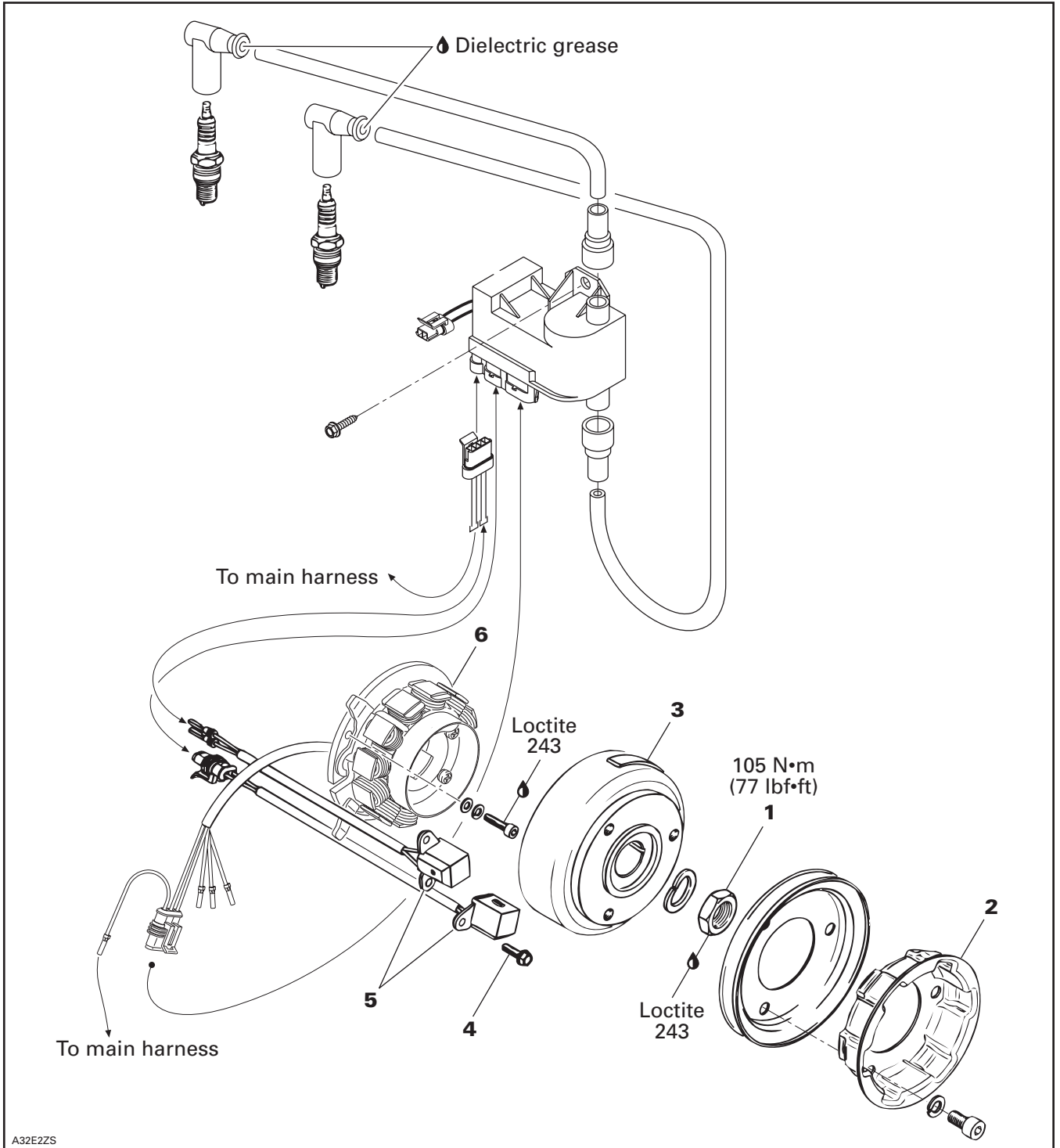
Interval between cylinders must be  $180^\circ \pm 0.5$ .

Any other reading indicates a misaligned (twisted) crankshaft.

# CDI SYSTEM

## DENSO TRIGGER COIL IGNITION SYSTEM

300 W and 340 W on ZX Series





**NOTE:** The following procedures can be done without removing the engine. To facilitate magneto removal, hold drive pulley with tool (P/N 529 027 600).

CDI means Capacitor Discharge Ignition System.

## CLEANING

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

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

## DISASSEMBLY

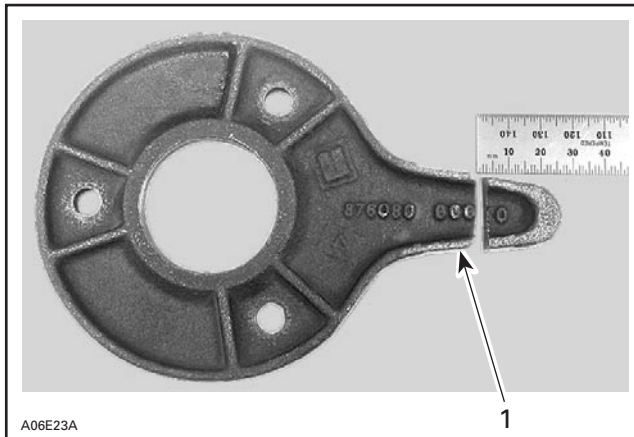
### 3, Magneto Flywheel

To gain access to magneto assembly, remove the following parts as needed on different engines:

- tuned pipe and muffler
- rewind starter
- starting pulley **no. 2**.

To remove magneto flywheel retaining nut **no. 1**:

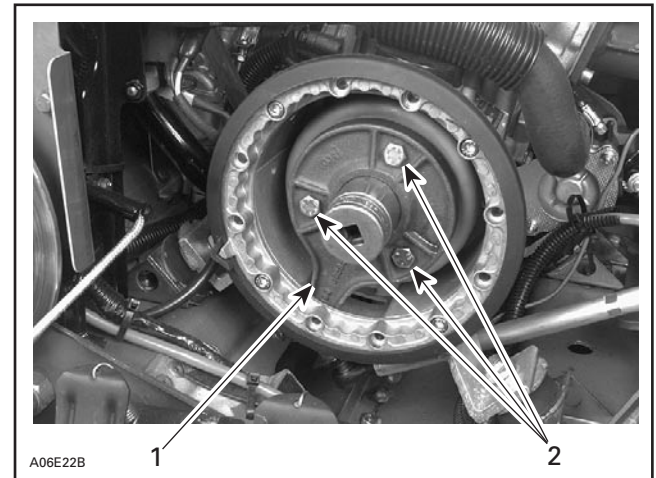
- Use magneto puller ring (P/N 420 876 080). Former puller must be modified as shown.



1. Cut by 25 mm (1 in)

- Install puller ring with its tab in magneto housing opening.

**CAUTION:** Use only M8 x 20 mm screws to bolt puller to magneto. When a counterweight **no. 7 (for liquid cooled models only)** is installed on magneto flywheel use M8 x 30 mm screws.

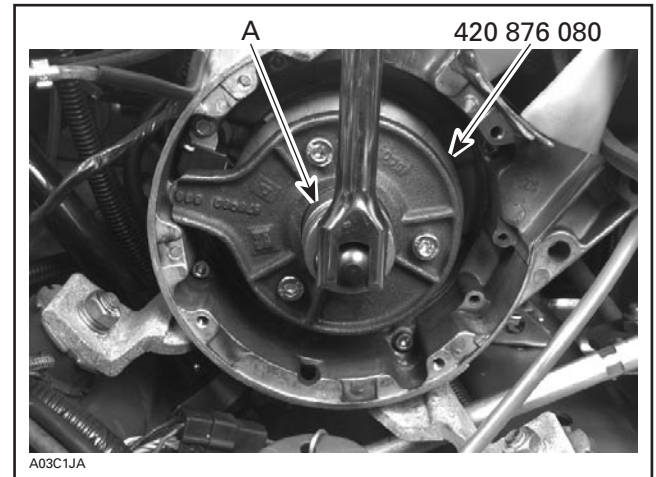


**TYPICAL**

1. Tab in magneto housing opening
2. M8 screws

- Remove magneto flywheel nut, using a 30 mm socket machined to 40 mm (1.580 in) outside diameter by 16 mm (5/8 in) long.

**NOTE:** To correctly remove a threadlocked fastener, first tap on the fastener to break threadlocker bond. This will avoid thread breakage.



**TYPICAL**

A. 30 mm socket

To remove magneto flywheel, install crankshaft protector (P/N 420 876 557) on crankshaft end. Screw puller (P/N 529 022 500) into puller ring.

- Tighten puller bolt and at the same time, tap on bolt head using a hammer to release magneto flywheel from its taper.



## Section 04 ENGINE

### Subsection 05 (CDI SYSTEM)

#### 5, Trigger Coil

Magneto and stator no. 6 must be removed before removing the trigger coil.

To replace the trigger coil:

- Disconnect trigger coil connector housing.
- Remove grommet from crankcase where trigger coil wire exits magneto housing.
- Remove retaining screws no. 4.
- Remove trigger coil and carefully pull wires.

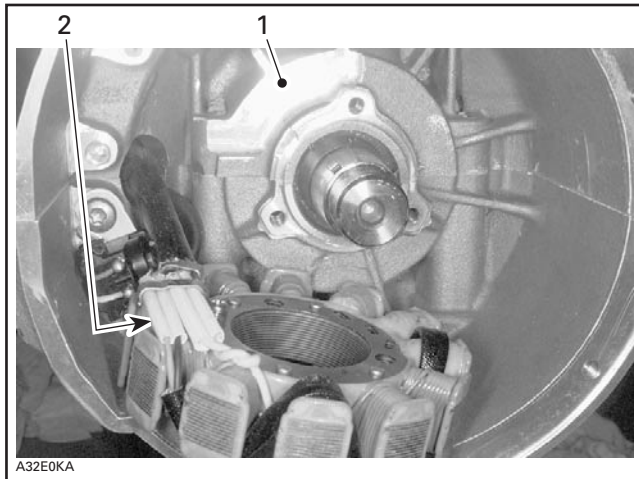
Install new trigger coil and other parts removed.

## ASSEMBLY

### *For Liquid Cooled Models Only*

#### 6, Stator

Position stator so that its wire protectors are over crankcase recess.



1. Crankcase recess
2. Wire protectors

### *All Models*

#### 3, Magneto Flywheel

Clean crankshaft extension (taper) and apply Loctite 243 (blue) on taper, then position Woodruff key, flywheel and lock washer on crankshaft.

Clean nut threads and apply Loctite 243 (blue) then tighten nut to 105 N•m (77 lbf•ft) for fan cooled engines and to 125 N•m (92 lbf•ft) for liquid cooled engines.

At reassembly coat all electric connections except Deutsch housings (waterproof gray housing) with silicone dielectric grease (P/N 293 550 004) to prevent corrosion or moisture penetration.

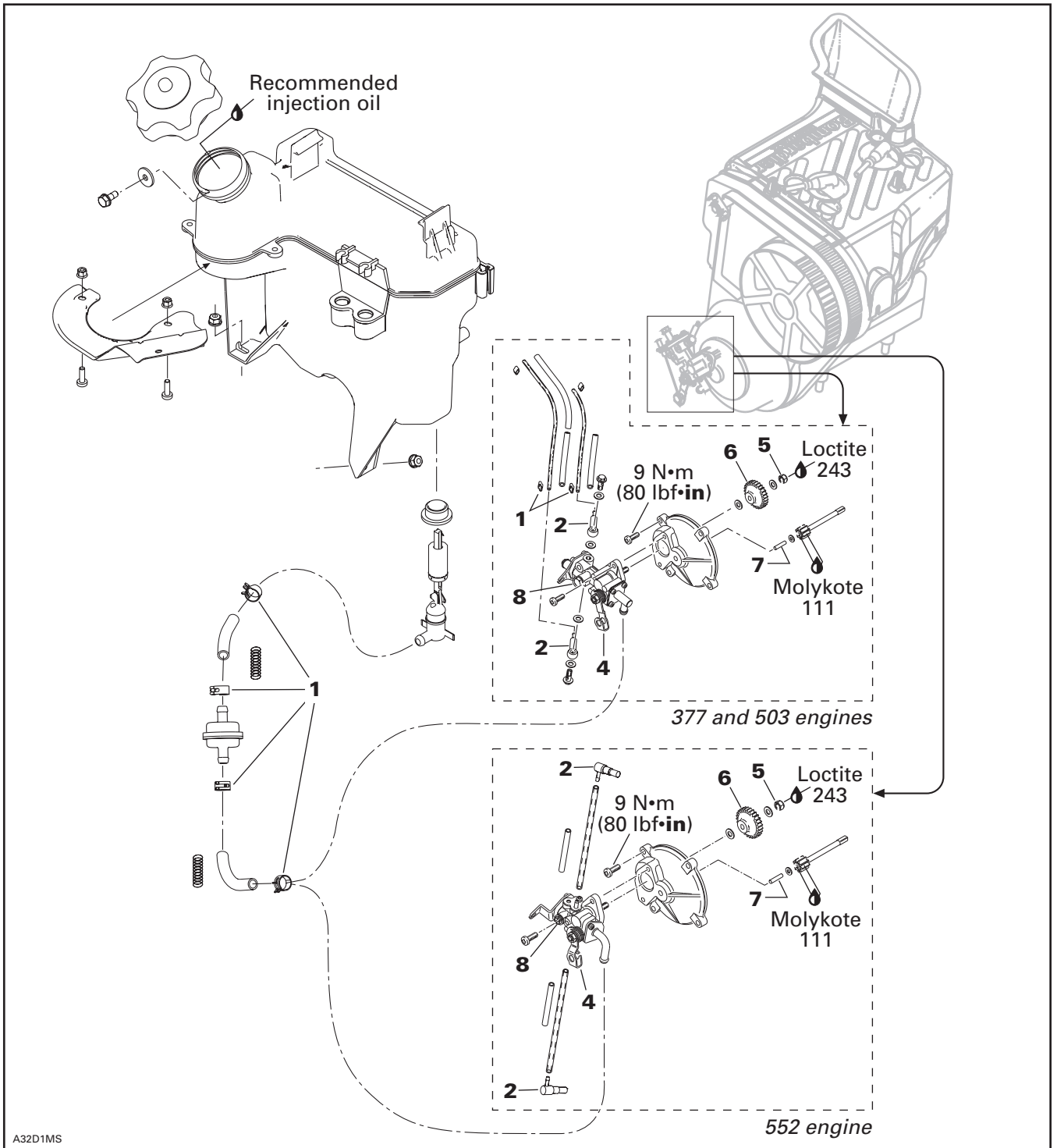
**CAUTION:** Do not use silicone “sealant”, this product will corrode contacts. Do not apply silicone dielectric grease on any Deutsch (gray) housing otherwise housing seal will be damaged.

#### Ignition Timing

Check as described in IGNITION TIMING.

# OIL INJECTION SYSTEM

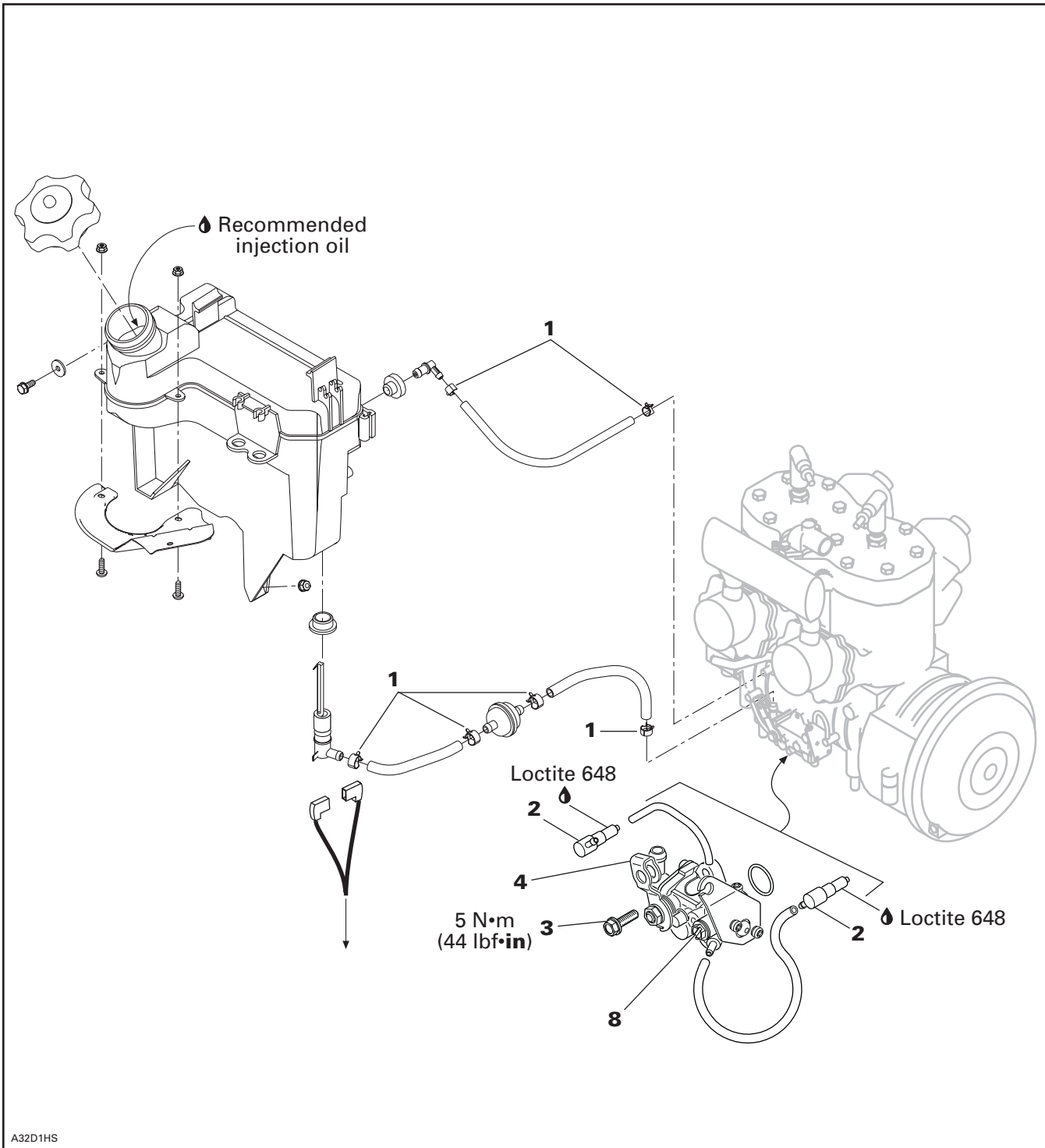
377, 503 and 552 Engines



## Section 04 ENGINE

### Subsection 06 (OIL INJECTION SYSTEM)

493, 593, 593 HO, 693, 793 and 793 HO Engines



**⚠ WARNING**

Wipe off any oil spills. Oil is highly flammable.

## OIL TYPE

### All Models

Use recommended injection oil as per vehicle *Operator's Guide*.

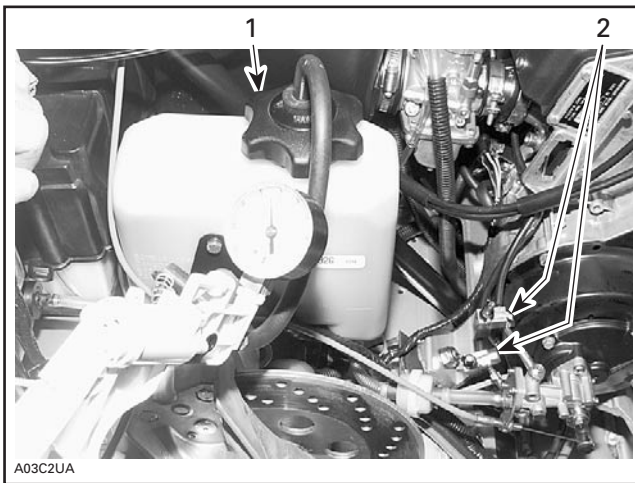
## OIL SYSTEM LEAK TEST

### All Models

The following test will indicate any leak from oil reservoir to the banjo fitting(s).

Install on oil reservoir special cap of leak testing kit (P/N 529 033 100).

Install hose pinchers (P/N 295 000 076) on outlet hoses.



#### TYPICAL

1. Special cap on reservoir
2. Hose pinchers on outlet hoses

Connect leak testing kit pump to special cap.

Pressurize oil system to 21 kPa (3 PSI). That pressure must not drop during 3 minutes.

If pressure drops, locate leak(s) and repair/replace leaking component(s).

## OIL PUMP IDENTIFICATION

### 4, Pump Lever

Different engines need different pumps. See identification on lever no. 4.

**CAUTION:** Always mount proper pump on engine.

| ENGINE TYPE | OIL PUMP IDENTIFICATION |
|-------------|-------------------------|
| 377         | L13                     |
| 493         | 02                      |
| 503         | E8                      |
| 552         | 03                      |
| 593, 593 HO | 02                      |
| 693         | 01                      |
| 793, 793 HO | 01                      |

**NOTE:** The following procedures can be done without removing the engine from chassis.

## CLEANING

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

## DISASSEMBLY

**NOTE:** Some oil pump components are not available as single parts.

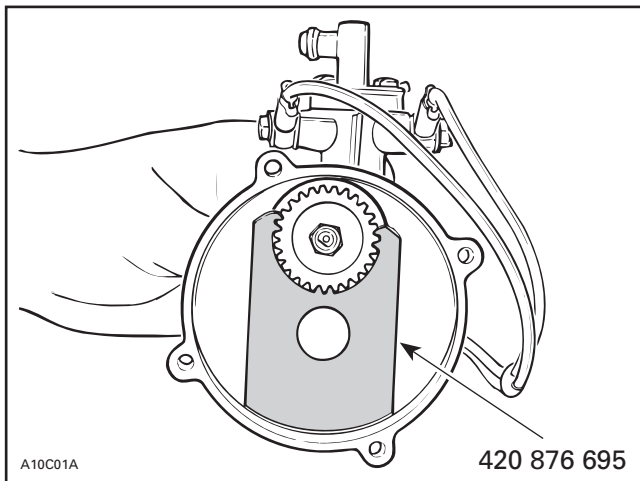
### 5,6, Gear Retaining Nut and Oil Pump Gear

To remove gear retaining nut, first extract the needle roller with pliers then lock gear in place using the following gear holder.

| ENGINE TYPE | TOOL P/N    |
|-------------|-------------|
| 377/503/552 | 420 876 695 |

## Section 04 ENGINE

### Subsection 06 (OIL INJECTION SYSTEM)



TYPICAL

## ASSEMBLY

### 1, Spring Clip

Always check for spring clips tightness.

### 6, Oil Pump Gear

At gear assembly, apply a light coat of Molykote 111 (P/N 413 707 000) on gear teeth.

### 7, Needle Roller (fan cooled engine only)

The needle roller must be engaged as deep as possible in the pump mounting flange.

### 3, Screw

Torque to 5 N•m (44 lbf•in).

Make sure cable barrel is well seated in oil pump lever.

Secure barrel with plastic washer and circlip.

Install cable lock washer on lever side.

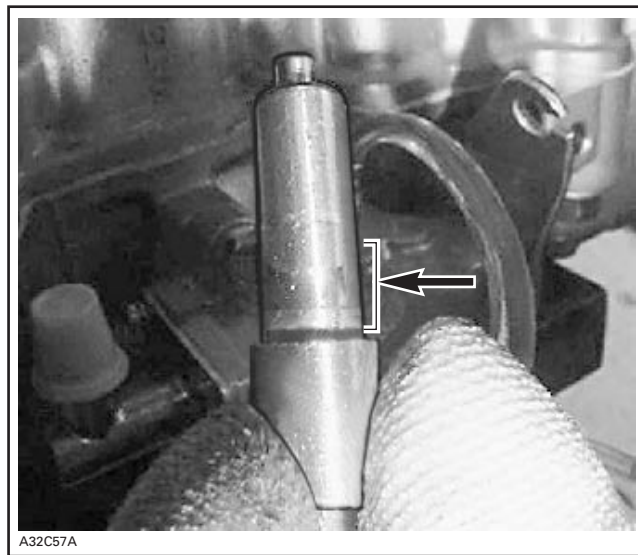
Verify cable and oil pump lever operation.

### 2, Check Valve

#### Liquid Cooled Engines

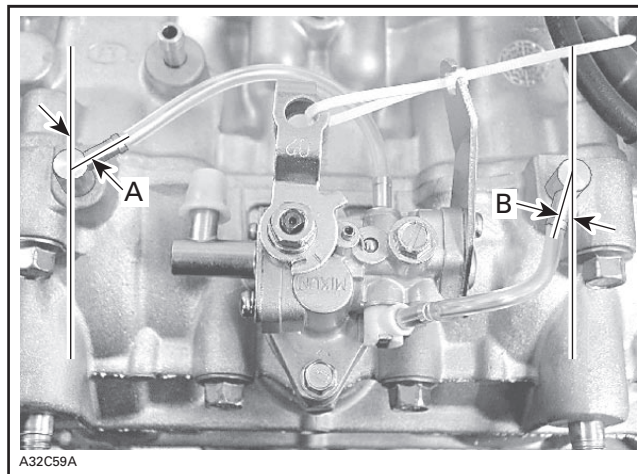
Apply Loctite 648 (green) (P/N 413 711 400) on the outer diameter of the check valve (machined section). Take care that Loctite is ONLY in this area.

**NOTE:** Prior to coating it with Loctite, make sure check valve body is clean and dry. Clean from dirt or oil, if any, with Pulley flange cleaner (P/N 413 711 809).



APPLY LOCTITE ON THIS AREA ONLY

Install the check valve in the correct position as described on next photos into the crankcase lower side.



TYPICAL — POSITION FOR LIQUID COOLED ENGINES

A. PTO side  $45^\circ \pm 5^\circ$  from cylinder axis to the top

B. MAG side  $20^\circ \pm 5^\circ$  from cylinder axis to the bottom

Punch in the check valve carefully with a plastic hammer.

Clean the crankcase from surplus of Loctite 648 with a rag.

### 3, Screw

Torque to 5 N•m (44 lbf•in).

Cable plastic elbow must be fastened and fully inserted.

Make sure cable barrel is well seated in oil pump lever.

Secure barrel with plastic washer and circlip.  
 Install cable lock washer on left side of support.  
 Verify cable and oil pump lever operation.

**ADJUSTMENT**

**Fan Cooled Engines**

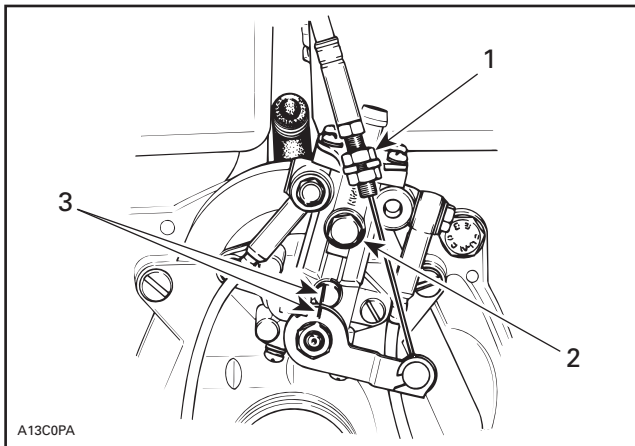
Prior to adjusting the pump, make sure all carburetor adjustments are completed and engine is stopped.

Eliminate the throttle cable free-play by pressing the throttle lever until a light resistance is felt, then hold in place.

The mark on the pump casting and on the lever must align. Width of lever mark is the tolerance.

Loosen the adjuster nut and adjust accordingly.

Retighten the adjuster nut.



**TYPICAL**

- 1. Adjuster nut
- 2. Bleeder screw
- 3. Marks

**CAUTION:** Proper oil injection pump adjustment is very important. Any delay in the opening of the pump can result in serious engine damage.

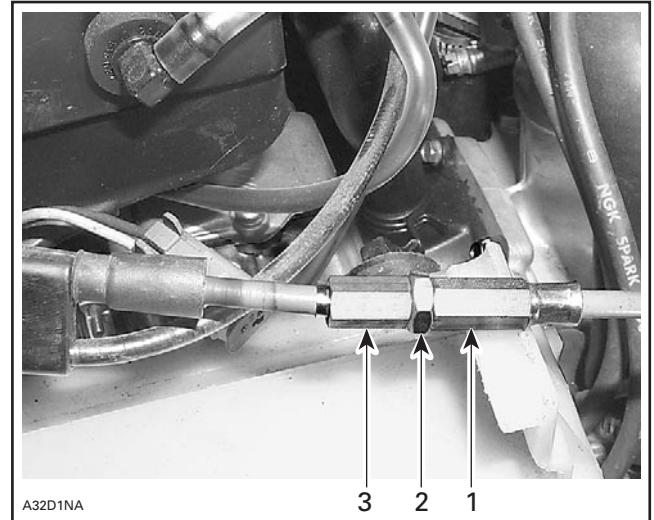
**Liquid Cooled Engines**

Prior to adjusting the pump, make sure all carburetor adjustments are completed and engine is stopped.

Stretch the adjusting cable through a maximum force of 32 N•m (7.2 lbf•ft).

**NOTE:** It is better to have two persons to check the cable distance.

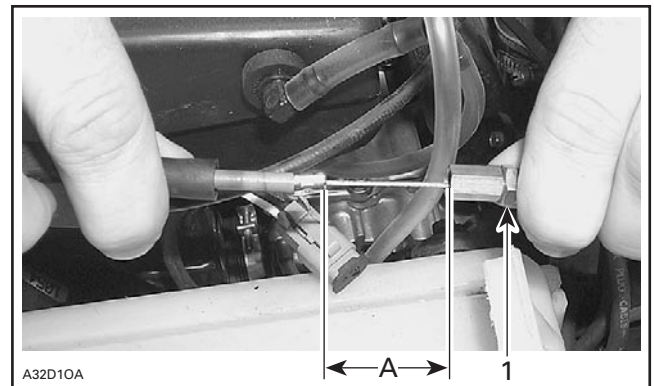
Check the visible distance of the stretched cable, while one person is stretching it and other checking the distance.



**TYPICAL**

- 1. Adjusting cable
- 2. Lock nut
- 3. Adjusting screw

The visible stretched distance of the cable should be  $18.0 \pm 0.3$  mm ( $0.708 \pm 0.012$  in).



**TYPICAL**

- 1. Lock nut
- A. Visible distance =  $18.0 \pm 0.3$  mm ( $0.708 \pm 0.012$  in)

If the visible distance is less or more than specified above, adjust the cable distance accordingly. To do so, loosen lock nut, turn adjusting screw in or out, retighten lock nut.

## Section 04 ENGINE

### Subsection 06 (OIL INJECTION SYSTEM)

#### To Bleed Oil Lines

Bleed main oil line (between tank and pump) by loosening the bleeder screw **no. 8** until air has escaped from the line. Add injection oil as required.

Reinstall all parts.

Bleed the small oil line between pump and engine by running engine at idle while holding the pump lever in fully open position.

**NOTE:** Make a J hook out of mechanical wire to lift the lever.

#### **WARNING**

Ensure not to operate carburetor throttle mechanism. Secure the rear of the vehicle on a stand.

## CHECKING OPERATION

### Oil Pump

#### On Vehicle

**NOTE:** Main oil line must be full of oil. See bleeding procedure above.

Lift rear of vehicle and support with a mechanical stand. Unplug small oil lines from pump. Start engine and stop it as soon as it fires.

Check that oil in small oil lines has been sucked up (this will be indicated by a clear section of small oil lines). Repeat the procedure until this condition is attained.

Reconnect small oil lines, start engine and run at idle while holding the pump lever in fully open position. Oil columns must advance into small oil lines.

If not, remove pump assembly and check the pump gear and drive shaft (if applicable) for defects, replace as necessary. Test pump as describes below.

**NOTE:** Through normal use, oil level must not drop in small tubes. If oil drops, verify check valve operation in injection nozzle. Replace as necessary.

#### Test Bench

Connect a hose filled with injection oil to main line fitting. Insert other hose end in an injection oil container. Using a clockwise rotating drill rotate pump shaft. Oil must drip from outer fittings while holding lever in a fully open position. If not replace pump.

## 2, Check Valve

For engine 493, 552, 593, 593 HO, 693, 793 and 793 HO, check valve is part (built-in) of injection nozzle.

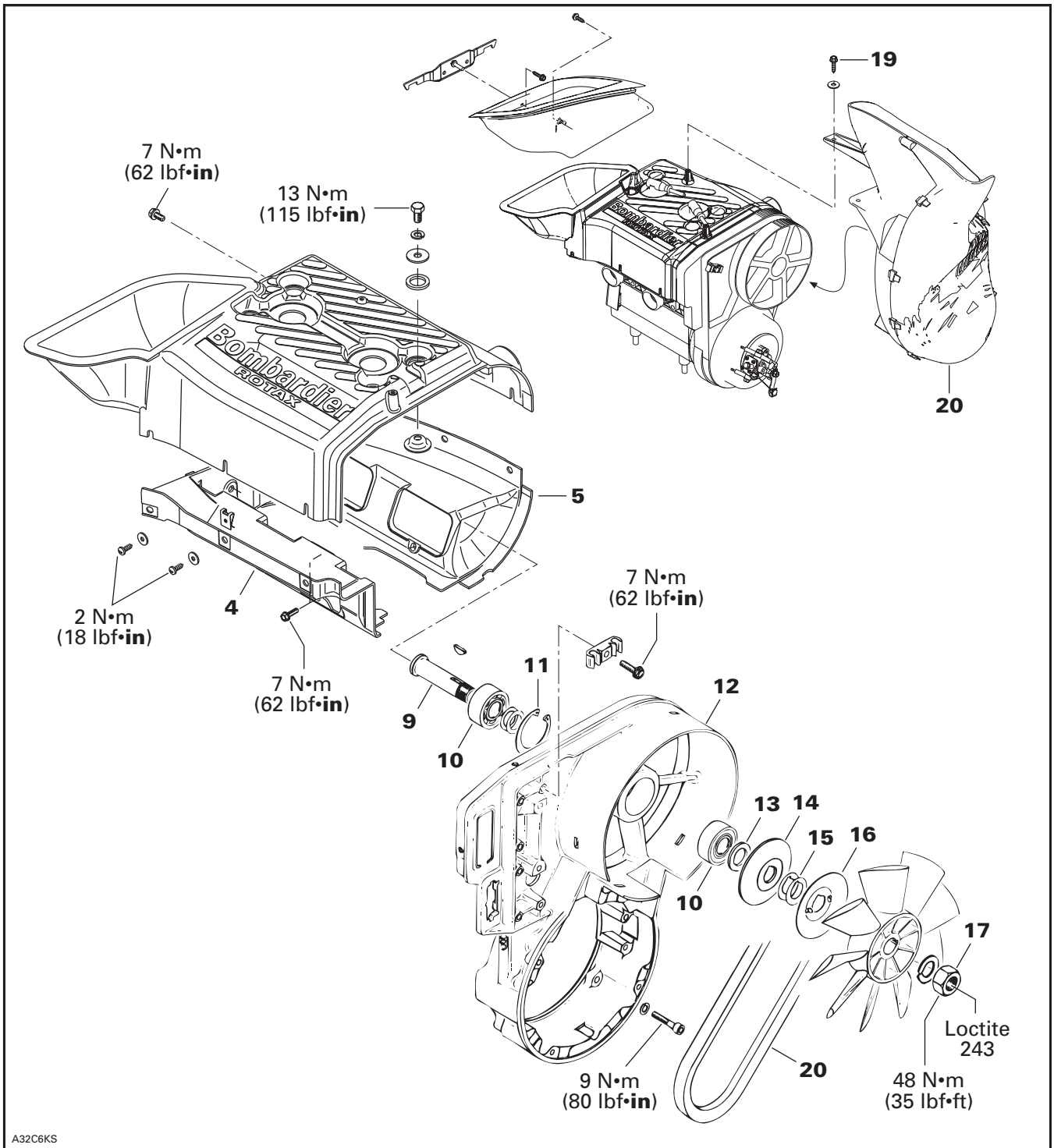
For engines 377 and 503, check valve is part (built-in) of banjo fitting.

To verify this check valve, proceed the same as for checking pump operation on vehicle. First unplug oil line from check valve. After restarting the engine, check that a clear section in small oil line is present. Reconnect oil line.

Run engine at idle. Oil column must advance. If the check valve is faulty, oil column will go back and forth. Replace if so.

# AXIAL FAN COOLING SYSTEM

377, 503 and 552 Engines



A32C6KS



## Section 04 ENGINE

### Subsection 07 (AXIAL FAN COOLING SYSTEM)

**NOTE:** The following procedures can be done without removing engine from chassis.

## REMOVAL

**NOTE:** To facilitate further disassembly, fan nut may be removed before removing fan housing.

Remove rewind starter, starting pulley, trigger coil wire from 4-connector housing then fan housing ass'y.

## CLEANING

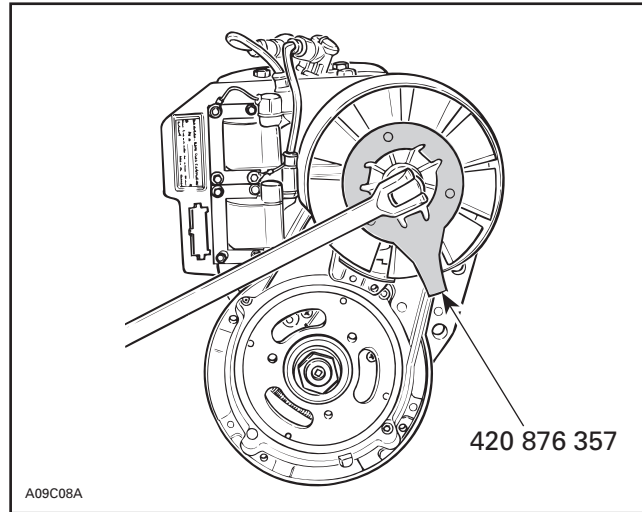
Clean all metal components in a non-ferrous metal cleaner.

## DISASSEMBLY AND ASSEMBLY

Remove the tuned pipe to gain access.

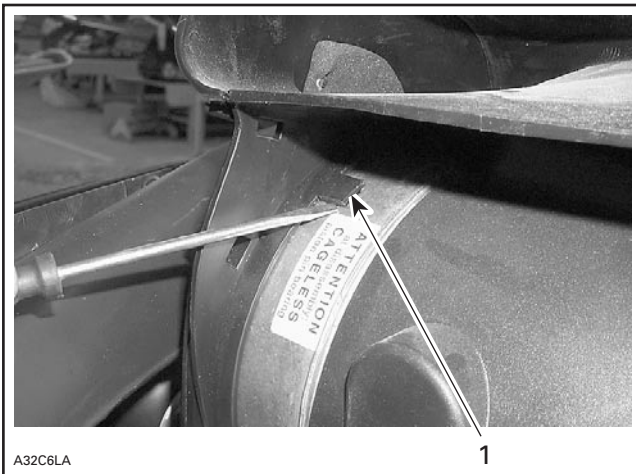
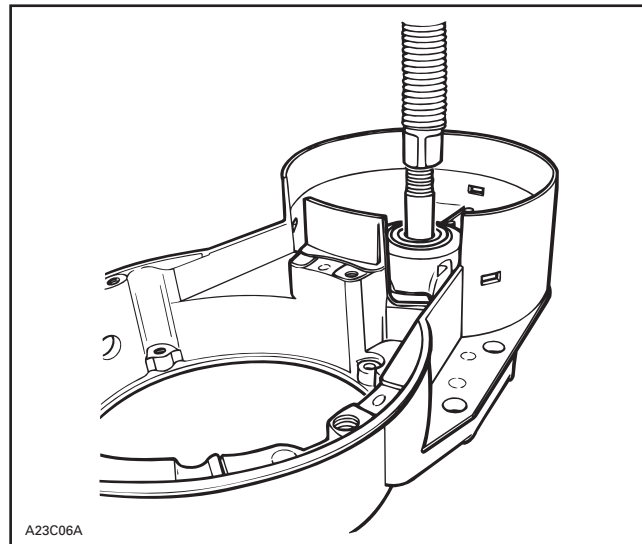
Unscrew the 2 screws **no. 19** of inlet duct **no. 20**. Remove the inlet duct by unclipping three tabs using a flat screwdriver from the engine fan housing.

To remove or install fan pulley retaining nut **no. 17**, lock fan pulley with special holder wrench (P/N 420 876 357). At assembly, torque nut to 48 N•m (35 lbf•ft).



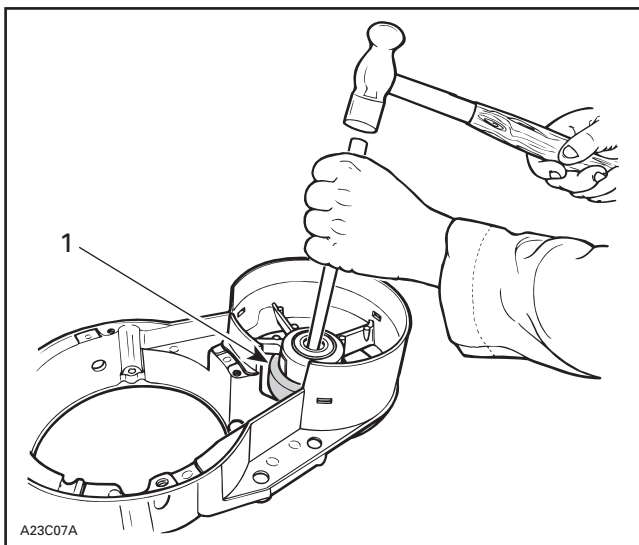
TYPICAL

Using a press, drive the fan shaft **no. 9** out.



1. Tab

Support fan housing no. 12 with a ring. With a punch, working all around bearing no. 10 inner race, drive bearing out of fan housing. Keep shims for installation.



1. Ring supporting fan housing

Remove circlip no. 11 then remaining bearing.

To install, press one bearing in place then install circlip and shims. Press the other bearing from opposite side until it is flush with housing. Press fan shaft from engine side of fan housing. Check for free rolling action.

## INSTALLATION

At assembly, apply a light coat of Loctite 243 (blue) on screw no. 1 threads.

A gasket must be placed on both sides (inner and outer) of intake and exhaust holes of cylinder cowl nos. 4 and 5.

Reinstall fan protector no. 18 properly.

### **⚠ WARNING**

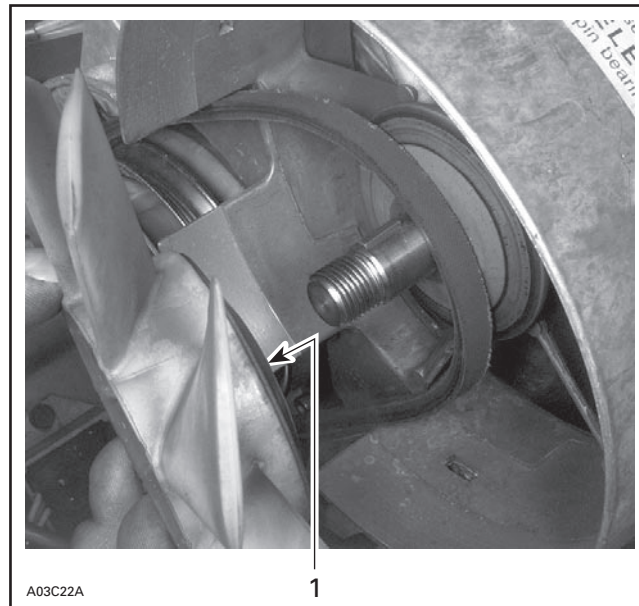
Always reinstall fan protector after servicing.

## FAN BELT REPLACEMENT AND DEFLECTION ADJUSTMENT

Remove muffler, rewind starter and on so equipped models connecting flange. Follow procedure described above.

Using fan holder tool (P/N 420 876 357), remove fan nut.

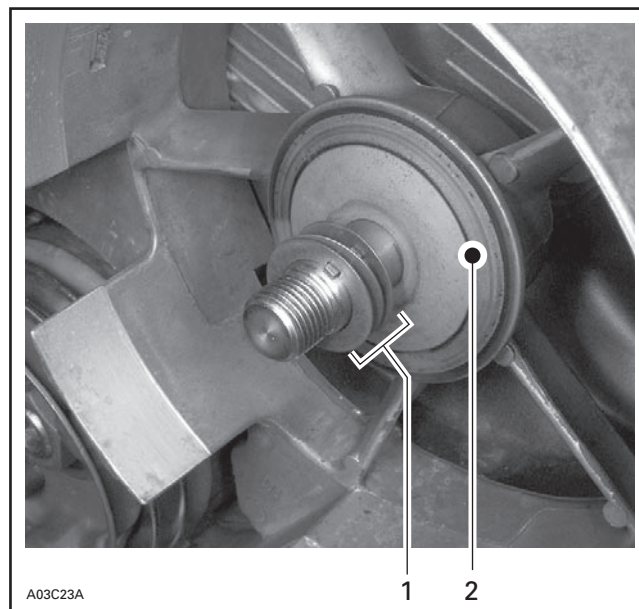
Remove fan with pulley half.



1. Remove fan with pulley half

Remove fan belt.

Leave shims and second half pulley in place. Refer to the following photo.



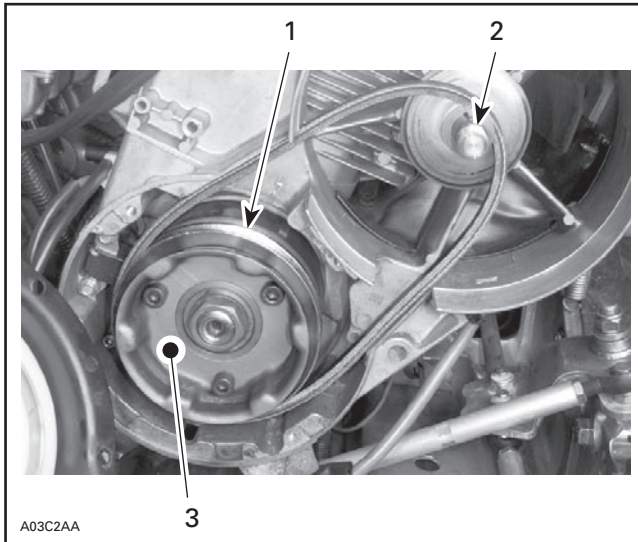
1. Keep shims  
2. Leave second half pulley in place

## Section 04 ENGINE

### Subsection 07 (AXIAL FAN COOLING SYSTEM)

#### Reassembly

Install fan belt on bottom pulley first then position onto fan shaft, as shown in the next photo.



**FAN BELT PROPERLY INSTALLED ON BOTTOM PULLEY AND FAN SHAFT**

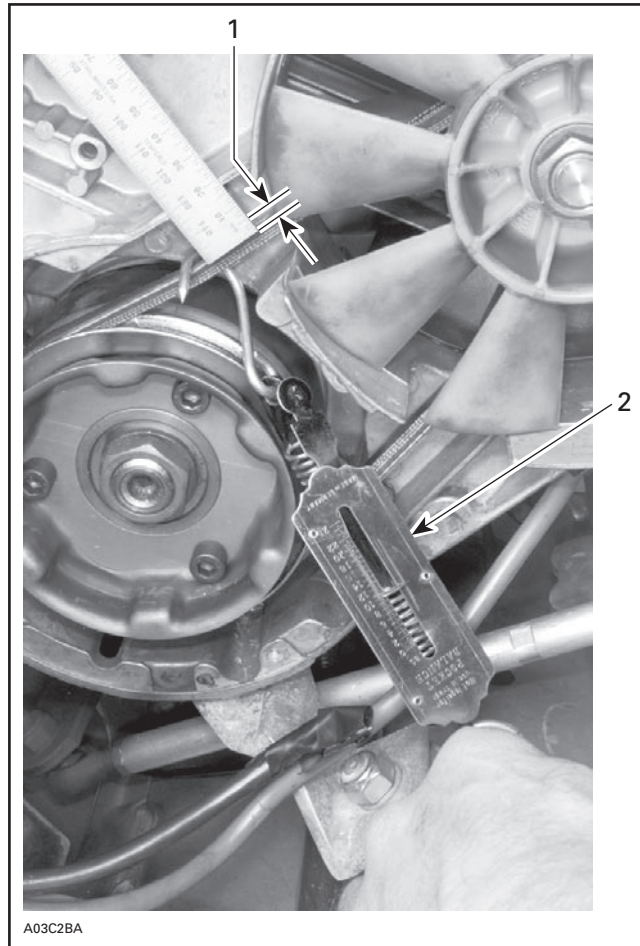
1. Bottom pulley
2. Fan shaft
3. Starting pulley

Reinstall fan assembly on fan shaft. Temporarily tighten fan nut.

**CAUTION:** When reinstalling fan assembly, ensure that key is properly positioned into fan shaft keyway.

#### Fan Belt Deflection Adjustment

Check fan belt deflection using a ruler and a fish scale positioned midway between pulleys as per following photo.



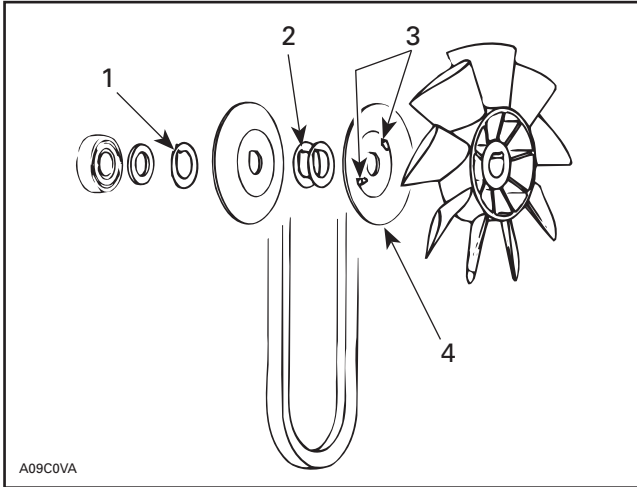
#### TYPICAL

1. Measure deflection here
2. Fish scale

Belt deflection must be according to the following specifications:

| ENGINE TYPE      | BELT DEFLECTION | FORCE APPLIED |
|------------------|-----------------|---------------|
| 377, 503 and 552 | 9.5 mm (3/8 in) | 5 kg (11 lb)  |

To adjust deflection tension, add or remove shim(s) no. 15 between pulley halves nos. 14 and 16. Install excess shim(s) between distance sleeve no. 13 and pulley half no. 14 (housing side).



1. Unused shim(s) here
2. Adjust here
3. Positioning noses
4. Some engines only

Select pulley halves so that the one with 2 positioning noses will be on fan side. Ensure to insert these noses into fan notches.

Once fan belt is properly adjusted, torque fan nut to 48 N•m (35 lbf•ft) using holder wrench (P/N 420 876 357), as shown in the following photo.

**NOTE:** Apply Loctite 243 (blue) on fan nut threads.



**TORQUE FAN NUT USING HOLDER WRENCH**

### Finalizing Reassembly

Reinstall rewind starter.

**CAUTION:** When installing rewind starter, ensure that oil pump shaft is properly positioned. Do not force shaft insertion. Turn fan until oil pump shaft slides in place, as shown in the following photo.



**TURN FAN TO SLIDE OIL PUMP SHAFT IN PLACE**

Secure rewind starter with original screws.

Reinstall fan protector no. 18 properly.

Install the air inlet duct no. 20 with screws no. 19 and Loctite Black Max 380.

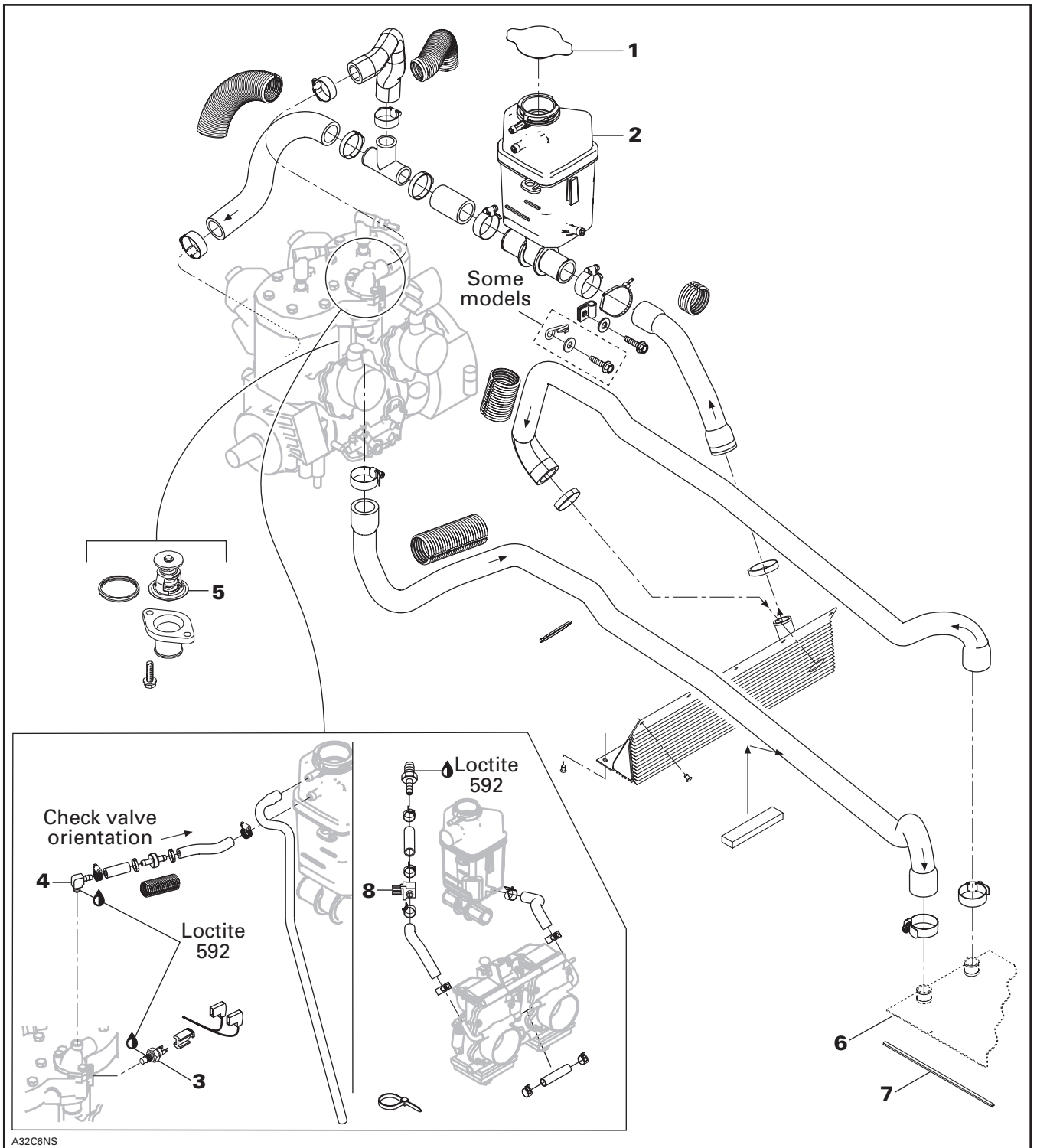
**⚠ WARNING**

**Always reinstall fan protector after servicing.**

Reinstall muffler.

# LIQUID COOLING SYSTEM

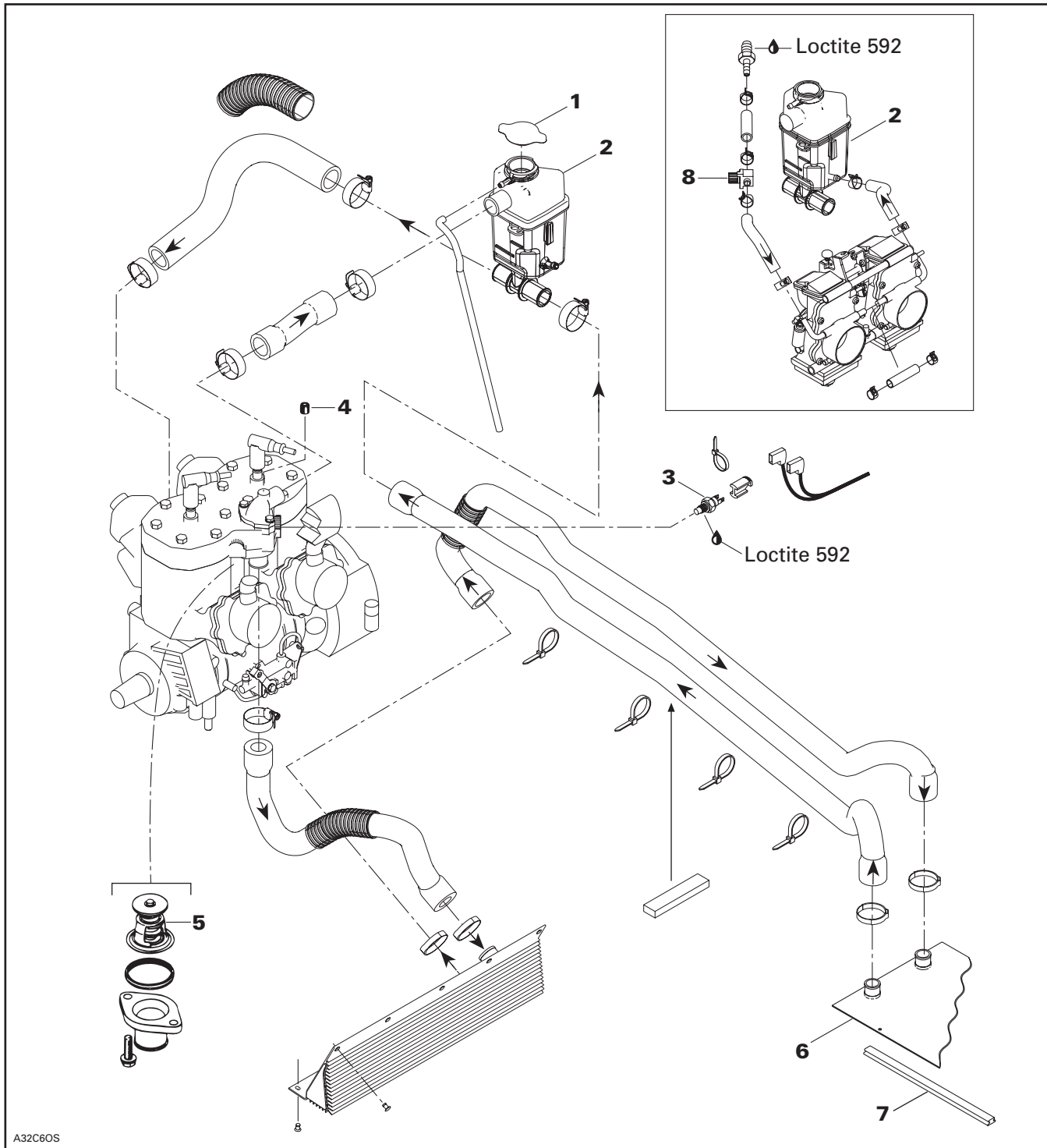
493 Engine



# Section 04 ENGINE

## Subsection 08 (LIQUID COOLING SYSTEM)

593, 593 HO, 693, 793 and 793 HO Engines



## COOLING SYSTEM LEAK TEST

Install special radiator cap (P/N 529 021 400) included in engine leak tester kit (P/N 861 749 100) on coolant tank. Install hose pincher (P/N 295 000 076) on overflow hose. Using pump also included in kit pressurize all system through coolant reservoir to 100 kPa (15 PSI).

Check all hoses and cylinder/base for coolant leaks. Spray a soap/water solution and look for air bubbles.



## INSPECTION

Check general condition of hoses and clamp tightness.

## DRAINING THE SYSTEM

### **⚠ WARNING**

Never drain or refill the cooling system when engine is hot.

To drain the cooling system, siphon the coolant mixture from the coolant tank. Disconnect hose at water pump to drain coolant from engine.

When the coolant level is low enough, lift the rear of vehicle to drain the radiator.

## DISASSEMBLY AND ASSEMBLY

### 3,4, Sender and Plug or Elbow

Apply Loctite 592 (P/N 413 702 300) thread sealant on sender and plug or elbow to avoid leaks.

### 1, Pressure Cap

Check if the cap pressurizes the system. If not, install a new 90 kPa (13 PSI) cap (do not exceed this pressure).

### 6,7, Radiator and Radiator Protector

Insert radiator protector into radiator C-rail and crimp C-rail at rear end. Refer to FRAME for radiator removal.

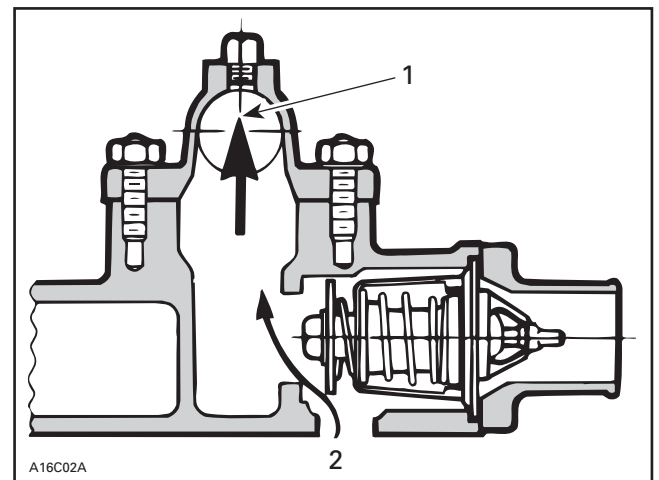
### 5, Thermostat

To check thermostat, put in water and heat water. Thermostat should start to open when water temperature reaches the following degree. It will be almost fully open at 50°C (122°F).

| ENGINE | TEMPERATURE  |
|--------|--------------|
| All    | 42°C (108°F) |

Thermostat is a double action type.

- a. Its function is to give faster warm up of the engine by controlling a circuit; water pump — engine — coolant tank. This is done by bypassing the radiator circuit.



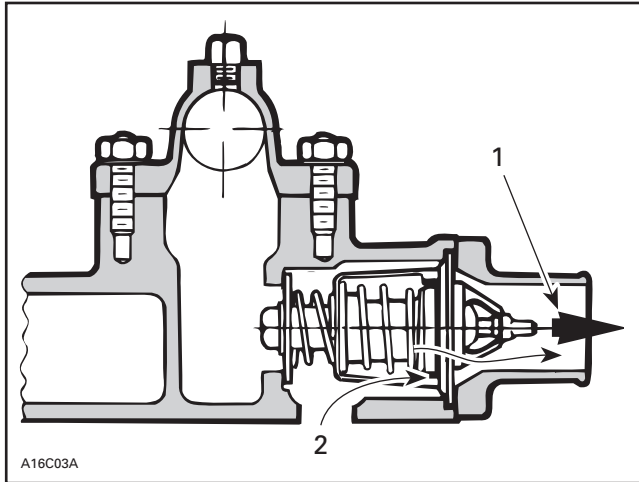
TYPICAL — CLOSED THERMOSTAT, COLD ENGINE

1. To reservoir
2. From cylinders

## Section 04 ENGINE

### Subsection 08 (LIQUID COOLING SYSTEM)

b. When the liquid is warmed enough, the thermostat opens progressively the circuit, water pump — engine — radiators — coolant tank to keep the liquid at the desired temperature. (See the diagram of the exploded view).



TYPICAL — OPEN THERMOSTAT, WARM ENGINE

1. To radiators
2. From cylinders

These 2 functions have the advantage of preventing a massive entry of cold water into the engine.

## COOLING SYSTEM REFILLING PROCEDURE

**CAUTION:** To prevent rust formation or freezing condition, always replenish the system with recommended premixed coolant.

### System Capacity

Refer to TECHNICAL DATA.

### Refilling Procedure

#### All Engines

**IMPORTANT:** USE THE 50/50 PREMIXED COOLANT - 37°C (-35°F) (P/N 293 600 038).

Do not reinstall pressure cap.

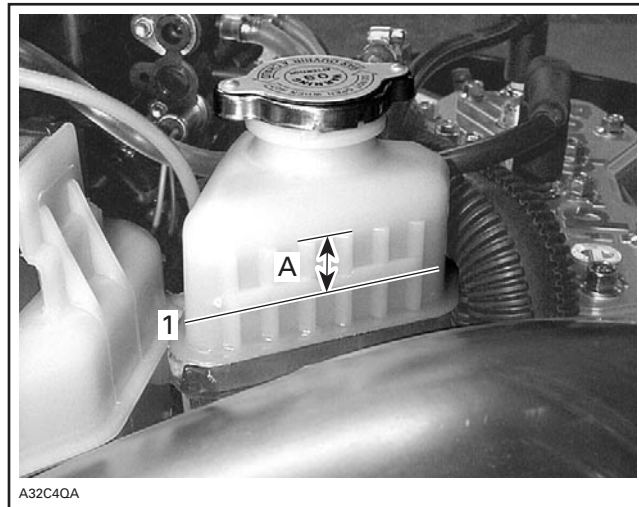
With engine cold, refill coolant tank up to COLD LEVEL line. Start engine. Refill up to line while engine is idling until rear radiators are warm to the touch (about 4 to 5 minutes). Always monitor coolant level while filling tank to avoid emptying. Install pressure cap.

Lift rear of vehicle and support it safely.

Activate throttle lever 3 - 4 times to bring engine speed to 7000 RPM.

Apply the brake.

Lower vehicle back on ground and add coolant up to 15 mm (1/2 in) above the COLD LEVEL line.



1. Cold level line
- A. 15 mm (1/2 in)

Lift front of vehicle of 60 cm (24 in) and support it safely. Let the vehicle idle for two minutes.

Put vehicle back on ground and add coolant up to 15 mm (1/2 in) over COLD LEVEL line.

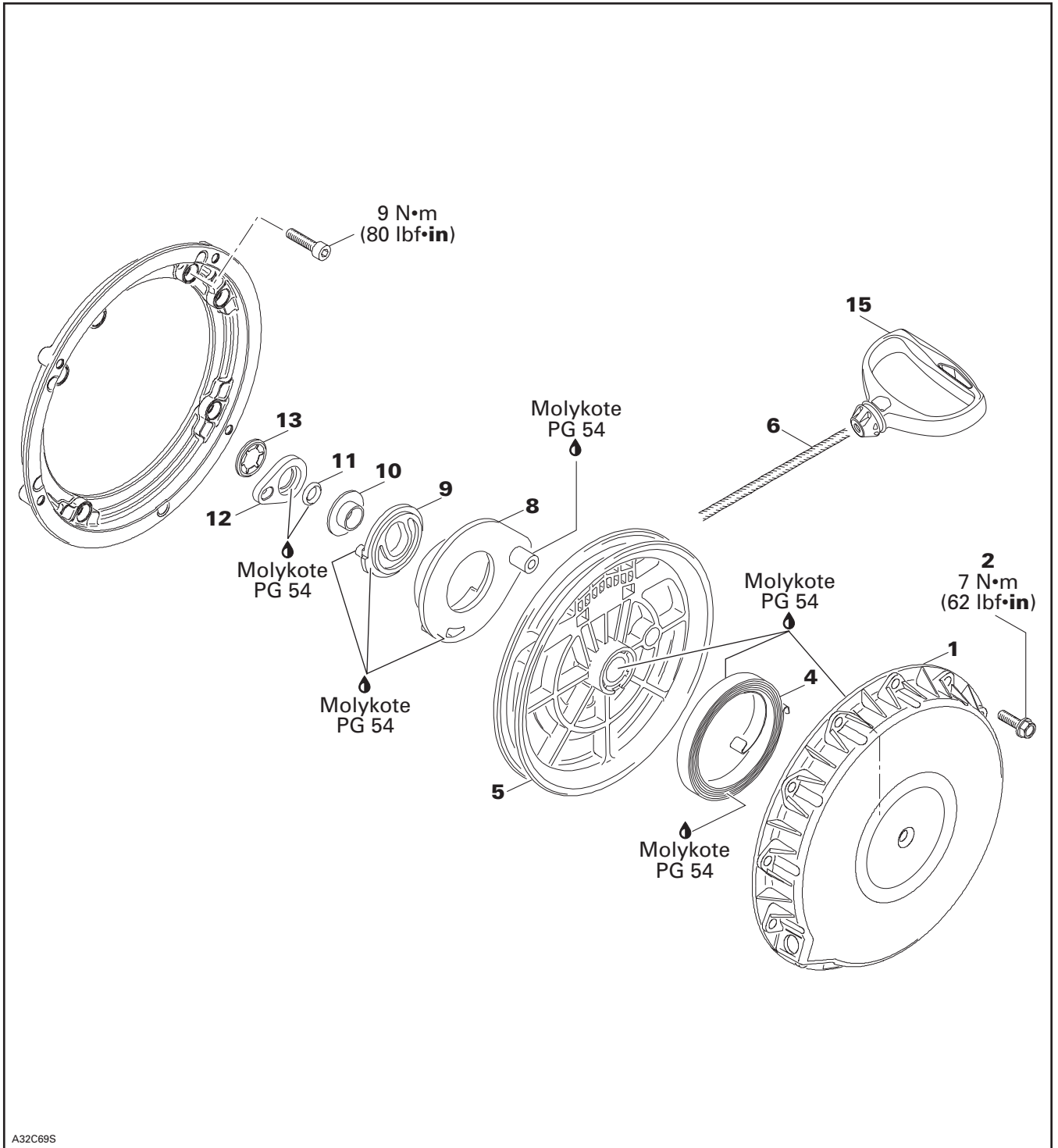
When engine has completely cooled down, recheck coolant level in coolant tank and refill up to line if needed.

Check for coolant mixture freezing point. Specification is -37°C (-35°F). Adjust as necessary.



# REWIND STARTER

*Plastic Rewind Starter on ZX Liquid Cooled Models*

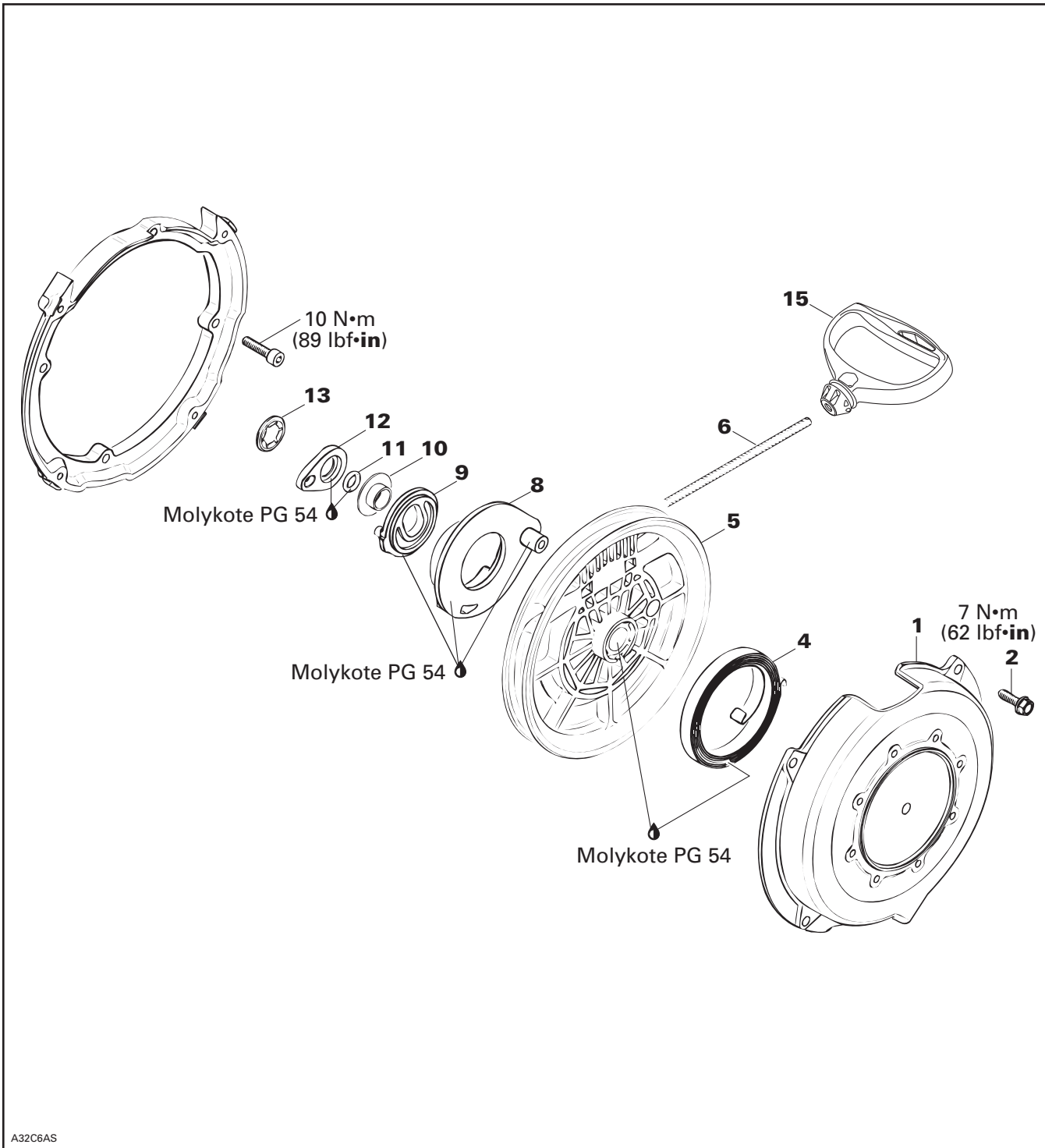


A32C69S

## Section 04 ENGINE

### Subsection 09 (REWIND STARTER)

#### Plastic Rewind Starter on ZX Fan Cooled Models



## INSPECTION

**NOTE:** Due to dust accumulation, rewind starter must be periodically cleaned, inspected and lubricated.

**CAUTION:** It is of the utmost importance that the rewind starter spring be lubricated periodically using Molykote PG 54 (P/N 420 899 763). Otherwise, rewind starter component life will be shortened and/or rewind starter will not operate properly under very cold temperatures.

Check if rope no. 6 is fraying, replace if so.

When pulling starter grip, mechanism must engage within 30 cm (1 ft) of rope pulled. If not, disassemble rewind starter, clean and check for damaged plastic parts. Replace as required, lubricate, reassemble and recheck. Always replace O-ring no. 11 every time rewind starter is disassemble.

When releasing starter grip, it must return to its stopper and stay against it. If not, check for proper spring preload or damages. Readjust or replace as required.

When pulling starter grip 10 times in a row, it must return freely. If not, check for damaged parts or lack of lubrication. Replace parts or lubricate accordingly.

## REMOVAL

Using a small screwdriver, extract rope knot from starter grip no. 15. Cut rope close to knot. Tie a knot near starter.

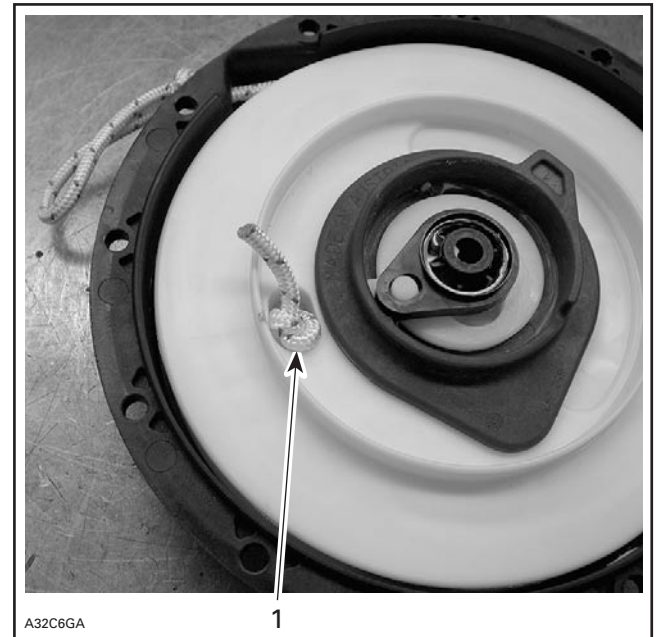
Remove screws no. 2 securing rewind starter no. 1 to engine then remove rewind starter.

### **Fan Cooled Engines Only**

Remove pump from rewind starter cover.

## ROPE REPLACEMENT

Pull out rope. Hold rewind starter in a vise. Slide rope and untie the knot. Pull out the rope completely.



1. Knot to be untied.

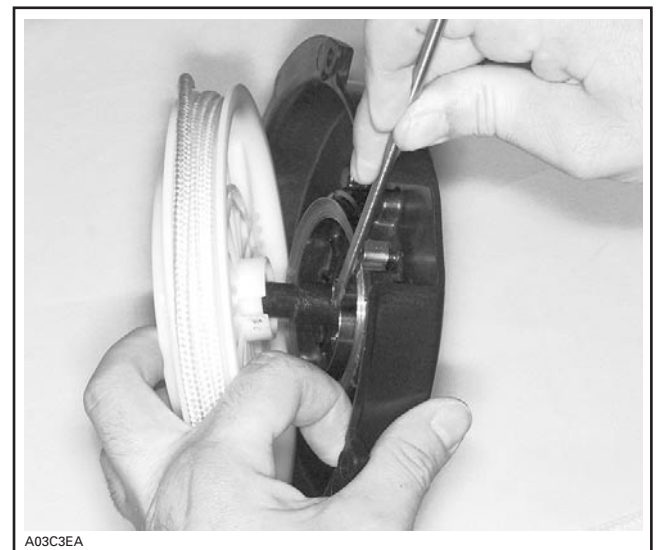
**NOTE:** When rope is completely pulled out, spring preload is 4-1/2 turns.

## DISASSEMBLY

Undo knot previously tied at removal. Let sheave get free to release spring preload.

Cut push nut no. 13 and discard. Remove locking element no. 12, O-ring no. 11, step collar no. 10, pawl lock no. 9 and pawl no. 8.

Remove sheave no. 5 from starter housing no. 1. Hold spring with a screwdriver.



Pull out knot and then pull out rope no. 6.

## Section 04 ENGINE

### Subsection 09 (REWIND STARTER)

## ASSEMBLY

At assembly, position spring no. 4 outer end into spring guide notch then wind the spring counter-clockwise into guide.

### **⚠ WARNING**

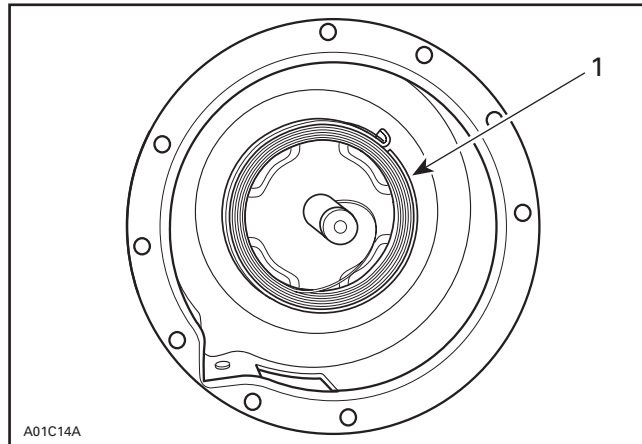
Since the spring is tightly wound inside the guide it may fly out when rewind is handled. Always handle with care.



1. Outer end into guide notch

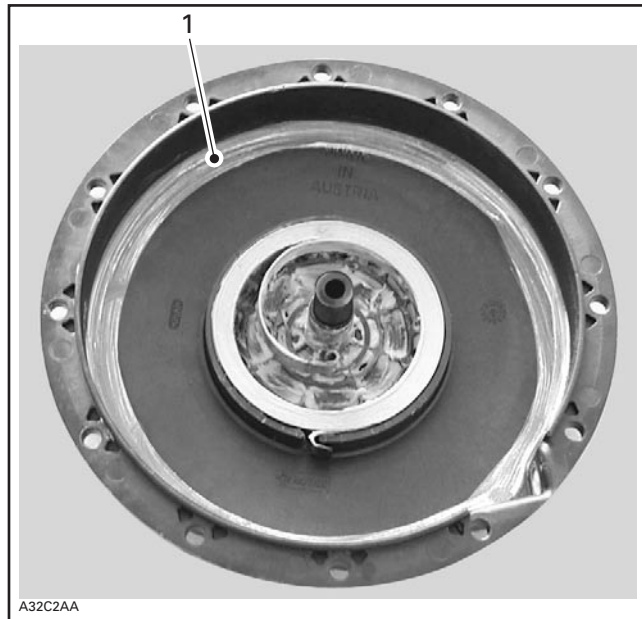
**CAUTION:** It is of the utmost importance that the rewind starter spring be lubricated periodically using Molykote PG 54 (P/N 420 899 763). Otherwise, rewind starter component life will be shortened and/or rewind starter will not operate properly under very cold temperatures.

Lubricate spring assembly and 1 cm (1/2 in) wide on bottom of housing with Molykote PG 54 (P/N 420 899 763).



TYPICAL

1. Molykote PG 54 inside spring guide

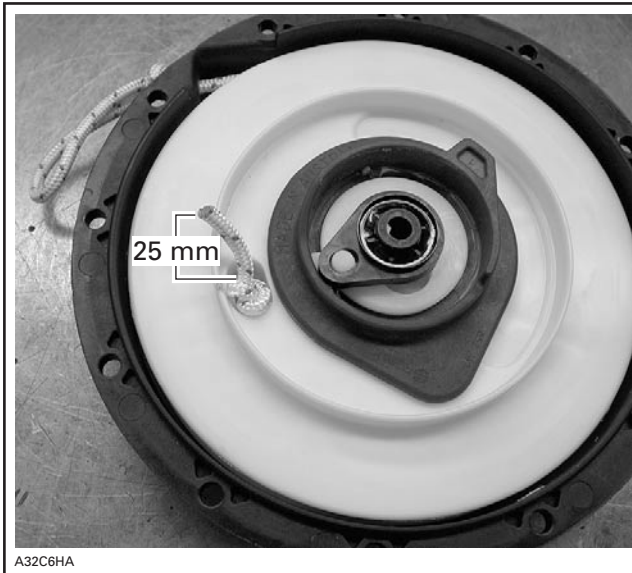


1. Molykote PG 54 applied 1 cm (1/2 in) wide on bottom of housing

**CAUTION:** The use of standard multi-purpose grease could result in rewind starter malfunction.

**Section 04 ENGINE**  
**Subsection 09 (REWIND STARTER)**

To install rope **no. 6**, insert rope into sheave **no. 5** orifice and lock it by making a knot, leaving behind a free portion of about 25 mm in length. Fuse rope end with a lit match and insert it into sheave.



*FREE PORTION*



*FREE PORTION INSERTED INTO SHEAVE*

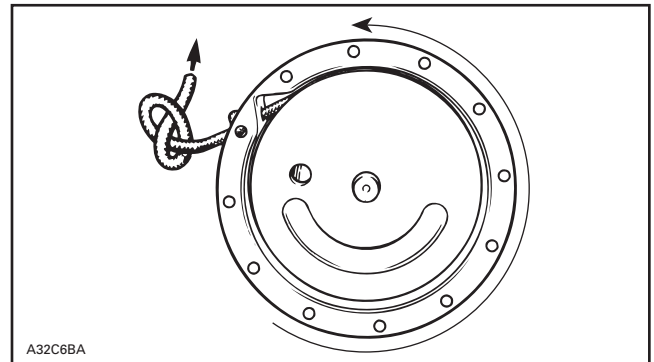
Lubricate housing post with silicone compound grease. Install sheave.

To adjust rope tension:

Wind rope on sheave and place rope sheave into starter housing making sure that the sheave hub notch engages in the rewind spring hook.

Rotate the sheave counterclockwise until rope end is accessible through rope exit hole. This will give 1/2 turn of preload.

Pull the rope out of the starter housing and temporarily make a knot to hold it.



*TYPICAL*

Lubricate pawl **no. 8** with Molykote PG 54 (P/N 420 899 763) then install over rope sheave.



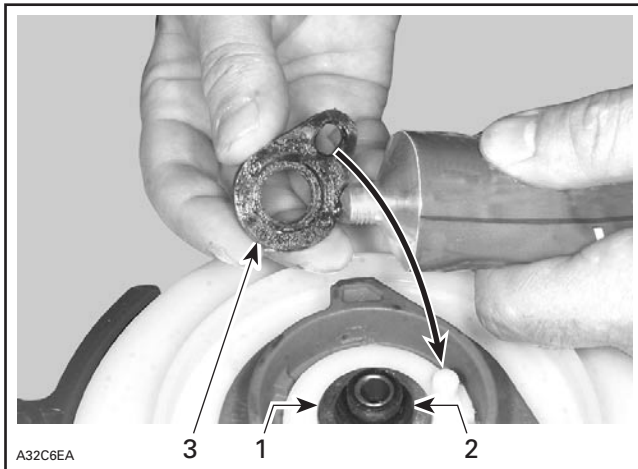
## Section 04 ENGINE

### Subsection 09 (REWIND STARTER)

Lubricate pawl lock **no. 9** with Molykote PG 54 (P/N 420 899 763). Install over pawl.



Install step collar **no. 10** with its sleeve first. Lubricate a new O-ring **no. 11** and locking element **no. 9** with Molykote PG 54 (P/N 420 899 763). Install over pawl lock.



1. Step collar
2. O-ring
3. Locking element

Install a new push nut **no. 13**.

## INSTALLATION

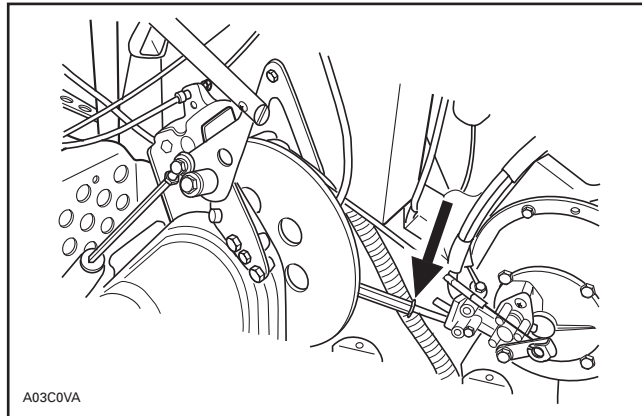
Fuse rope end with a lit match.

### **Fan Cooled Engines Only**

Reinstall oil pump on rewind starter assembly.

### **All Models**

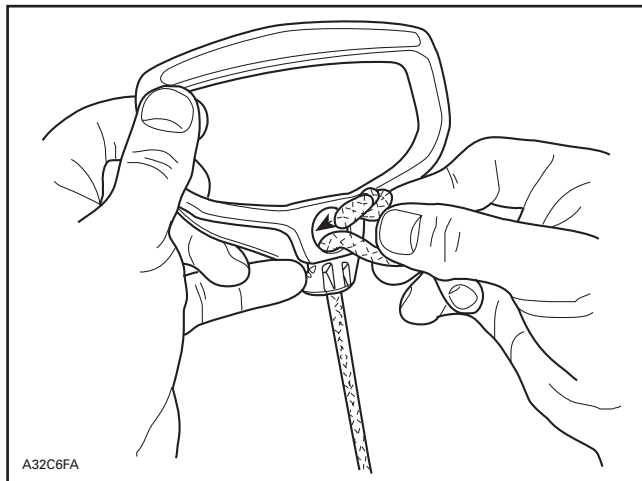
Thread starter rope **no. 6** through rope guide when applicable.



*TYPICAL*

Reinstall rewind starter assembly on engine.

Pass rope through starter grip **no. 15** and tie a knot in the rope end. Insert rope end down and pull the starter grip over the knot.

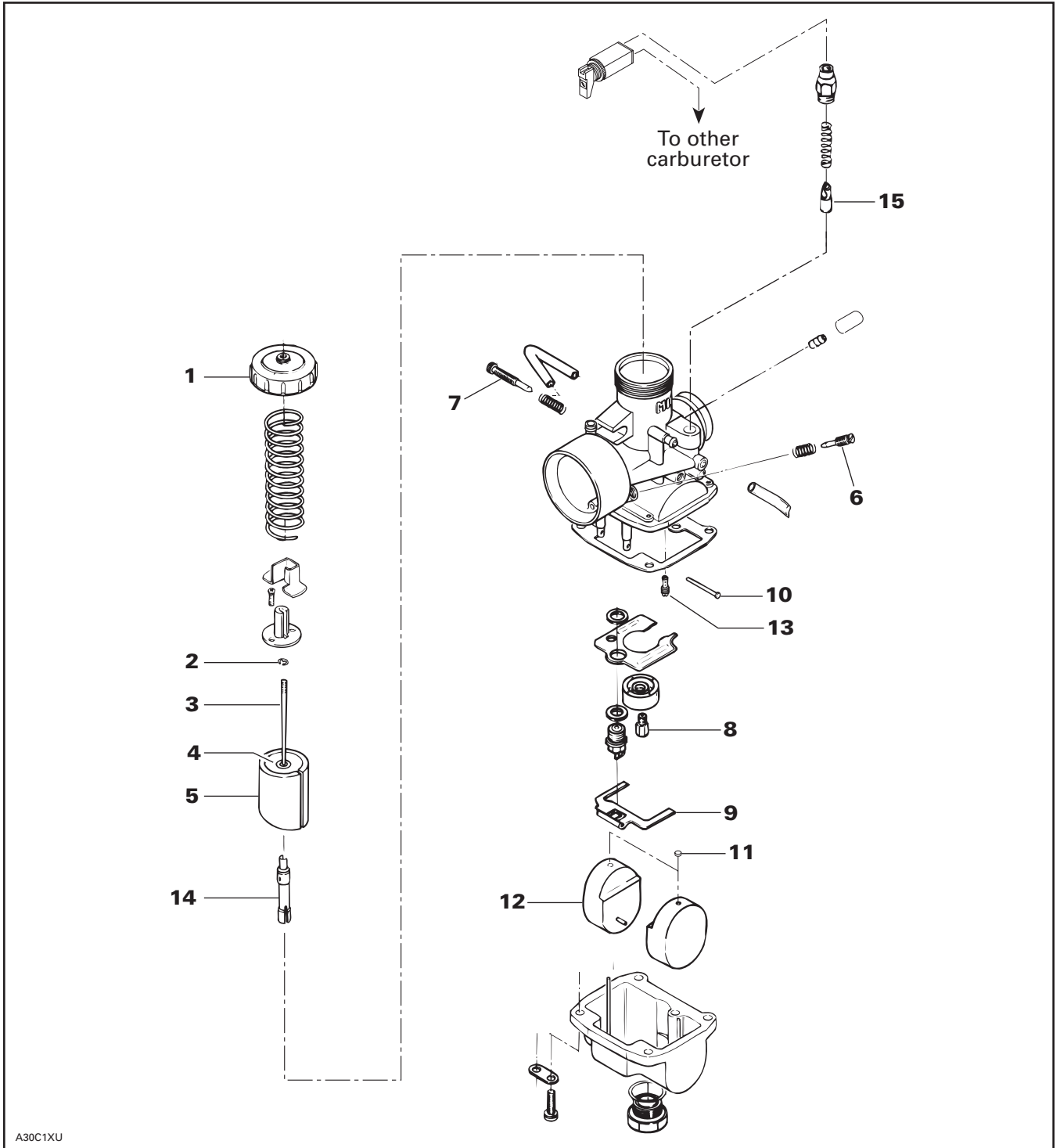


*TYPICAL*

# CARBURETOR AND FUEL PUMP

## CARBURETOR

VM Type



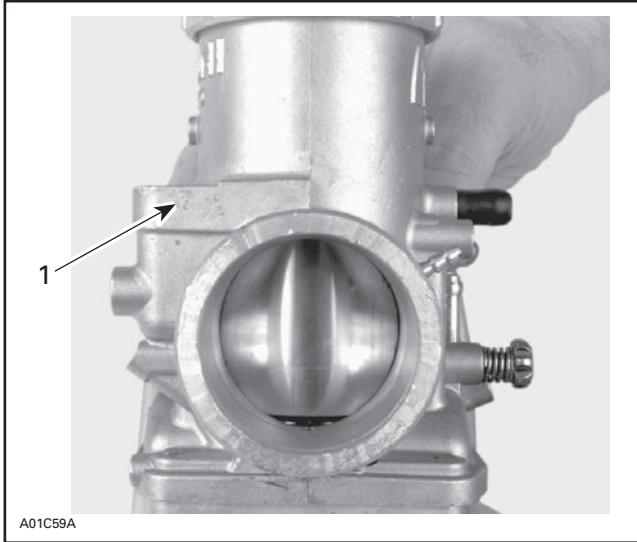
A30C1XU

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

#### IDENTIFICATION

All carburetors are identified on their body.



#### TYPICAL

1. Identification: 34-482

#### REMOVAL

Unfasten clamps then, remove air silencer from left hand side.

Disconnect fuel inlet lines.

#### **⚠ WARNING**

Fuel is flammable and explosive under certain conditions. Always wipe off any fuel or oil spillage from the vehicle. Ensure work area is well ventilated. Do not smoke or allow open flames or sparks in the vicinity.

Unscrew carburetor cover no. 1 then pull out throttle slide no. 5 from carburetor.

#### **⚠ WARNING**

Exercise care when handling throttle slide. Scratches incurred may cause throttle slide to stick open in operation.

Disconnect throttle cable from throttle slide.

Remove carburetors from engine.

Unscrew choke plunger from each carburetor.

#### CLEANING AND INSPECTION

The entire carburetor should be cleaned with a general solvent and dried with compressed air before disassembly.

**CAUTION:** Heavy duty carburetor cleaner may be harmful to the float material and to the rubber parts, O-rings, etc. Therefore, it is recommended to remove those parts prior to cleaning.

Carburetor body and jets should be cleaned in a carburetor cleaner following manufacturer's instructions.

#### **⚠ WARNING**

Solvent with a low flash point such as gasoline, naphtha, benzol, etc., should not be used as they are flammable and explosive.

Check inlet needle tip condition. If worn, the inlet needle and seat must be replaced as a matched set.

**NOTE:** Install needle valve for snowmobile carburetor only. It is designed to operate with a fuel pump system.

Check throttle slide for wear. Replace as necessary.

Check idle speed screw straightness. Replace as necessary.

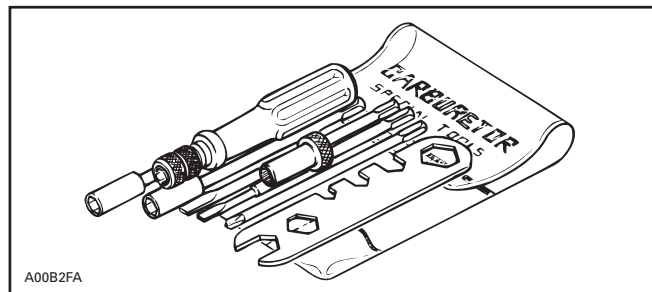
Check for fuel soaked into float no. 12; replace as necessary.

Check float for cracks or other damages affecting free movement; replace as necessary.

Inspect throttle cable and housing for any damages. Replace as necessary.

#### DISASSEMBLY AND ASSEMBLY

**NOTE:** To ease the carburetor disassembly and assembly procedures it is recommended to use carburetor tool kit (P/N 404 112 000).





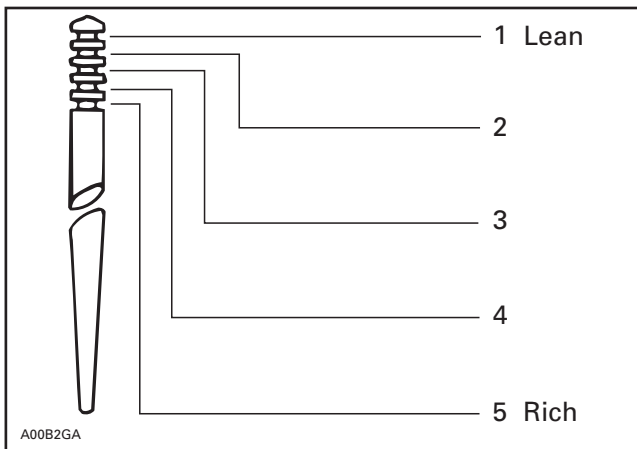
**2,3, E-Clip and Needle**

Remove screws from needle retaining plate to withdraw the needle.

The position of the needle in the throttle slide is adjustable by means of an E-clip inserted into 1 of 5 grooves located on the upper part of the needle. Position 1 (at top) is the leanest, 5 (at bottom) the richest.

**NOTE:** The last digit of the needle identification number gives the recommended calibrated position of the E-clip **from the top** of the needle.

**EXAMPLE:** 6DH4-3  
 Needle identification      ↑      ↑      Recommended position of the E-clip from top



CLIP POSITIONS

**8, Main Jet**

The main jet installed in the carburetor has been selected for a temperature of - 20°C (0°F) at sea level. Different jetting can be installed to suit temperature and/or altitude changes. A service bulletin will give information about calibration according to altitude and temperature.

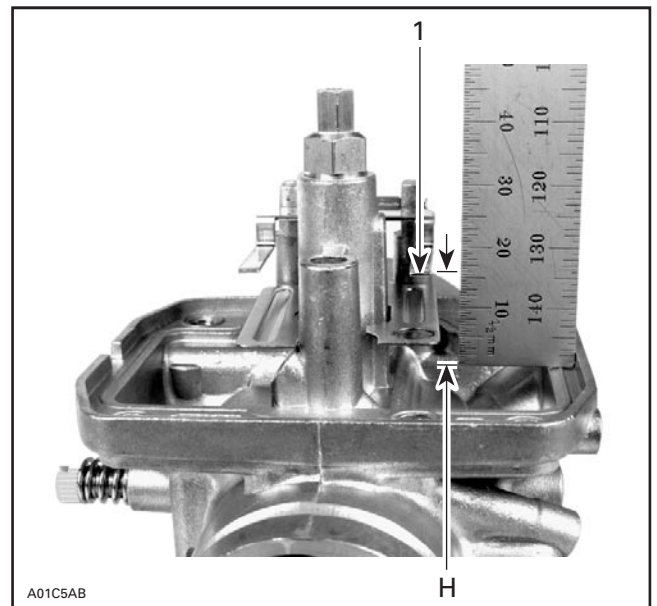
**CARBURETOR FLOAT LEVEL ADJUSTMENT**

**CAUTION:** Spark plugs will foul if float is adjusted too low. Engine may be damaged if float is adjusted too high.

**9,10, Float Arm and Float Arm Pin**

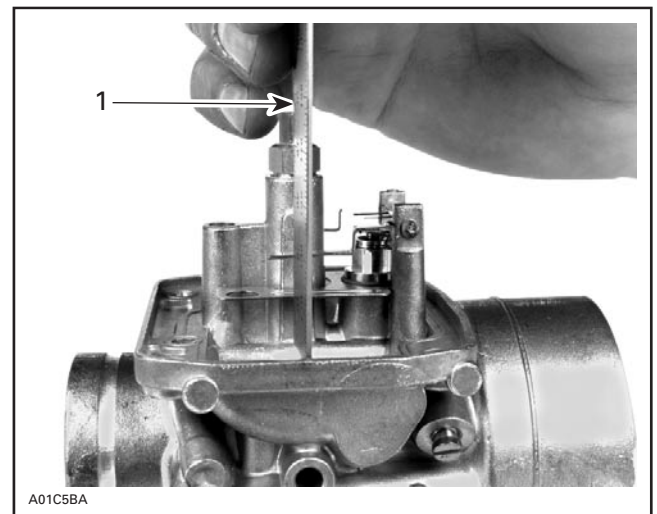
Correct fuel level in float chamber is vital toward maximum engine efficiency. To check for correct float level proceed as follows:

- Make sure that float arm is symmetrical — not distorted.
- Remove float bowl and gasket from carburetor.
- With carburetor chamber upside-down on a level surface, measure height H between bowl seat and **top** edge of float arm. Keep ruler perfectly vertical and in line with main jet hole.



TYPICAL — VM TYPE

- 1. Measure from top of float arm
- H: Float height (including float arm thickness)



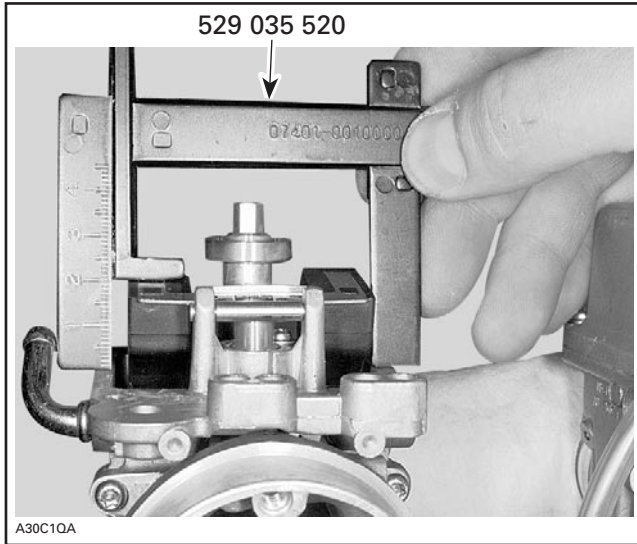
TYPICAL — VM TYPE

- 1. Ruler vertical and in line with main jet

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

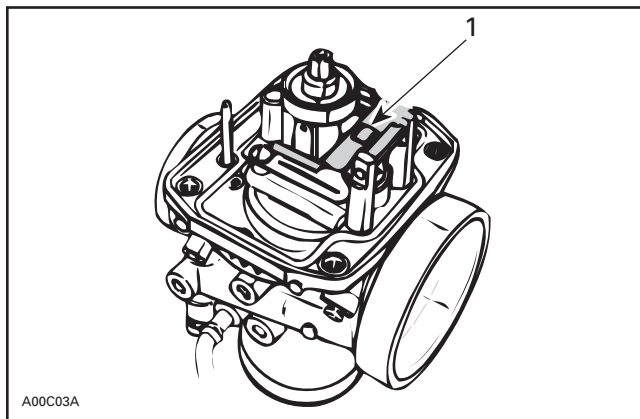
Float level height can be checked using tool (P/N 529 035 520). Keep tool in line with main jet as explained above.



| CARBURETOR IDENTIFICATION | FLOAT HEIGHT H    |
|---------------------------|-------------------|
| VM 30-205                 | 23.9 mm (.941 in) |
| VM 34-576                 |                   |
| VM 34-590                 |                   |
| VM 34-591                 |                   |

#### To Adjust Height H

- Bend the contact tab of float arm until the specified height is reached.



TYPICAL

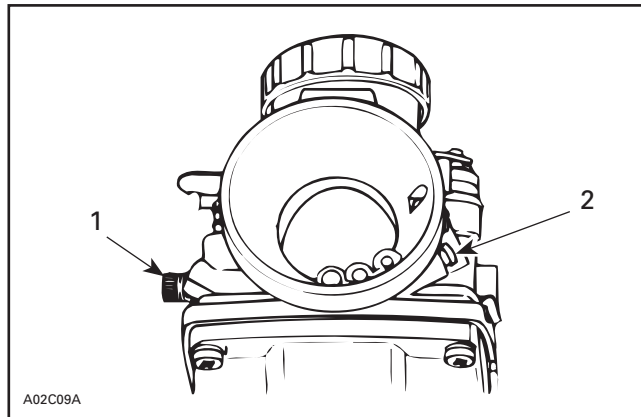
1. Contact tab

## CARBURETOR ADJUSTMENTS

**NOTE:** For high altitude regions, a *Service Bulletin* will give information about calibration according to altitude and temperature.

Adjustments should be performed following this sequence:

- air screw adjustment
- throttle slide height (preliminary idle speed adjustment)
- throttle cable adjustment
- carburetor synchronization
- final idle speed adjustment (engine running)
- oil pump and carburetor synchronization.



1. Idle speed screw
2. Air screw

### 6, Air Screw Adjustment

Completely close the **air screw** (until a slight seating resistance is felt) then back off as specified.

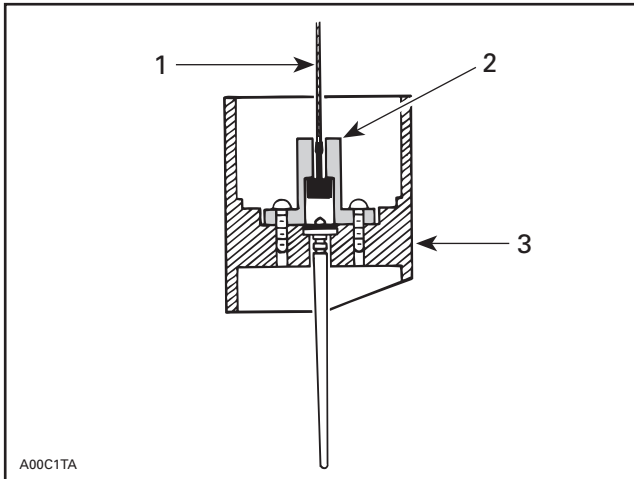
Turning screw in clockwise enriches mixture and conversely, turning it out counterclockwise leans mixture.

Refer to TECHNICAL DATA for the specifications.

**Throttle Slide Height  
(preliminary idle speed adjustment)**

Hook throttle cable into the needle retainer plate.

**NOTE:** Do not obstruct hole in throttle slide when installing needle retaining plate. This is important to allow air escaping through and thus allowing a quick response.

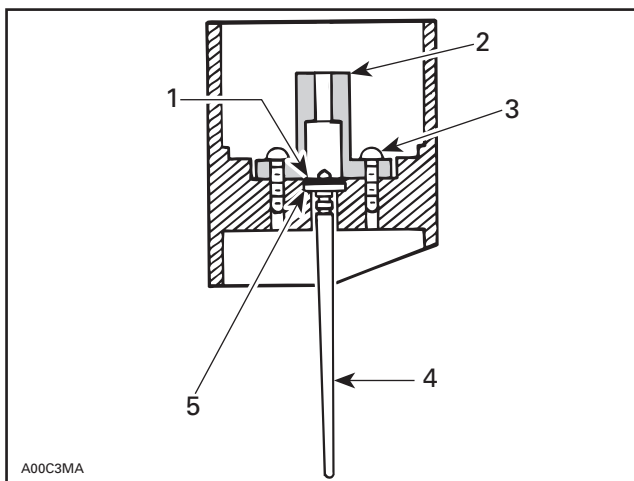


**CENTER POST TYPE**

- 1. Throttle cable
- 2. Needle retaining plate
- 3. Throttle slide

Make sure the nylon packing no. 4 is installed on all applicable throttle slides.

**CAUTION:** Serious engine damage can occur if this notice is disregarded.



**CENTER POST TYPE**

- 1. E-clip
- 2. Needle retaining plate
- 3. Screw
- 4. Needle
- 5. Nylon packing

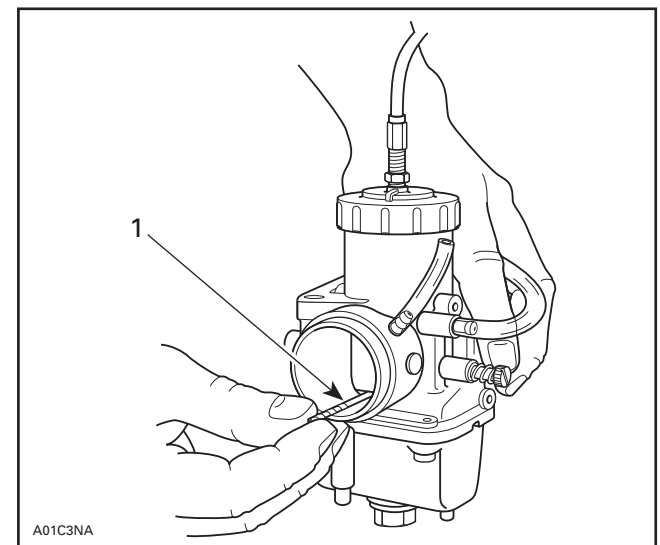
Using a drill bit, adjust throttle slide height (see following table) by turning idle speed screw no. 7.

Throttle slide height is measured on **outlet** side of carburetor (engine side).

**NOTE:** Make sure that throttle cable does not hold throttle slide. Loosen cable adjuster accordingly.

Final idle speed adjustment (engine running at idle speed) should be within 1/2 turn of idle speed screw from preliminary adjustment.

| MODELS   | THROTTLE SLIDE HEIGHT<br>(drill bit size)<br>± 0.1 mm (± .004 in) |
|--|---|
| MX Z 550 Fan,<br>Legend 550 Fan,<br>Grand Touring 550 Fan<br>Summit 550 Fan Europe | 1.6 (0.063)   |
| MX Z 380 Fan,<br>Legend 380 Fan,<br>Grand Touring 380 Fan                          | 1.7 (0.067)   |
| Skandic 500 Fan<br>Summit 550 Fan  | 1.9 (0.075)   |



**TYPICAL**

- 1. Drill bit used as gauge for throttle slide height

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

## INSTALLATION

**CAUTION:** Never allow throttle slide(s) to snap shut.

Prior to installing carburetor, adjust air screw and preliminary idle speed as described above.

To install carburetor on engine, inverse removal procedure.

However, pay attention to the following:

On applicable models, make sure to align tab of carburetor and air silencer with notch of adaptor(s). On applicable models, install adaptor with UP mark facing up.

**CAUTION:** The rubber flange must be checked for cracks and/or damage. At assembly, the flange must be perfectly matched with the air manifold or severe engine damage will occur.

Install clamps in a way that their tightening bolts are staggered — not aligned.

### Throttle Cable Adjustment

#### **⚠ WARNING**

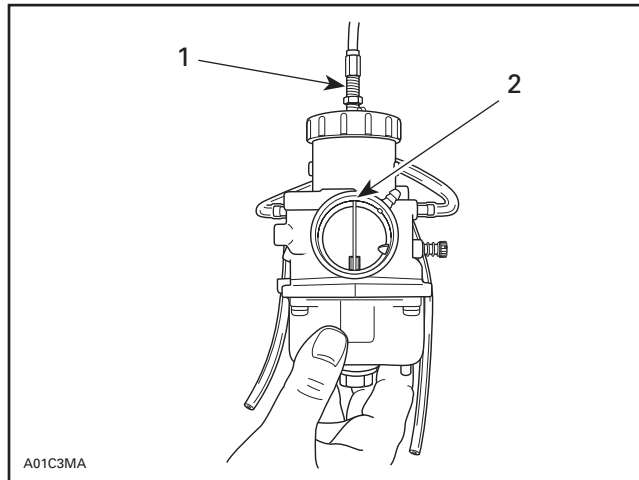
Ensure the engine is turned OFF, prior to performing the throttle cable adjustment.

Carburetors must be installed on engine and throttle cable properly routed.

For maximum performance, correct cable adjustment is critical.

At full opening, throttle slide must be flush or 1.0 mm (.040 in) lower than the top of carburetor **outlet** bore (engine side). Use a mirror and look through inlet bore.

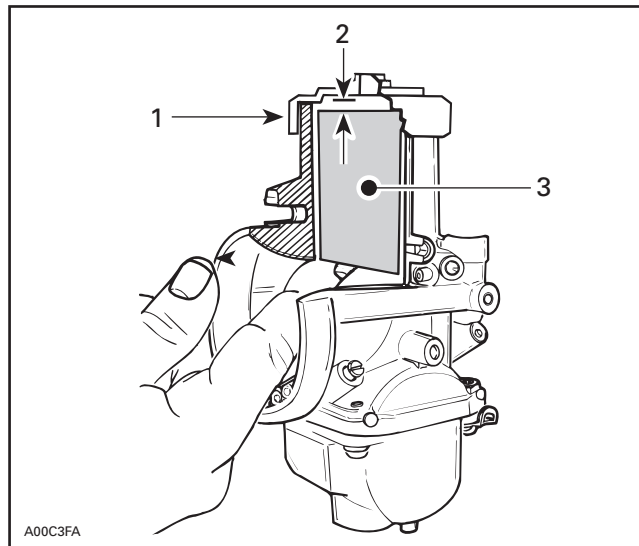
First, loosen adjuster nut then turn throttle cable adjuster accordingly.



**FULL OPENING (THROTTLE LEVER AGAINST HANDLE GRIP)**

1. Throttle cable adjuster
2. Throttle slide flush or 1.0 mm (.040 in) lower than carburetor outlet bore (engine side)

Check that **with the throttle lever fully depressed**, there is a free play between the carburetor cover and top of throttle slide.



**FULL OPENING (THROTTLE LEVER AGAINST HANDLE GRIP)**

1. Cover
2. Free play
3. Throttle slide

#### **⚠ WARNING**

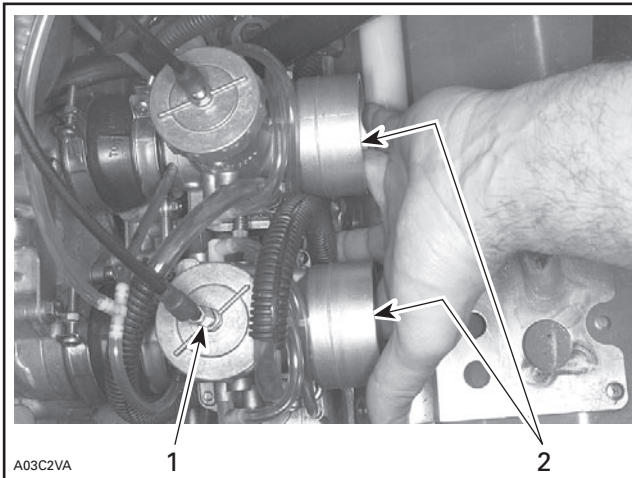
This gap is very important. If the throttle slide rests against the carburetor cover at full throttle opening, this will create too much strain and may damage the throttle cable or other components in throttle mechanism.

## Carburetor Synchronization

When depressing throttle lever, both carburetor slides must start to open at same time.

Unlock cable adjustment lock nut on one carburetor.

Screw or unscrew cable adjuster until all carburetor slides start to open at same time. Cable play will be identical on all carburetors. Retighten jam nut.



### TYPICAL

1. Screw or unscrew adjuster
2. Check that all slides start to open at the same time

Check throttle slide position at wide open throttle. Throttle slide must be flush or 1.0 mm (.040 in) lower than carburetor outlet bore. At that same position, check that throttle slide does not contact carburetor cover. Turn cable adjuster and recheck synchronization.

**CAUTION:** If the throttle slide rests against the carburetor cover at full throttle opening, this will create too much strain and may damage the throttle cable or other components in throttle mechanism.

**CAUTION:** Make sure all carburetors start to operate simultaneously.

## CHOKE

### Choke Plunger Adjustment

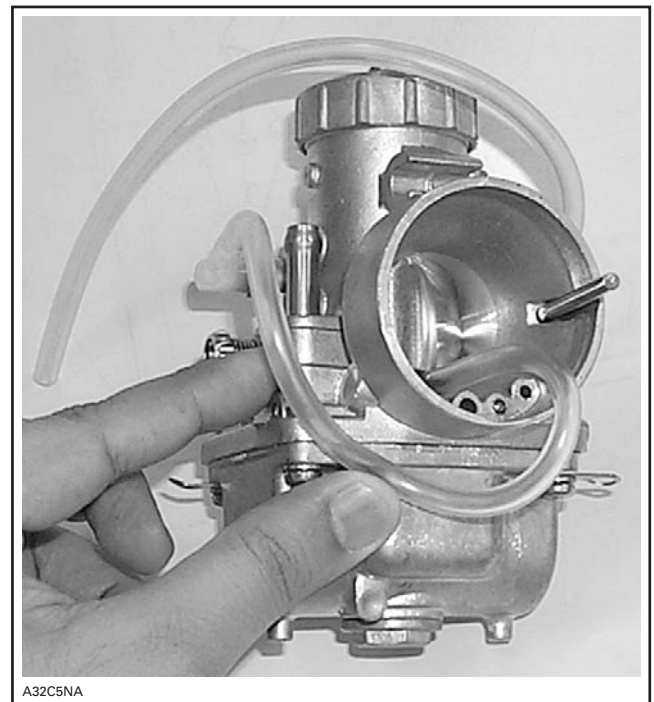
Set choke lever to half open position.



CHOKE LEVER — HALF OPEN POSITION

Use choke plunger tool (P/N 529 035 602).

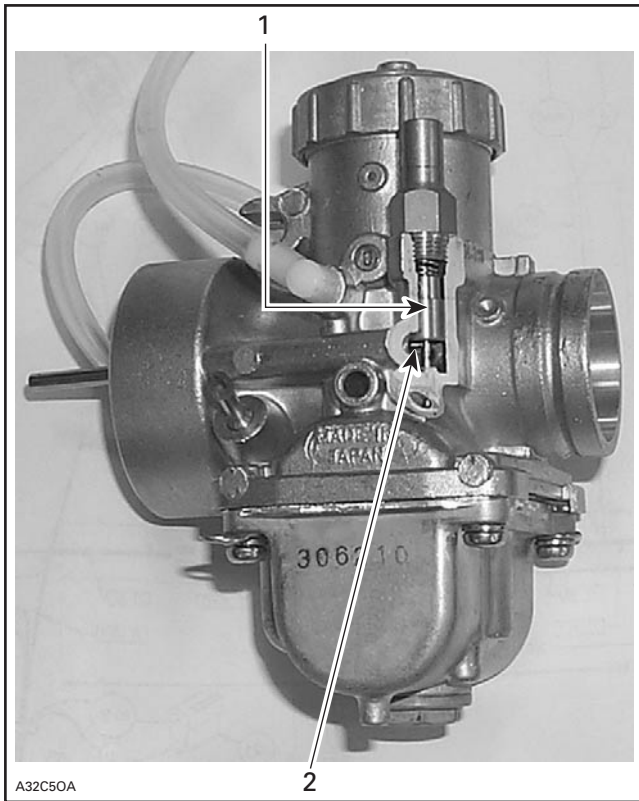
Insert the choke plunger tool into choke air inlet of carburetor. Tool stopper may not lean against recess wall.



AIR SILENCER SIDE SHOWN

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)



*CUT-AWAY (ENGINE SIDE SHOWN)*

1. Choke plunger
2. Tool properly seated under choke plunger

If tool tip does not seat under choke plunger no. 15, adjust as follows:

Make sure choke lever is at half open position.

Turn choke cable adjustment nut by hand until tool properly seats under choke plunger.

**NOTE:** A light pressure should be needed to position tool under plunger.

Tighten choke cable lock nut and reinstall protector cap.

Set choke lever to close and open positions and ensure that tool properly seats under plunger **only** when lever is set to half open position.

Set choke lever to close position and, by pulling and pushing choke lever, make sure there is no tension on cable (free play).

### Idle Speed Final Adjustment

**CAUTION:** Before starting engine for the final idle adjustment, make sure that oil pump is adjusted. The oil injection pump adjustment must be checked after each time carburetor idle is adjusted. Refer to OIL INJECTION SYSTEM.

Start engine and allow it to warm then adjust idle speed to specifications by turning **idle speed** screw clockwise to increase engine speed or counterclockwise to decrease it.

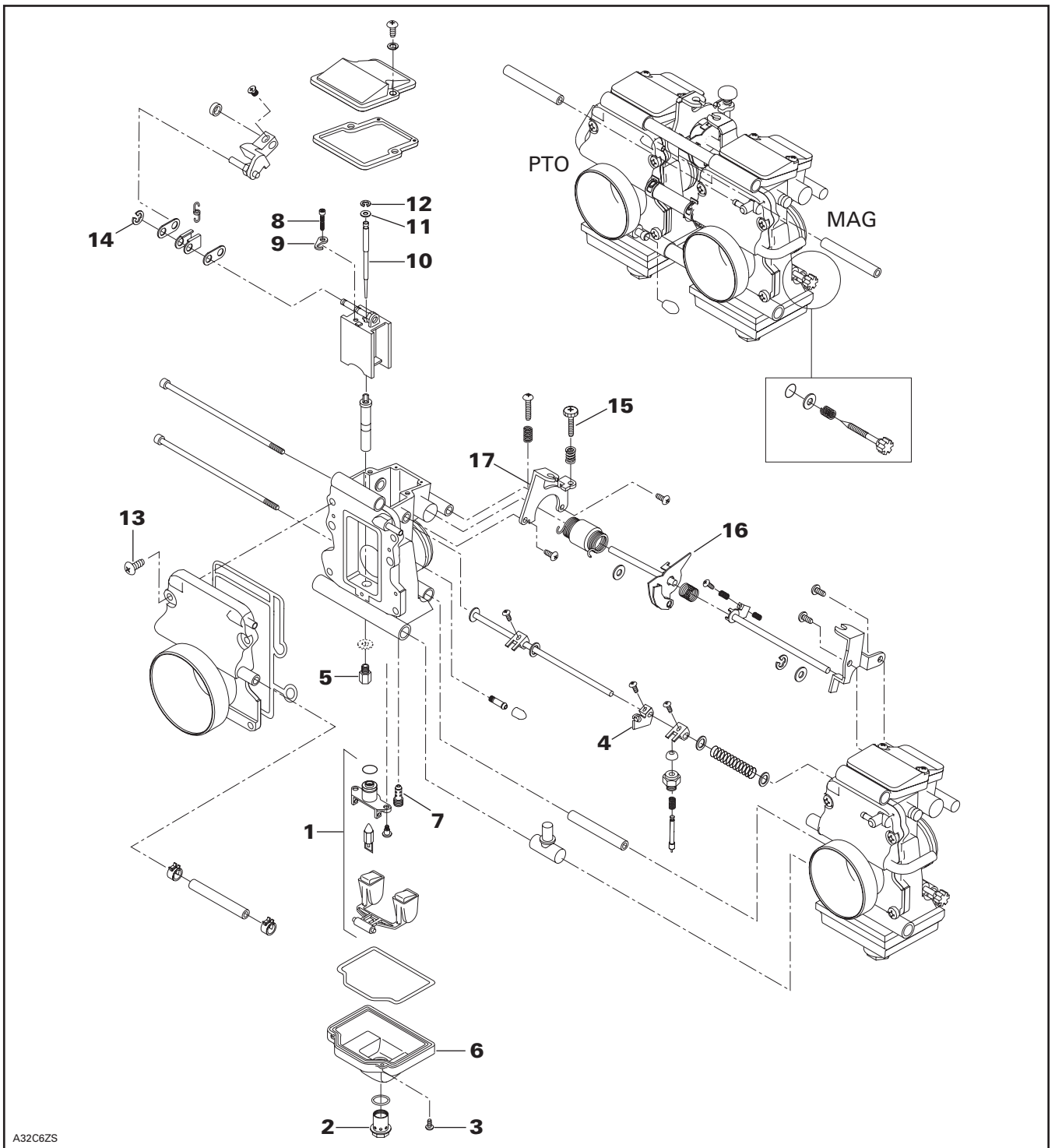
Refer to TECHNICAL DATA for the specifications.

**NOTE:** Turn adjustment screw the same amount on each carburetor to keep carburetors synchronized.

**CAUTION:** Do not attempt to set the idle speed by using the air screw. Severe engine damage can occur.

**Section 04 ENGINE**  
Subsection 10 (CARBURETOR AND FUEL PUMP)

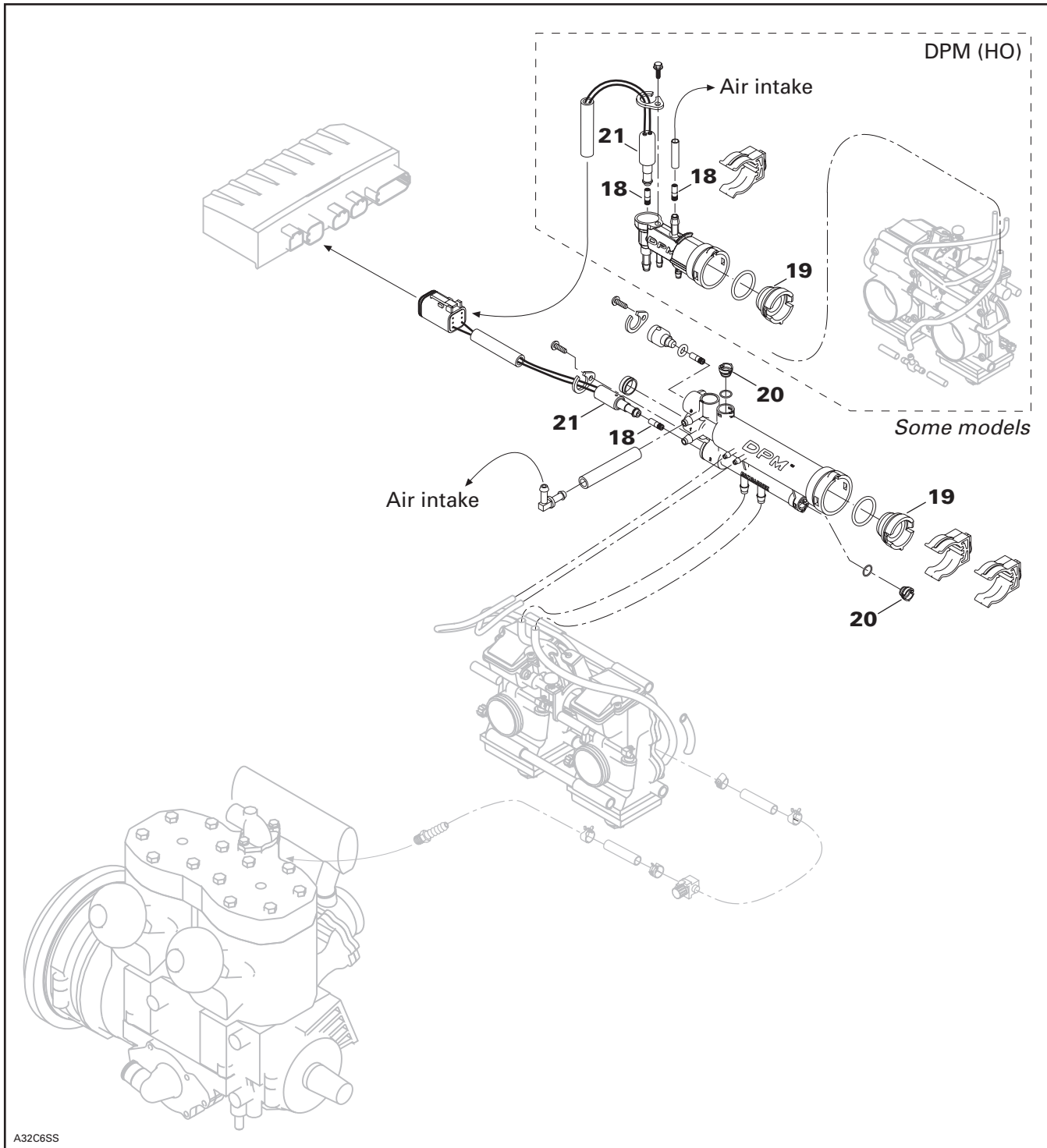
**TM Type**



## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

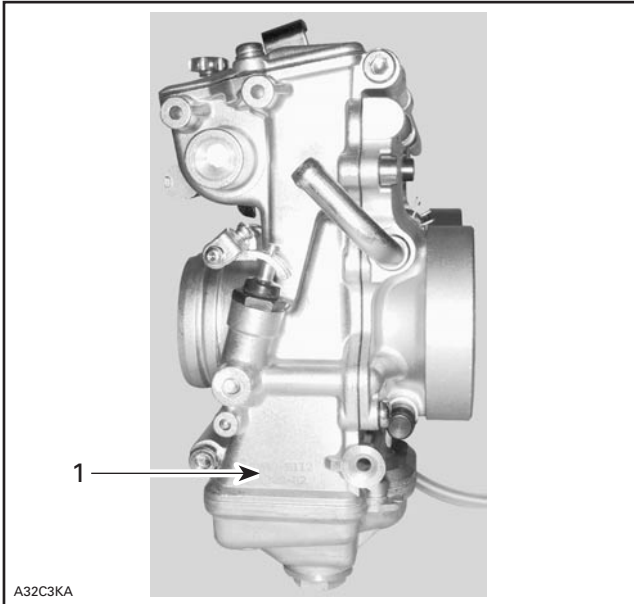
#### DPM — Some Models





**IDENTIFICATION**

TM type dual carburetor ass'y is identified on PTO side carburetor body.



*TYPICAL*

1. Identification: TM 40-B112

**REMOVAL**

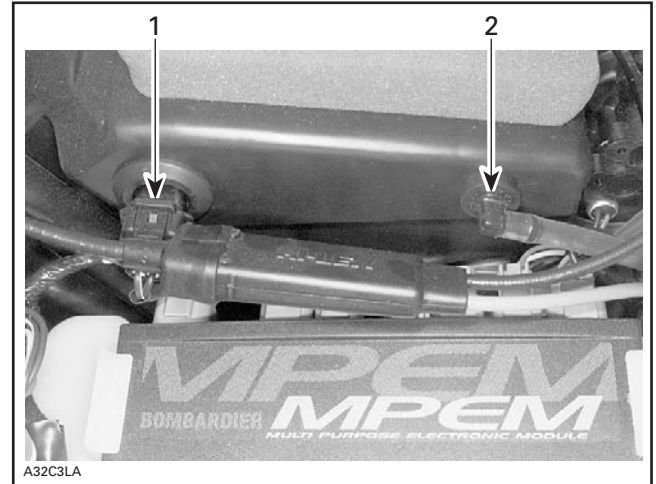
**All Models**

Lift hood.

**DPM Models**

Disconnect air temperature sensor connector at air silencer.

Disconnect DPM air vent hose nipple from air silencer.



**DPM EQUIPPED MODELS**

1. Air temperature sensor
2. DPM air vent hose nipple

**Non-DPM Models**

Disconnect carburetor float bowl vent hose nipple from air silencer.

**DPM Models**

Unhook DPM manifold from its supports.

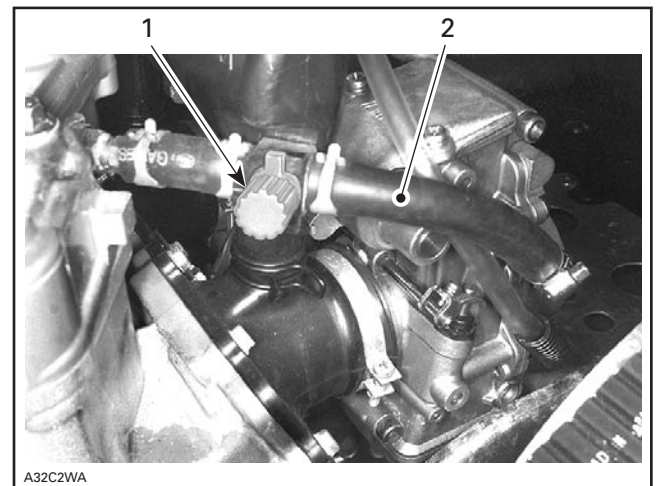
Remove DPM supports from air silencer.

**All Models**

Loosen clamps retaining air silencer adapter to carburetor assembly and remove air silencer.

**Heated Carburetor Models**

Close valve at heated carburetor coolant inlet line.

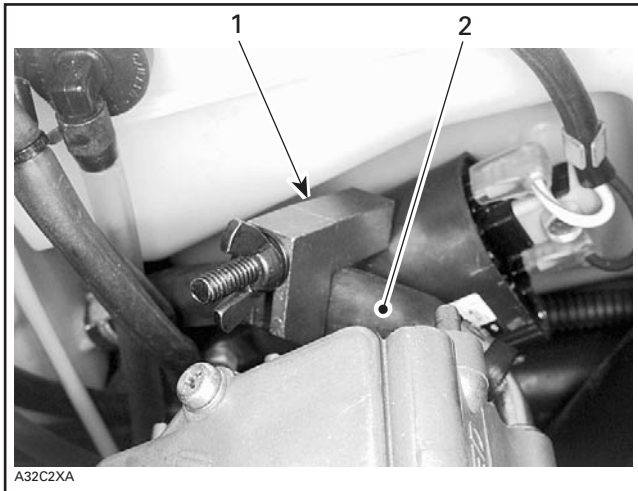


1. Valve
2. Inlet line

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

Pinch heated carburetor coolant outlet line.



1. Pincher (P/N 295 000 076)
2. Outlet line

Disconnect both lines from carburetor assembly taking care to recuperate coolant.

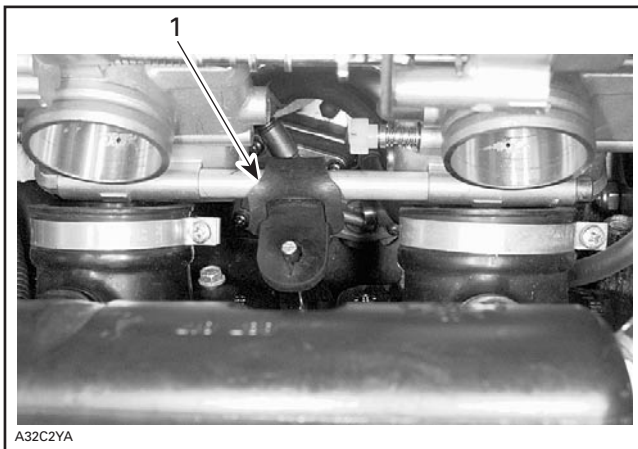
#### All Models

Disconnect throttle and choke cables.

Loosen clamps retaining dual carburetor assembly to carburetor sockets.

Gently slide out securing strap (if so equipped).

**CAUTION:** Securing strap between 2 carburetors has to be gently slid out to avoid breakage.



1. Securing strap

Remove dual carburetor assembly, pinch and disconnect fuel line. Take care to recuperate fuel.

#### WARNING

Fuel is flammable and explosive under certain conditions. Always wipe off any fuel or oil spillage from the vehicle. Ensure work area is well ventilated. Do not smoke or allow open flames or sparks in the vicinity.

## CLEANING AND INSPECTION

#### All Models

The entire carburetor should be cleaned with a general solvent and dried with compressed air before disassembly.

**CAUTION:** Heavy duty carburetor cleaner may be harmful to the float material and to the rubber parts, O-rings, etc. Therefore, it is recommended to remove those parts prior to cleaning.

Carburetor body and jets should be cleaned in a carburetor cleaner following manufacturer's instructions. When jets are very dirty or coated with varnish and gum, replace them.

#### WARNING

Solvent with a low flash point such as gasoline, naphtha, benzol, etc., should not be used as they are flammable and explosive.

Check throttle slide for wear. Replace as necessary.

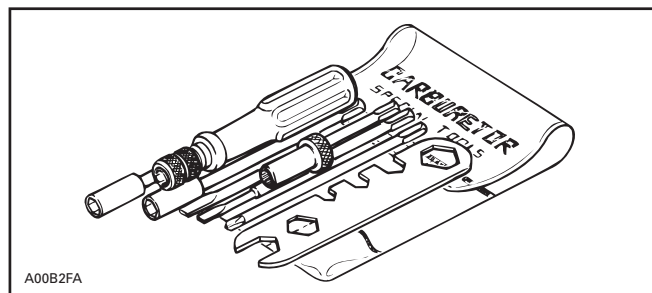
Check for fuel soaked into float no. 1; replace as necessary.

Check float for cracks or other damages affecting free movement; replace as necessary.

Inspect throttle and choke cables and housings for any damage. Replace as necessary.

## DISASSEMBLY AND ASSEMBLY

**NOTE:** To ease the carburetor disassembly and assembly procedures, it is recommended to use carburetor tool kit (P/N 404 112 000).



## 6, Float Bowl

Unscrew drain screw no. 2 and screw no. 3. Remove float bowl.

## 1, Float and Needle Valve Ass'y

Unfasten both screws then, pull out float and needle valve ass'y no. 1.

At assembly, apply Loctite 243 on screw threads.

## 5, Main Jet

The main jet installed in the carburetor has been selected for a temperature of - 20°C (0°F) at sea level. Different jetting can be installed to suit temperature and/or altitude changes. A service bulletin will give information about calibration according to altitude and temperature.

Main jet no. 5 may be removed without removing float bowl no. 6 by first removing drain screw no. 2.

## 7, Pilot Jet

Use narrow screwdriver from carburetor tool kit (P/N 404 112 000) to unfasten pilot jet no. 7.

## 12, Throttle Slide

### **⚠ WARNING**

It is critical to the free operation of the throttle slide that the 2 connecting plates as assembled in one carburetor be of the exact same length. Always replace the connecting plates by a pair of new ones that were matched at the factory for length and discard the old ones. Simultaneously replace all the plates of the carburetors of a same rack.

Do not disassemble throttle slide needlessly.

**CAUTION:** After throttle slide reassembly, proceed with a leak test. See below for procedure.

### **Heated Carburetor Models**

Disassemble both carburetors at the same time. Coolant hose between carburetor throttle slide covers must remain in place during the complete disassembly and assembly.

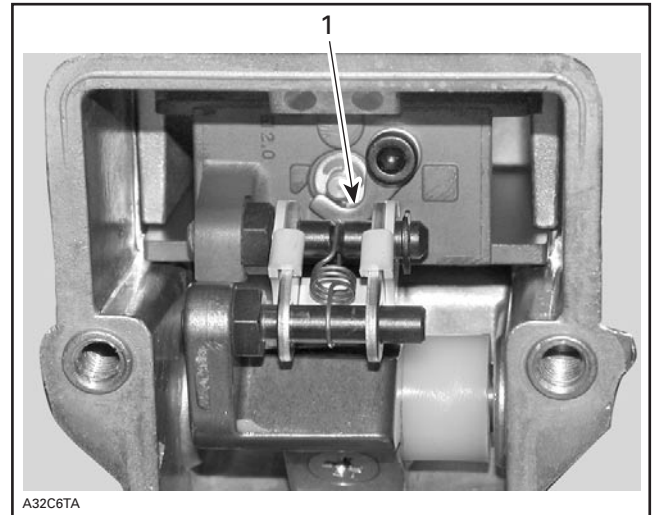
### **All Models**

Remove carburetor cover.

Loosen needle retainer screw no. 8.

Fully open throttle and hold in this position for the following step.

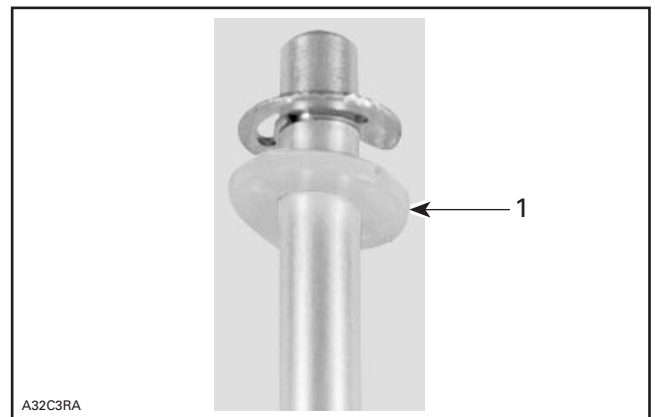
Move aside needle retainer no. 9.



A32C6TA

1. Needle retainer moved aside

Turn dual carburetor ass'y upside down to free needle no. 10. Take care not to loose plastic washer no. 11 under needle circlip no. 12.



A32C3RA

1. Plastic washer

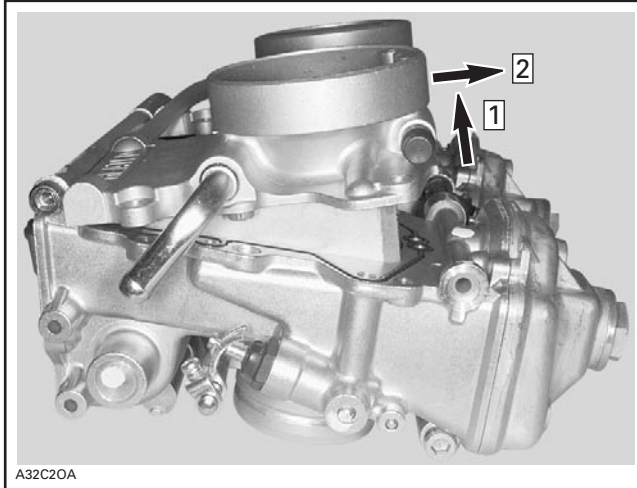
Unscrew throttle slide cover screws no. 13.

Open throttle 3/4 wide and keep that opening.

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

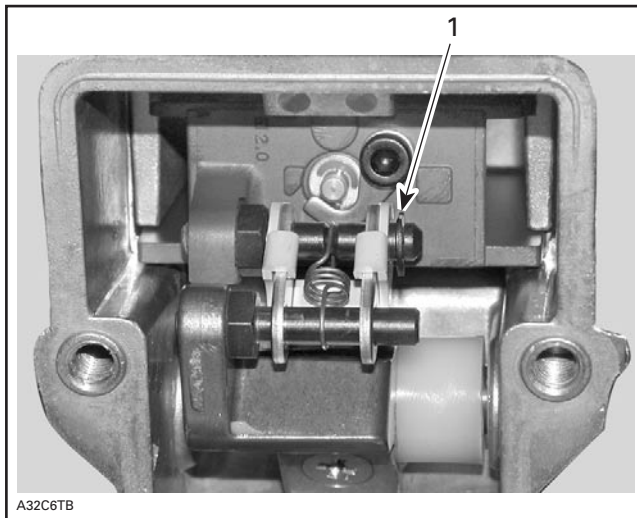
Lift throttle slide covers bottom first until they are free from carburetor bodies. Then, slide them out.



Step 1: Lift bottom first

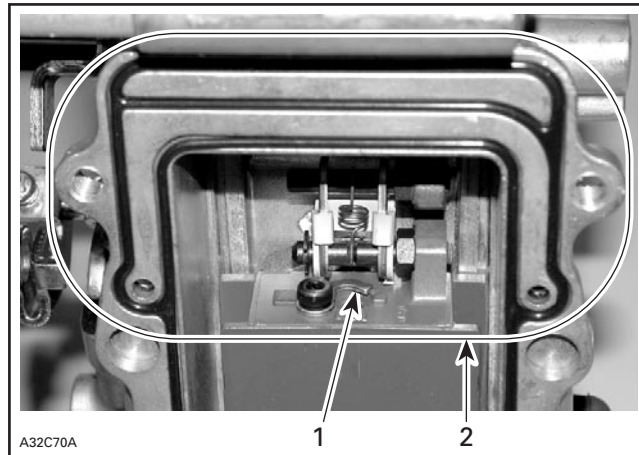
Step 2: Slide out

Remove circlip no. 14 retaining throttle slide.



1. Circlip

At throttle slide assembly, needle retainer must face carburetor body.



1. Needle retainer

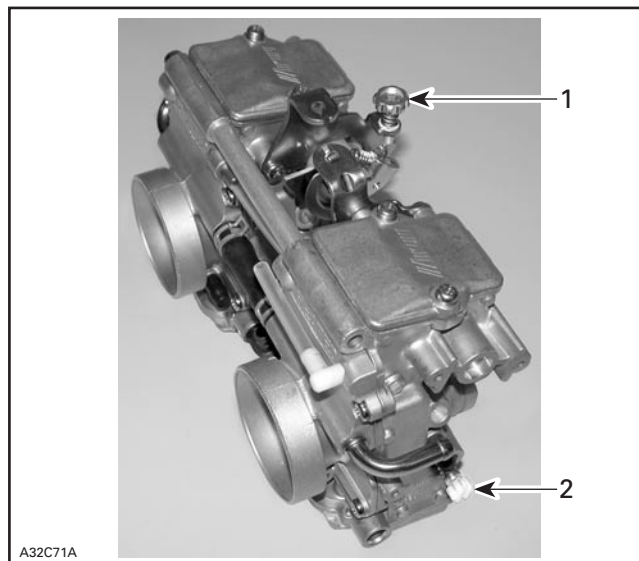
2. Ensure O-ring gasket is properly seated

After inserting throttle slide cover in place and before installing screws, ensure O-ring gasket is properly seated in its groove especially in the area around vent nipple. See illustration above.

## CARBURETOR ADJUSTMENTS

Adjustments should be performed following this sequence:

- pilot screw adjustment
- carburetor synchronization and throttle slide height (preliminary idle speed adjustment)
- throttle cable adjustment
- choke cable adjustment
- oil pump and carburetor synchronization
- final idle speed adjustment (engine running).



1. Idle speed screw

2. Pilot screw (one on each carburetor)

**Pilot Screw Adjustment**

Completely close the **pilot screw** (until a slight seating resistance is felt) then back off as specified.

Turning screw in clockwise leans mixture and conversely, turning it out counterclockwise enriches mixture.

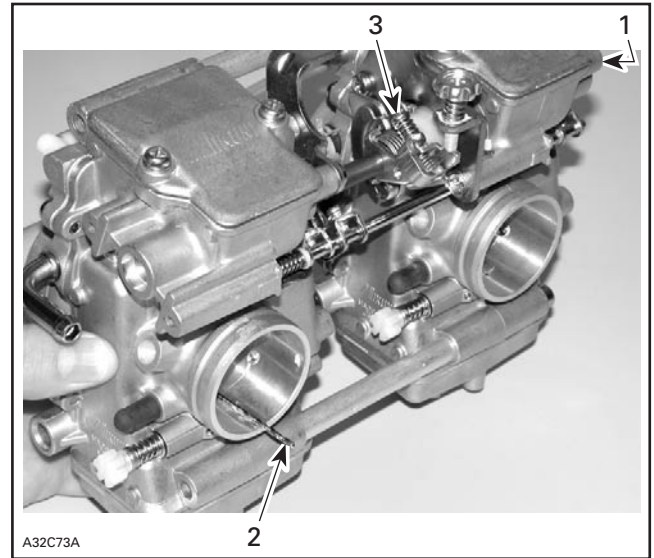
Refer to TECHNICAL DATA for the specifications.

**Carburetor Synchronization and Throttle Slide Height (preliminary idle speed adjustment)**

First proceed on PTO carburetor.

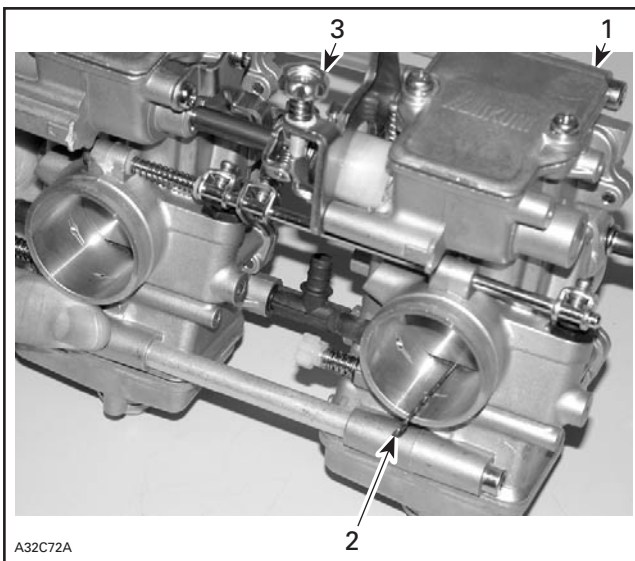
Use a drill bit to measure throttle slide height (see following table) on **outlet** side of carburetor (engine side).

Adjust by turning idle speed screw **no. 15**.



1. PTO carburetor adjusted first  
 2. Drill bit used as a gauge to measure throttle height  
 3. Synchronization screw

**NOTE:** Make sure that throttle cable does not hold throttle slide. Loosen cable adjuster accordingly. Final idle speed adjustment (engine running at idle speed) should be within 1/2 turn of idle speed screw from preliminary adjustment.



1. Adjust PTO carburetor first  
 2. Drill bit used as a gauge to measure throttle height  
 3. Idle speed screw

For MAG carburetor use synchronization screw. Use same drill bit as for PTO carburetor to measure throttle slide height. Turn synchronization screw to adjust.

| MODELS   | THROTTLE SLIDE HEIGHT<br>(drill bit size)<br>± 0.1 mm (± .004 in) |
|--|---|
| MX Z 700/800,<br>Legend 700,<br>Grand Touring 700                                    | 1.5 (0.059)   |
| MX Z 600 Adrenaline/<br>Renegade,<br>Grand Touring 800                               | 1.7 (0.067)   |
| MX Z 500, MX Z 600 Trail,<br>Legend 500/600,<br>Grand Touring 500/600,<br>Summit 700 | 1.8 (0.071)   |
| Summit 600/800   | 2.0 (0.079)   |

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

## INSTALLATION

**CAUTION:** Never allow throttle slide(s) to snap shut.

Install dual carburetor assembly making sure to align securing strap in its bracket.

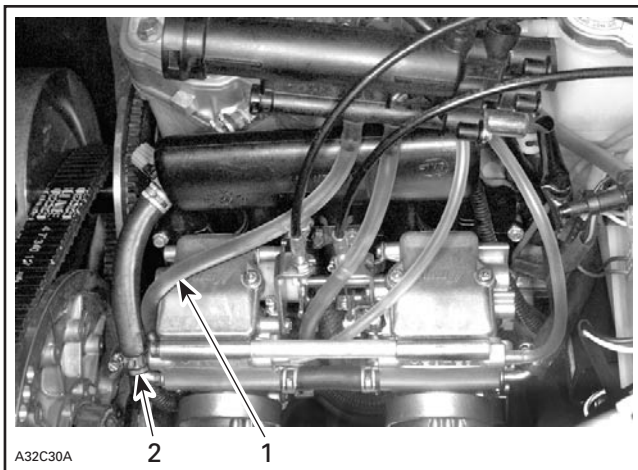
**Make sure dual carburetor assembly is properly inserted into carburetor sockets, hold it in place and tighten retaining clamps.**

Secure heated carburetor inlet and outlet lines with clamps, tighten to 1.5 to 2.0 N•m (13 to 18 lbf•in) and remove pincher on outlet line.

Allow coolant to flow from coolant tank to carburetor before opening valve.

Connect all hoses to dual carburetor assembly and to DPM, making sure there is no kinked hoses after reconnection.

**NOTE:** Left side DPM hose must be routed under heated carburetor coolant inlet hose.



1. Left side DPM hose
2. Heated carburetor coolant inlet hose

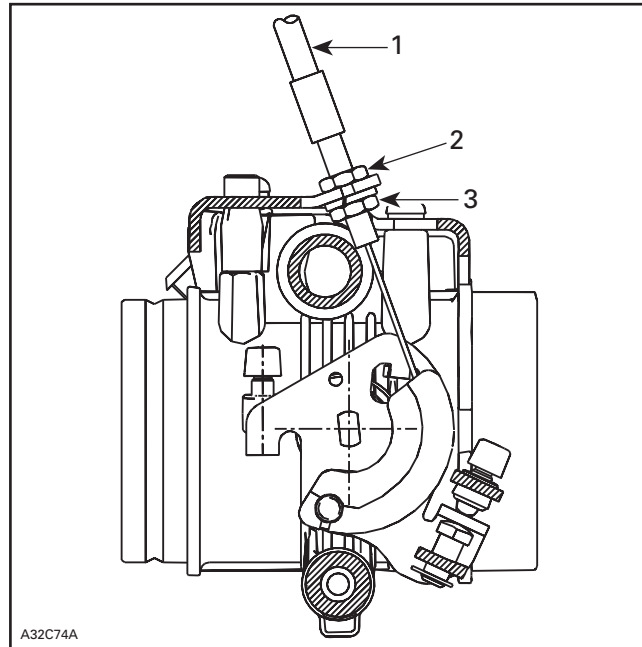
### Throttle Cable Adjustment

Adjust throttle cable as per following procedure:  
Loosen throttle cable housing adjusting and locking nuts.

Connect throttle cable barrel to carburetor cam lever no. 16.

While holding throttle lever to wide open throttle position, pull on the throttle cable until mechanism touches the stopper. In this position, turn cable housing adjusting nut and tighten lock nut.

Also ensure that, when throttle is released to idle position, the idle adjusting screw end touches its stopper.



1. Throttle cable
2. Adjusting nut
3. Locking nut

### Choke Cable Adjustment

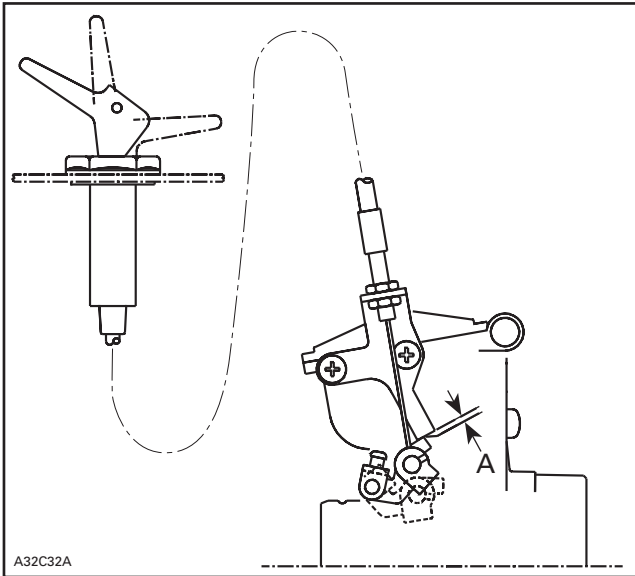
Adjust choke cable as per following procedure:

Loosen choke cable housing adjusting and locking nuts.

Connect choke cable on starter lever no. 4.

While choke lever is fully open, pull choke cable until starter lever reaches the stopper. Tighten cable housing adjusting and locking nuts in this position.

As a confirmation, the gap between the stopper and the bracket should be within 0 and 0.5 mm (0 and 1/64 in).



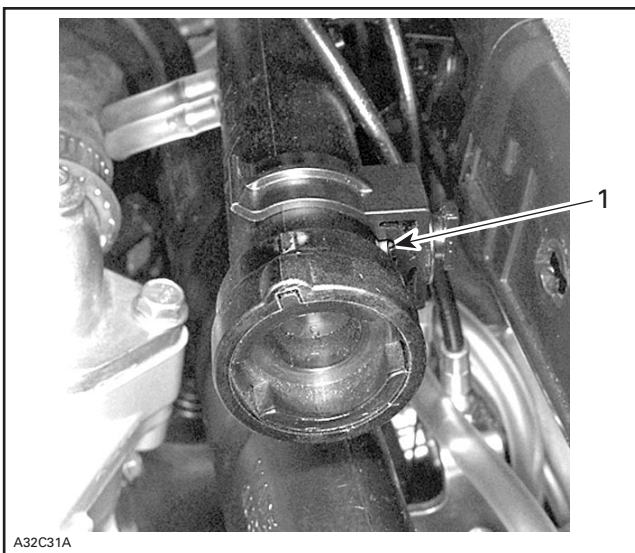
A. Within 0 and 0.5 mm (0 and 1/64 in)

Reinstall air silencer and DPM.

Reconnect DPM air vent hose at air silencer.

**Make sure dual carburetor assembly properly slides into air silencer adapters; hold it in place and tighten clamps.**

**NOTE:** DPM must be installed with its protrusion in highest support slot.



1. Protrusion in highest support slot

Reconnect DPM air vent hose nipple to air silencer.

Reconnect air temperature sensor connector to air silencer.

### Idle Speed Final Adjustment

**CAUTION:** Before starting engine for the final idle adjustment, make sure that oil pump is adjusted. The oil injection pump adjustment must be checked after each time carburetor idle is adjusted. Refer to OIL INJECTION SYSTEM.

Start engine and allow it to warm then adjust idle speed to specifications by turning **idle speed** screw clockwise to increase engine speed or counterclockwise to decrease it.

Refer to TECHNICAL DATA for the specifications.

**CAUTION:** Do not attempt to set the idle speed by using the pilot screw. Severe engine damage can occur.

### DPM

*Some Models*

### TESTING

#### Air Temperature Sensor

At 20°C (68°F), the sensor resistance must be 2500 Ω ± 300.

Sensor should also be tested through all its operating range. Use the following chart.

Replace sensor if not within specifications.

| TEMPERATURE |     | RESISTANCE (ohms) |
|-------------|-----|-------------------|
| °C          | °F  |                   |
| -30         | -22 | 28 000            |
| -20         | -4  | 14 500            |
| 0           | 32  | 5 500             |
| 20          | 68  | 2 500             |
| 40          | 104 | 1 200             |
| 60          | 140 | 600               |
| 80          | 176 | 320               |
| 100         | 212 | 180               |
| 120         | 248 | 120               |

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

#### Solenoid and MPEM

##### Static Test

Unplug electric connector of solenoid **no 21** and connect it to a 12 V battery. The solenoid must sound when it opens. Otherwise, replace solenoid. Repeat test several times.

##### Dynamic Test

Air temperature sensor must be at 20°C (68°). For the test, operate the engine at the RPM specified in the following chart.

| MODEL  | TEST RPM |
|--|----------|
| MX Z 500<br>Legend 500<br>Grand Touring 500                                | 3000     |
| MX Z 600/600 HO<br>Legend 600<br>Grand Touring 600<br>Summit 600 HO/800 HO | 3500     |
| MX Z 700/800<br>Legend 700<br>Grand Touring 700<br>Summit 700              | 3800     |

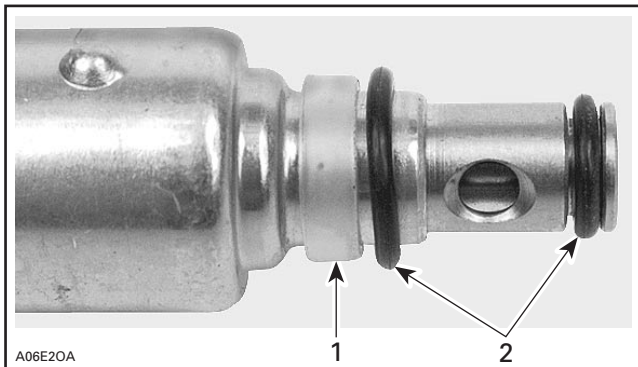
The solenoid must vibrate.

Otherwise, ensure fuse(s), wiring harness and connections are in good condition and if so, try a new MPEM and retest. Refer to ELECTRICAL section.

#### PARTS REMOVAL AND INSTALLATION

##### Solenoid

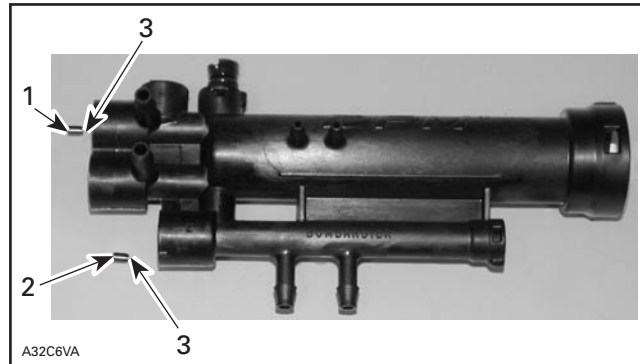
At reassembly, ensure that solenoid seals are in place.



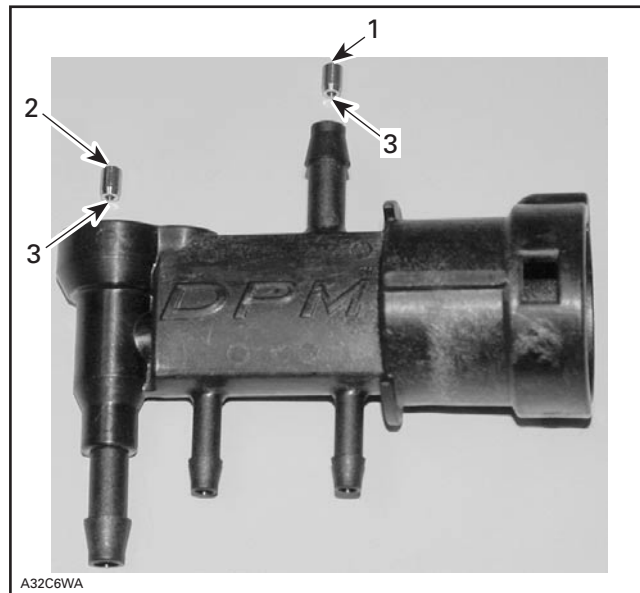
1. Plastic seal
2. O-rings

##### Jet

When installing jet **no 18** in DPM, ensure to position the taper end as shown.



1. Vent jet
2. Lean jet
3. Taper end here



1. Vent jet
2. Lean jet
3. Taper end here



Pay also attention not to mix the jets. Refer to the following table for the proper inner diameter size. Refer to the illustration above for the jet location.

| MODEL   | VENT JET                   | LEAN JET   |
|---|----------------------------|------------|
|   | INSIDE DIAMETER<br>mm (in) |            |
| MX Z 600 Trail<br>Legend 600 Sport<br>Grand Touring 600<br>Sport/SE   | 1.8 (.071)                 | 2.0 (.079) |
| MX Z 600 Adrenaline/<br>Renegade<br>Summit 600 Adrenaline<br>Summit 800 Adrenaline/X/<br>Highmark/Highmark X/<br>Highmark Xtreme                        | 1.2 (.047)                 | 2.0 (.079) |
| MX Z 700 Adrenaline<br>MX Z 800 Adrenaline/<br>Renegade<br>Legend 700 Sport/SE<br>Grand Touring 700<br>Sport/SE<br>Summit 700 Adrenaline/<br>X/Highmark | 1.6 (.063)                 | 2.0 (.079) |

**Cap**

Prior to installing caps **no 19** and **20**, ensure O-rings are in good condition. To install cap, firmly push until tabs click and lock on both sides in DPM.

**DPM MANIFOLD TESTING**

**Visual Inspection**

With DPM manifold removed from vehicle and all hoses disconnected from DPM manifold, inspect for any broken fittings or missing dust caps. If any part is broken, replace DPM manifold and **do not proceed** with leak test procedure. If any part is missing, order necessary part as listed in parts catalog, replace, **then perform leak test procedure**.

If there is no apparent breakage or missing part on DPM manifold, perform the following leak test procedure.

**Leak Testing**

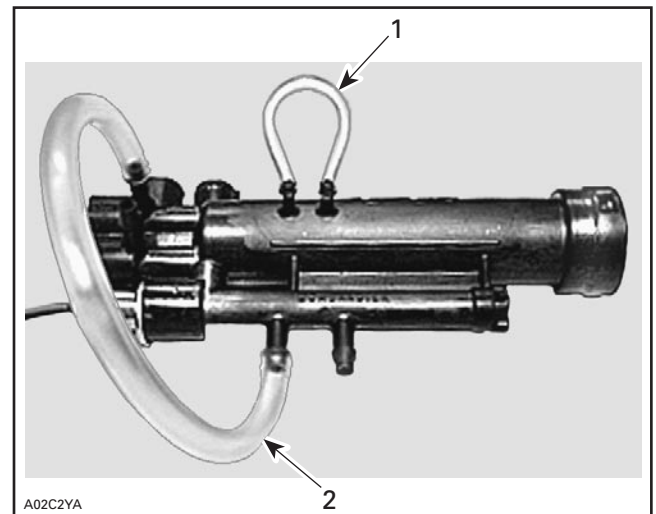
**Required Items**

The following items will be required:

- Water column with at least 350 mm (13-3/4 in) in height.
- Engine leak test kit (P/N 861 749 100).
- 4.8 mm (3/16 in) T-fitting.
- 6 mm (15/64 in) T-fitting.
- 3.5 mm (9/64 in) ID x 100 mm (4 in) hose.
- 6 mm (15/64 in) ID x 300 mm (12 in) hose.

**DPM Manifold Preparation**

Connect hoses as shown.

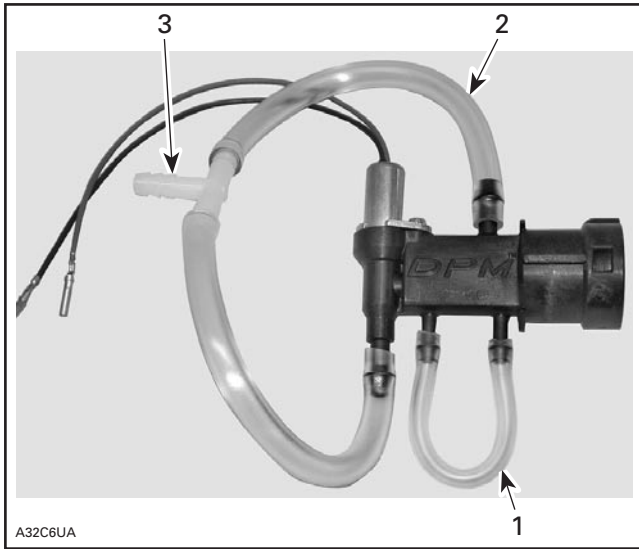


**LARGE DPM — SOME MODELS**

1. 3.5 mm (9/64 in) ID hose
2. 6.0 mm (15/64 in) ID hose

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)



A32C6UA

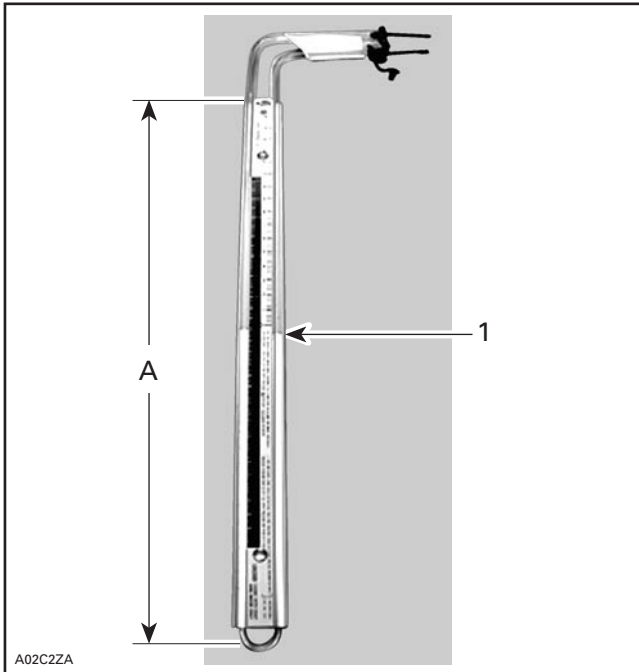
#### SMALL DPM — SOME MODELS

1. 3.5 mm (9/64 in) ID hose
2. 6.0 mm (15/64 in) ID hose
3. 6 mm (15/64 in) T-fitting

#### Water Column Preparation

Mount water column vertically and secure it to a wall or workbench.

Fill water column to center line (at least 175 mm (6-7/8 in)) in height. Refer to following photo.

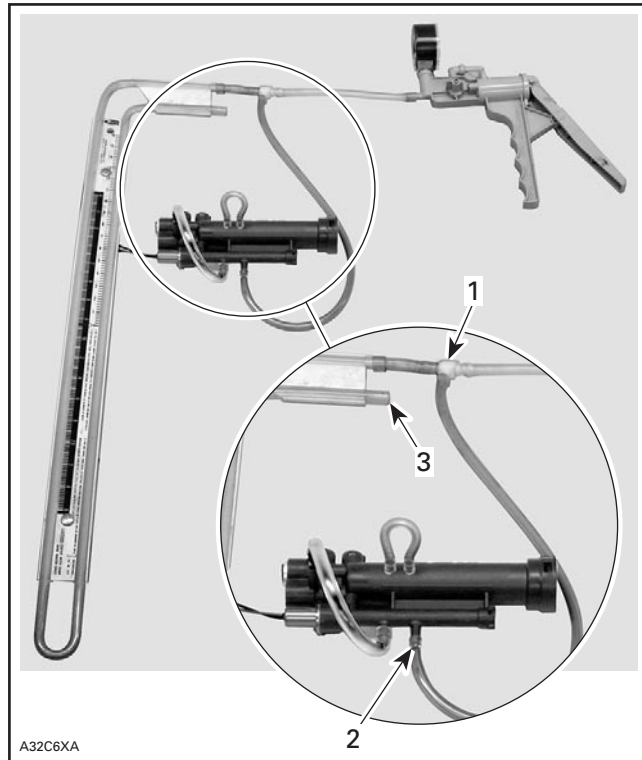


A02C2ZA

1. Center line at 175 mm (6-7/8 in)
- A. 350 mm (13-3/4 in)

#### Connecting the Pump, DPM Manifold and Water Column

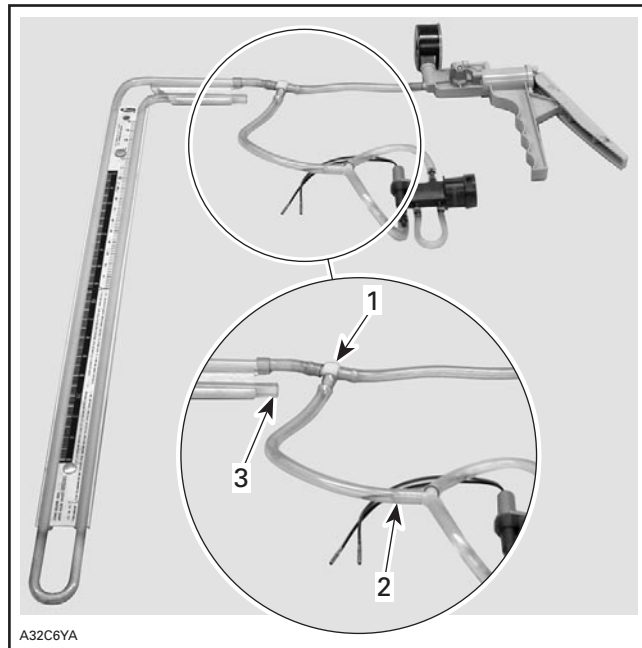
Connect hoses as shown.



A32C6XA

#### LARGE DPM — SOME MODELS

1. 4.8 mm (3/16 in) T-fitting
2. Collector port fitting
3. Vented to atmosphere



A32C6YA

#### SMALL DPM — SOME MODELS

1. 4.8 mm (3/16 in) T-fitting
2. T-fitting
3. Vented to atmosphere

Collect hose into one of the water column tubes, leave the other tube at atmospheric pressure.

### Testing

Set pump to "vacuum".

**CAUTION:** Never use pump directly on DPM to make a pressure test. The vacuum produced by the pump is too high and would damage DPM components. Use the water column as explained above.

Apply negative pressure (vacuum) until the extremities of the water in the tube attain a difference of 350 mm (13-3/4 in).

Stop pumping and allow water levels to stabilize in tube.

### Analysis

If water level remains unchanged, the DPM manifold **is not** defective.

If water level drops slowly to return to an even level in **more than** 10 seconds, the DPM manifold **is not** defective.

If water level drops to an even level **in less than** 10 seconds, the DPM manifold **is** defective. Replace DPM manifold parts, (refer to *Parts Catalog*) and re-test. If test fails again, replace DPM manifold.

If you are unable to attain any amount of vacuum (water level increases and decreases immediately in tube), check your set-up and re-do the test.

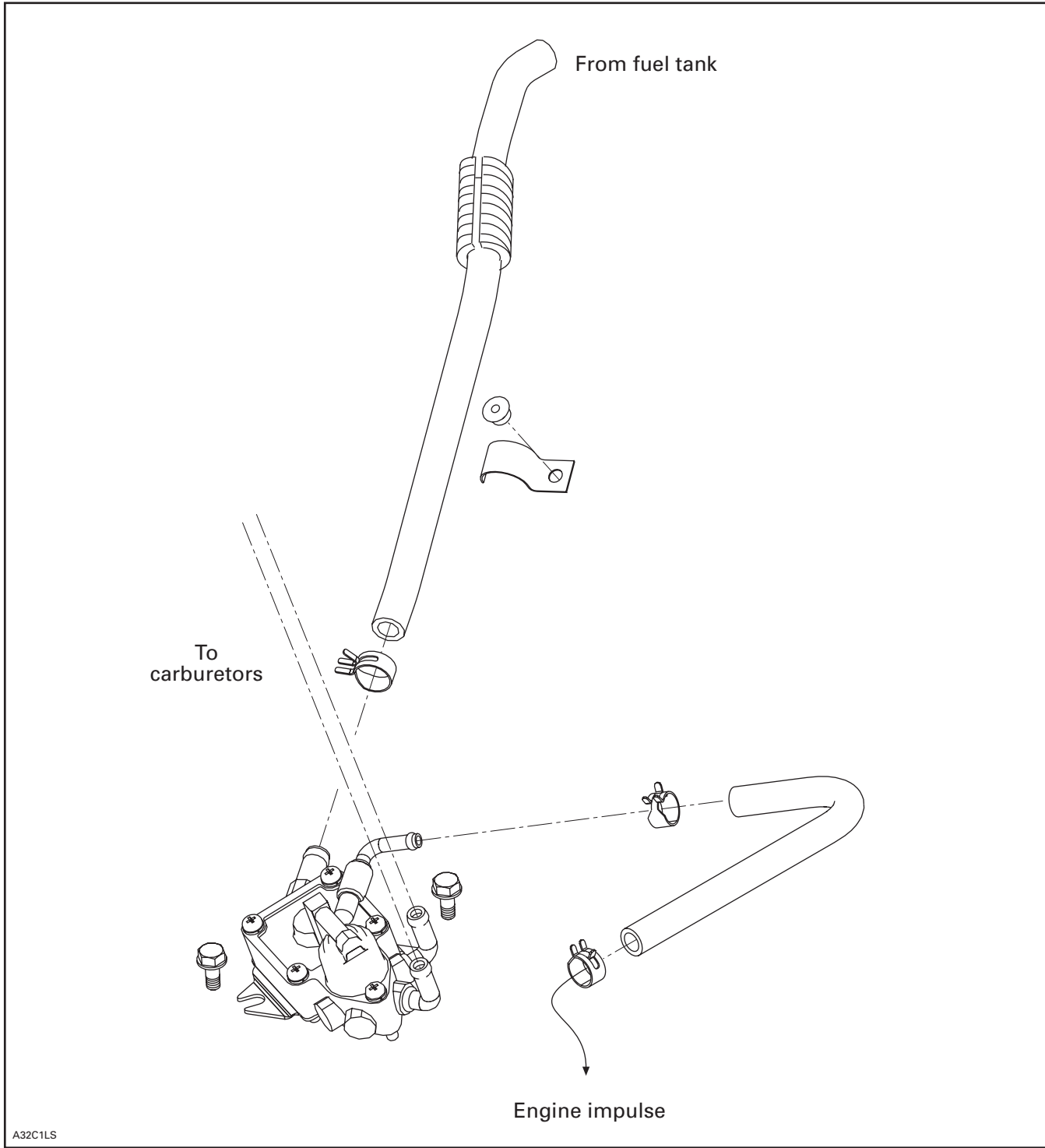
If you still cannot attain any vacuum, DPM manifold **is** defective. Replace DPM manifold.

## Section 04 ENGINE

### Subsection 10 (CARBURETOR AND FUEL PUMP)

## FUEL PUMP

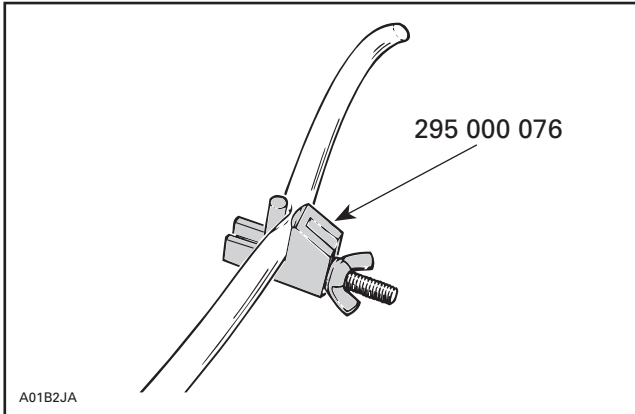
All Models



A32C1LS

## REMOVAL

Install a hose pincer (P/N 295 000 076) on fuel supply line close to pump inlet.



- Disconnect fuel outlet line(s).
- Disconnect impulse line.
- Remove screws securing fuel pump to chassis.

## PUMP VERIFICATION

Check fuel pump valves operation as follows:

Connect a clean plastic tubing to the inlet nipple and alternately apply pressure and vacuum with pump of leak test kit. The inlet valve should release with pressure and hold under vacuum.

Repeat the same procedure at the outlet nipple. This time the outlet valve should hold with pressure and also under vacuum.

**NOTE:** Plug remaining outlet with finger while checking outlet valve.

Check impulse diaphragm and gasket on high-supply fuel pump with twin outlets as follows:

Connect a clean plastic tubing to the impulse nipple and plug vent hole on top cover on so equipped models. Either apply pressure or vacuum. The diaphragm/gasket must not leak.

## CLEANING AND INSPECTION

The entire pump should be cleaned with general purpose solvent before disassembly.

Fuel pump components should be cleaned in general purpose solvent and dried with compressed air.

### **⚠ WARNING**

Solvent with a low flash point such as gasoline, naphtha, benzol, etc., should not be used as each is flammable and explosive.

Inspect diaphragm. The pumping area should be free of holes, tears or imperfections. Replace as needed.

## INSTALLATION

Inverse removal procedure.

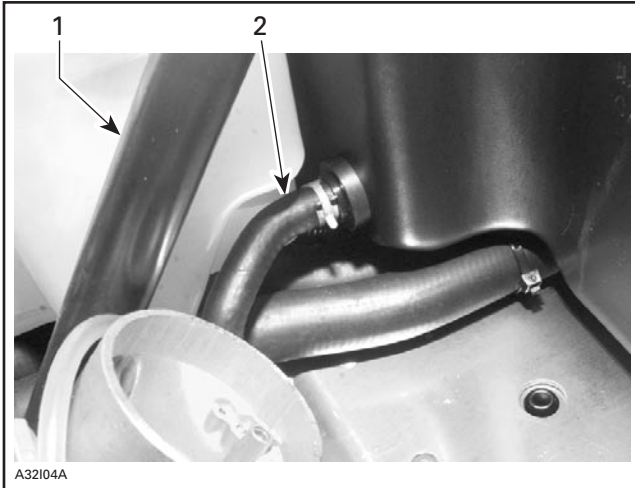
### **⚠ WARNING**

Pressure test to ensure there is no leak in fuel system.

# FUEL TANK AND THROTTLE CABLE

## Fuel Tank

After draining fuel tank, unplug fuel line.

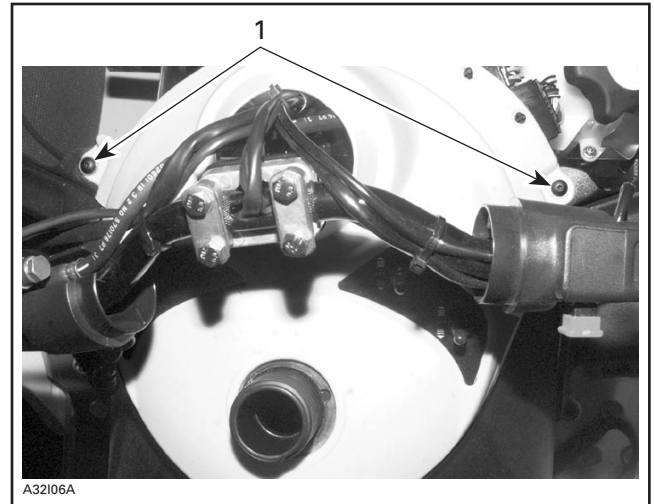


- 1. Steering column
- 2. Fuel line

Remove console nut using console nut key (P/N 529 035 603).



Unscrew console and move it toward front.

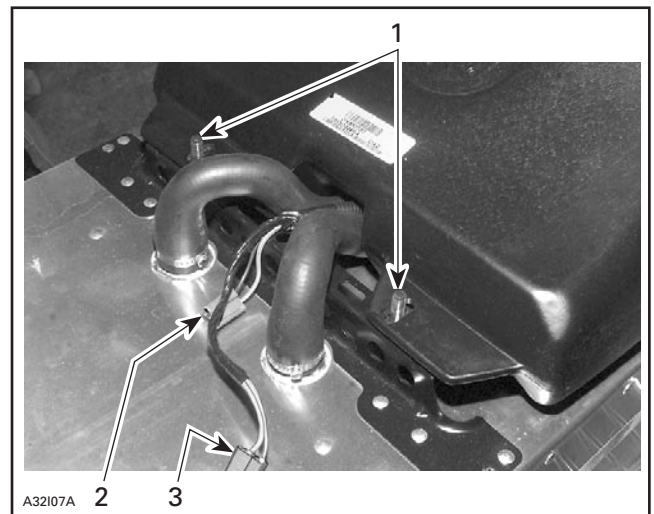


- 1. Remove these screws

Open storage compartment at rear of seat. Remove nuts and washers retaining rear of seat then move seat rearward.

Disconnect taillight connector housing located between seat and fuel tank.

Remove seat then unbolt rear of fuel tank. Unplug electric fuel level gauge on so equipped models.

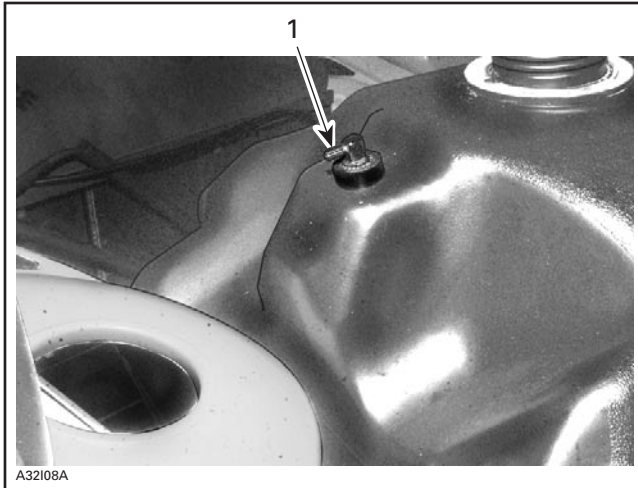


- 1. Nuts retaining rear of fuel tank removed
- 2. Connector housing of electric fuel level gauge
- 3. Connector housing of taillight

## Section 04 ENGINE

### Subsection 11 (FUEL TANK AND THROTTLE CABLE)

Move fuel tank rearward then, unplug vent tube from vent fitting at top front of fuel tank.

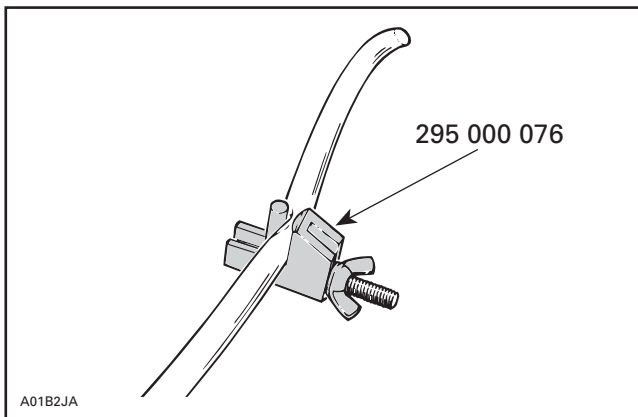


1. Vent fitting

#### Fuel Tank Lines

##### **⚠ WARNING**

Whenever a fuel line is disconnected, obstruct line with a hose pincher (P/N 295 000 076) or equivalent device. Fuel is flammable and explosive under certain conditions. Ensure work area is well ventilated. Do not smoke or allow open flames or sparks in the vicinity.



#### Impulse/Fuel Lines Spring Clips (all models)

Always reposition spring clips after any repair to prevent possible leaks.

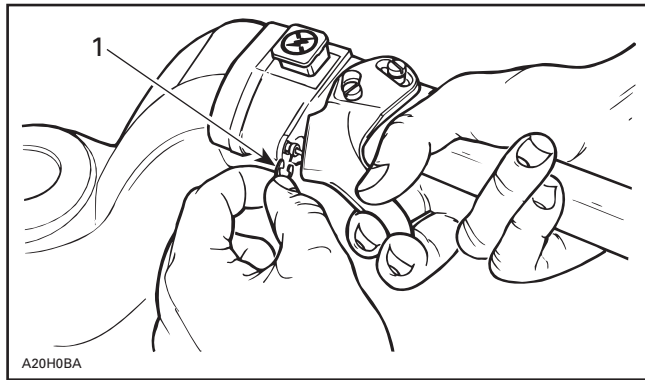
#### Throttle Cable Circlip at Handlebar (all models)

Put silicone grease (P/N 293 550 004) around cable barrel. Locate circlip as per illustration.

##### **⚠ WARNING**

If this procedure is disregarded, throttle might be half-open at normally closed position and the engine will speed up when starting.

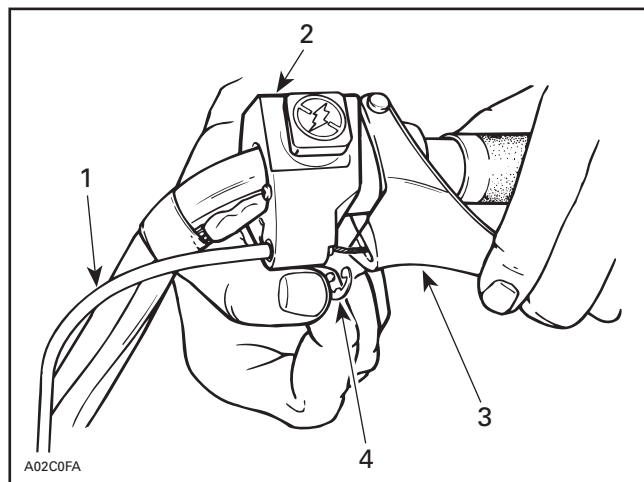
#### Models with Easy Action Throttle Lever



TYPICAL

1. Circlip

#### Other Models



TYPICAL

1. Throttle cable housing
2. Throttle handle housing
3. Throttle handle
4. Circlip

Adjust throttle cable as specified in CARBURETOR AND FUEL PUMP.

### Throttle Cable Routing

**CAUTION:** Check that throttle cable is routed away from sharp edges, hot or vibrating parts. When turning steering while engine is running, idle speed must not vary.

### Fuel Level Sensor

#### Inspection

Visually inspect the condition of connectors and wiring throughout the circuit. Connections must be clean and tight, and wiring free of damage. Repair as necessary. Use silicone dielectric grease to prevent corrosion at the connectors. Operate the engine to see if the problem has been corrected.

#### Fuse Replacement

A 0.25 ampere fuse protects fuel level sensor circuitry. Remove seat to gain access.

### Fuel Level Sensor Screws

Torque fuel level sensor retaining screws to 1 N•m (8 lbf•in) in a criss-cross sequence and then to 2.8 N•m (25 lbf•in), using the same sequence.